D4.1 Guideline discussing and addressing recommendations for good practice exchange from the pilots

Version 1.0, 25.10.2024

Co-funded by the Erasmus+ Programme of the European Union

Table of contents

Introduction (ELS)

This document contains a collection of scenarios and activities that can be used in VET in mechanical industry for various mechanical industry production related processes. The scenarios are organized in categories according to the blended learning methods that could be used in each of them. Respectively, we have scenarios that leverage the opportunities created by the tools and services applied in the iQVet project. Some of them have extended examples that teachers and instructors could consult.

Using scenario cases in Vocational Education and Training (VET) is an effective way to apply and train on situations that students might encounter in their chosen field. This approach helps bridge the gap between theory and practice, allowing learners to apply their skills in a controlled, safe environment. The objectives might include for instance technical skills, problem-solving, critical thinking, communication etc. Clear objectives help design scenarios that are relevant and aligned with the curriculum. The cases reflect real situations that have been applied by the students during the iQVet project. The students could identify theses issue, evaluate potential solutions, and select the most appropriate response based on their knowledge, skills and competences. If appropriate, apply the cases in group scenarios that encourage teamwork, collaboration and cooperation. The roles in group scenarios may be used to simulate workplace dynamics and help them understand the importance of each role.

Reflection helps students solidify their learning and identify areas for growth. Discuss what went well, areas for improvement, and alternative ways to approach the selected scenarios, to help building critical thinking and self-awareness. The feedback should address the technical skills, decision-making, and soft skills like communication and teamwork.

Consider using scenarios with slight variations to reinforce skills and competences over time. This allows students to apply feedback and grow their expertise gradually. As students learning progress, it is possible to make scenarios more complex to reflect real-world challenges that become more difficult and challenging as they gain experience. Scenario-based learning in VET can significantly enhance practical skills and competences, build confidence, and improve students' readiness for employment in production industrial firms.

The advantages of scenario-based training enhance practical skills by providing the students with hands-on experience in realistic work-based practice situations, allowing them to develop and refine practical skills that they will use in the workplace. This type of training is especially valuable in VET, where skills application is essential.

In addition, application of scenarios helps boosting problem-solving skills in combination with critical thinking. Industry related production scenarios challenge students to assess situations, identify problems, and think critically to make informed decisions. This strengthens their problem-solving abilities and prepares them for the complexities they will face in a professional production framework setting.

Scenario adapted training will help improving job readiness. By applying work-based workplace situations, the VET will help students understand the demands of their chosen field and build confidence in their ability to perform and develop effectively. This readiness will make students more attractive to employers, since they are better prepared for job responsibilities.

Furthermore, scenarios help building communication capabilities and interpersonal skills. They often support or require students to work in teams, engage with "clients" or "colleagues," and help navigating through interpersonal dynamics. These experiences improve communication, empathy, and teamwork skills, which are crucial in almost any job within an industrial production firm.

Realistic scenarios will help making learning more engaging and relevant. Students will become more motivated to participate in VET when they see the direct link between their study efforts and the job skills and competences they need. This also makes learning more enjoyable and impactful.

It is often forgotten or even neglected, that mistake driven learning allows students to carry out mistakes, and learn from their mistakes without creating serious consequences for an industrial production. Such a safe learning environment fosters for instance experimentation, risk-taking, and growth, encouraging students to try different approaches to solve problems. Mistake-based training teaches learners that errors are a natural, valuable and effective part of the learning progression process. This shifts the focus from perfectionism to growth, helping learners see that improvement comes from continuous practice and refinement, and not from avoiding mistakes. It requires learners to actively think about their choices, engage with the material, and assess outcomes of their learning process. This active engagement solidifies learning far more effectively than passive learning methods like memorization of patterns and routs, as the brain is more likely to retain lessons learned through experience. In addition, it offers instructors natural opportunities to give targeted feedback. By addressing errors as they occur, trainers can provide constructive guidance on how to improve. This feedback loop helps learners understand not just what went wrong, but why, fostering a deeper understanding of the subject matter. This may be used by the learners to reflect on what led to their error and how they can adjust their approach. This self-assessment driven learning progression fosters independence and self-awareness, empowering learners to take ownership of their progress and hopefully become more autonomous problem-solvers. Is indeed important to try to make it as normal as possible that mistakes are an effective part of the learning journey, whereby this approach reduces the fear of making up failures. When students and learners understand that mistakes are a stepping stone rather than a setback, they approach learning with more openness and less anxiety, which can lead to a more positive, engaged learning experience. Thus, by overcoming mistakes through work-based practices help building confidence. As the students and learners understand that they can recover from errors, they will develop a stronger belief in their ability to handle challenges. This work-based self-assurance carries over into the workplace, whereby they become better prepared to take on responsibilities without fearing the occasional mistake.

Scenario based training help providing immediate and regular feedback to students such that they get continuous improvement of their learning progression. VET teachers and Instructors may provide instant feedback on students' decisions and actions during scenario-based training. This allows students to learn and improve in real time, honing their skills through direct coaching and reflection on their performance. This type of scenario-based training teaches students to be adaptable and think on their feet, qualities that are essential in today's fast-evolving advanced industrial production environments where unexpected challenges or changes happens frequently.

The cases have been developed and customized to reflect current industry standards and expectations, bridging the gap between VET programs and employer requirements. This alignment ensures that training is relevant and that students gain skills directly applicable to their roles.

Last but not least, "experiential oriented learning" that is applying scenario-based training, tends to improve retention by providing a memorable, hands-on way to learn. Students will more likely retain what they learn in scenarios compared to traditional lecture-based methods, making it easier to recall and apply knowledge when needed. In summary, scenario-based training is a powerful tool in VET because it brings theory to life, encourages hands-on learning, and prepares students for the demands and dynamics of real-world industrial production workplaces. This approach not only makes VET more effective, but helps empowering students to enter their careers with confidence and capability.

By embracing errors as opportunities for growth, this approach builds resilience, critical thinking, and self-confidence, ultimately leading to more competent and prepared professionals. When learners identify and correct errors, they create stronger mental connections, making it easier to recall the correct methods and solutions at a later stage. Indeed, the experience of learning from a mistake often makes the lesson stick more effectively than simply being told the correct way. It helps learners analyse problems and cases, assess possible different solutions, and make informed decisions. By facing and troubleshooting errors, the students and learners help developing valuable problem-solving skills, which are crucial for handling unexpected challenges in the production industries. Students and learners become more adaptable as they learn to view errors as opportunities rather than setbacks. This growth mindset encourages them to approach new challenges with confidence and adaptability. In summary, case-based VET offers students and learners a rich, engaging, and effective way to acquire skills and knowledge.

Making errors are a natural and valuable part of the learning progression processes. This shifts the focus from perfectionism to growth, helping students and learners see that improvement occurs from continuous practice and refinement processes, and not from avoiding mistakes. By experiencing and addressing mistakes in VET, students and learners will be better equipped to handle them when they occur on the job. They become familiar with the process of troubleshooting and recovery, which can minimize the impact of future errors.

Work-based VET practice that applies flipped learning methodologies?

Flipped learning is a growing pedagogical approach in upper secondary education. In a flipped classroom, students watch digital or online videos as part of their homework before class. During class time, they participate in active, work-based learning activities such as discussions, peer teaching, presentations, projects, problem-solving tasks, computations, and group activities. Essentially, this method "flips" the traditional model, where class time is typically used for lectures and problem demonstrations, while the homework focuses on presenting the problem sets, the cases or even or group related projects.

Flipped learning is more than just a passing trend; it is supported by educational theory as a strategy that can enhance student learning. Constructivist theory suggests that active learning helps students construct their own knowledge by building on existing cognitive frameworks, leading to a deeper understanding compared to more passive learning environments. Another key benefit of flipped learning is that it allows students to absorb some of the fundamental work-based knowledge before class, thus help transferring it into their long-term memory. This reduces cognitive load during class, enabling students to make deeper connections and engage with more complex work-based scenarios that involve health, environment and security of machines. Additionally, the in-class activities in a flipped classroom can be purposefully designed to develop important intra- and interpersonal skills.

Since around 2012, research on the effectiveness of flipped learning has expanded rapidly. However, the studies have been conducted in diverse contexts and published across various disciplines, making it challenging to draw clear conclusions about when and under what conditions work-based flipped classrooms outperform the more traditional lecture-based approaches.

Students in flipped classrooms typically outperform those in traditional settings. While previous research reviews have confirmed that flipped learning positively impacts students' fundamental knowledge, the flipped learning approach demonstrates a modest positive effect on higher-order thinking skills. Flipped learning is especially effective in helping students develop professional and academic skills through work-based learning activities. Flipped learning outperforms lecture-based approaches in promoting a wide range of intra- and interpersonal outcomes. It enhances students' interpersonal skills, increases their engagement with course content, and helps them develop essential metacognitive abilities such as time management and effective learning strategies. Flipped learning is particularly well-suited for work-based skills-based courses, as it allows class time to be dedicated to practicing and mastering work-based related skills. Flipped learning may have the greatest impact in courses that would otherwise rely heavily on a traditional lecture-based format.

Conventional wisdom suggests that instructors designing a flipped course should use pre-class quizzes and assignments to ensure students are prepared for the flipped class activities. In scenarios 1.1-6, online video has been used to prepare and enhance students learning progression in work-based learning activities at CNC milling machines. The training followed a partially flipped learning approach, tending to produce better work-based VET learning progression. Due to the time and expertise needed to design effective flipped class sessions, partially flipped courses may be more practical for instructors, especially those new to this teaching approach. These courses offer flexibility, allowing instructors to flip work-based learning materials and content that is best suited to the model while reserving more complex or foundational topics for traditional in-class instruction. Another reason to consider flipped learning is its positive impact on student satisfaction. Students in flipped classrooms reported higher levels of satisfaction with their courses compared to those in the traditional lecture-based settings.

Thus, both Work-Based VET and flipped learning are two educational approaches that enhance student engagement and learning outcomes, particularly in practical or skills-based contexts.

The work-based training strategy

Work-based training refers to educational programs that integrate learning with practical work experiences. This approach typically involves students participating in real-world tasks within a professional environment, allowing them to apply theoretical knowledge to practical situations. Key features include:

- Hands-on experiences let students engage in tasks that closely resemble those they will encounter in the workshop and in their future careers, helping to bridge the gap between theory and practice.

- Skill developments focuses on building specific skills relevant to a a particular profession, such as technical, communication, and problem-solving skills.

- Collaboration with employers supports a methodology that may involve partnerships with industrial companies or organizations that provide training opportunities, mentoring, and feedback.

- Assessment and evaluation of competence better support students based on their work-based performance in real-world scenarios, ensuring they can effectively apply what they have learned.

The flipped learning strategy

Flipped learning as an instructional strategy, reverses the traditional teaching model. In a flipped classroom, students first engage with new content outside of class, often through videos or online materials, and then use work-based VET practices time for active learning activities. Key elements include:

- Pre-class workshop preparation helps the students to reviewed CNC course materials, such as lecture videos or readings, before attending the work-based training in the workshop. This allows them to familiarize themselves with the content at their own pace.

- Active learning in work-based VET let the work-based training practices time become devoted to engaging students in discussions, problem-solving, group work, and hands-on activities that reinforce the material learned outside of the workshop.

- Enhanced engagement with the flipped work-based video illustrations encourages deeper understanding and retention of knowledge and skills by allowing students to apply concepts in interactive settings.

- Flexible learning solutions secure that the students can revisit the video materials as many times they need, catering to different learning styles and paces.

Integration of work-based training and flipped learning

Combining work-based training with flipped learning will create a powerful educational experience. For instance, the students watched the instructional videos and complete pre-class assignments related to specific CNC machine skills or tasks before participating in the hands-on work-based experiences in the workshop. This integration can:

- Enhance skill mastery by first getting an overview of the theoretical aspects and then afterwards applying them in practical work-based scenarios, students can better grasp complex skills.

- Increase flexibility since instructors can tailor class activities based on students' pre-work-based learning, focusing on areas where they need more practice or understanding.

- Promote engagement due to active learning in a work-based context that boost student motivation and satisfaction, leading to better VET outcomes.

Overall, both work-based training and flipped learning prioritize student engagement, practical application of knowledge, and skill development, making them effective strategies in modern education.

Embracing a new pedagogy can be challenging, and one major obstacle to transitioning a work-based VET course to a flipped format is the considerable time required to develop digitized, targeted video presentations. For instructors who have already gained experience and created such digital content and learning materials, it is an excellent opportunity to explore the potential of flipped learning further.

Blended learning methods for CNC machines (Meldal)

Scenario 1.1 – Learn how to start a CNC machine

Aim	To achieve better basic training in CNC- machining. Meeting the competence requirements of local businesses. Students should learn how to handle the CNC machine. **Title: Qualifying prior knowledge (CU 1)** Content: Be able to operate manual milling machines. Knowledge of the machine`s working directions (X-Y-Z). Tools and material knowledge. - Video 1: Starting up the CNC machine (Oppstart av CNC maskina, NO)
Activity	Apply the video in a flipped classroom, in combination with practice/ work-based training together with the teacher. The students study the videos before practical training may start up. Steps: - QR code is scanned, and the video appears on the phone. - The candidates are studying the videos.
Method	Watch the video first. Students apply them afterwards together with the teacher at the CNC machine. Apply: Flipped classroom, self-produced video material, use of QR-code, and curriculum that can be used on other machines and equipment's
Subject	Initial training of CNC operators.
License	Free usage.

Scenario 1.2 – Self-study of video material

Aim	To achieve better basic training in CNC- machining. Meeting the competence requirements of local businesses. Students should learn how to handle the CNC machine. **Title: Self-study of video material (CU 2)** Content: - Video 1: Starting up the CNC machine (Oppstart av CNC maskina, NO) - Video 2: Starting up the CNC machine (Oppstart av CNC maskina, NO) - Video 3: Tool measurement (Oppmåling av verktøy, NO) - Video 4: Buckle up the workpiece (Oppspening av arbeidsstykke, NO) - Video 5: Find the saved program and commissioning (Finne lagret program og igangkjøre, NO) - Video 6: Turning of the CNC machine (Slå av maskina, NO)

Activity	Apply the video in a flipped classroom, in combination with practice/ work-based training together with the teacher.
Method	Watch the video first. Students apply it together with the teacher at the CNC machine. Apply: Flipped classroom, self-produced video material, use of QR-code, and curriculum that can be used on other machines and equipment's
Subject	Initial training of CNC operators.
License	Free usage.

Scenario 1.3 – Initial review

Aim	To achieve better basic training in CNC- machining. Meeting the competence requirements of local businesses. Students should learn how to handle the CNC machine. **Title: Initial review (CU 3)** Content: - Theoretical review of the process. - Demonstration on the CNC machine.
Activity	Apply the video in a flipped classroom, in combination with practice/ work-based training together with the teacher.
Method	Watch the video first. Students apply it together with the teacher at the CNC machine. Apply: Flipped classroom, self-produced video material, use of QR-code, and curriculum that can be used on other machines and equipment's
Subject	Initial training of CNC operators.
License	Free usage.

Scenario 1.4 – Practical implementation with support of videomaterials

Aim	To achieve better basic training in CNC- machining. Meeting the competence requirements of local businesses. Students should learn how to handle the CNC machine. **Title: Practical implementation with support of videomaterials (CU 4)** Content: Start up the machine - The candidate goes through the start-up procedure. Support from the videos. Instructor observes.

	Clamping the workpiece - The candidate learns the clamping procedures. Support from the videos. Instructor observes. Measurement of tools - The candidate learns measurements of the tools. Support from the videos. Instructor observes. Setting the zero point on the workpiece - The candidate set the zero point on the workpiece. Support from the videos. Instructor observes. Finding the saved programme and commissioning - The candidate navigates to the stored programme. The candidate run the programme. Support from the video. Instructor observes. Switching off the machine - The candidate switching off the machine. Support from the videos. Instructor observes.
Activity	Apply the video in a flipped classroom, in combination with practice/ work-based training together with the teacher.
Method	Watch the video first. Students apply it together with the teacher at the CNC machine. Apply: Flipped classroom, self-produced video material, use of QR-code, and curriculum that can be used on other machines and equipment’s
Subject	Initial training of CNC operators.
License	Free usage.

Scenario 1.5 – Self-assessment by learner

Aim	To achieve better basic training in CNC- machining. Meeting the competence requirements of local businesses. Students should learn how to handle the CNC machine. **Title: Self-assessment by learner (CU 5)** Content: - The candidate reflects of what he/she has learnt in the process. - The candidate checks if the result is as expected. - Involves the use of different measuring tools. - Feedback to the instructor.
Activity	Apply the video in a flipped classroom, in combination with practice/ work-based training together with the teacher.
Method	Watch the video first. Students apply it together with the teacher at the CNC machine.

	Apply: Flipped classroom, self-produced video material, use of QR-code, and curriculum that can be used on other machines and equipment's
Subject	Initial training of CNC operators.
License	Free usage.

Scenario 1.6 – Instructor`s assessment of learner

Aim	To achieve better basic training in CNC- machining. Meeting the competence requirements of local businesses. Students should learn how to handle the CNC machine. **Title: Instructor`s assessment of learner (CU 6)** Content:  Does the candidate work independently?  The instructor`s assessment of acquired competence. Instructor checks the quality of the product. Is the candidate ready for the next competency step.
Activity	Apply the video in a flipped classroom, in combination with practice/ work-based training together with the teacher.
Method	Watch the video first. Students apply it together with the teacher at the CNC machine. Apply: Flipped classroom, self-produced video material, use of QR-code, and curriculum that can be used on other machines and equipment's
Subject	Initial training of CNC operators.
License	Free usage.

Work-based learning for welding for designers (WoS)

Scenario 2.1 – Learn about Common welding methods: MIG/MAG

Aim	Students learn about advantages and limitations of Metal Inert Gas (MIG) and Metal Active Gas (MAG) welding methods and become aware of how they work. ☐ PPP: Common welding methods with videos, page 15-18 ☐ WoS Video 1, MAG-136-1 ☐ WoS Video 2, MAG-136-2
Activity	Apply the videos together with PowerPoint Presentation (PPP) in a work-based training framework.
Method	**Before the course:** Students watch the videos and read the pages in PPP to be prepared for the course. **During the course:** The teacher shows the videos and explains the method using PPP.
Subject	Welding for designers: Overview of welding methods
License	Free usage

Scenario 2.2 – Learn about Common welding methods: TIG

Aim	Students learn about advantages and limitations of Tungsten Inert Gas (TIG) welding method and become aware of how it works for welding of carbon steel and aluminum. ☐ PPP: Common welding methods with videos, page 19-21 ☐ WoS Video 4, TIG Al ☐ WoS Video 6, TIG Steel-1 ☐ WoS Video 7, TIG Steel 2
Activity	Apply the videos together with PowerPoint Presentation (PPP) in a work-based training framework.
Method	**Before the course:** Students watch the videos and read the pages in PPP to be prepared for the course. **During the course:** The teacher shows the videos and explains the method using PPP.
Subject	Welding for designers: Overview of welding methods
License	Free usage

Scenario 2.3 – Learn about Common welding methods: SAW

Aim	Students learn about advantages and limitations of Submerged Arc Welding (SAW) method and become aware of how it works. - PPP: Common welding methods with videos, page 11-13 - WoS Video 5, SAW
Activity	Apply the video together with PowerPoint Presentation in a work-based training framework.
Method	**Before the course:** Students watch the videos and read the pages in PPP to be prepared for the course. **During the course:** The teacher shows the videos and explains the method using PPP.
Subject	Welding for designers: Overview of welding methods
License	Free usage

Scenario 2.4 – Learn about Common welding methods: MMA

Aim	Students learn about advantages and limitations of Manual Metal Arc (MMA) welding method and become aware of how it works. - PPP: Common welding methods with videos, page 11-13 - WoS Video 5, SAW
Activity	Apply the video together with PowerPoint Presentation in a work-based training framework.
Method	**Before the course:** Students watch the videos and read the pages in PPP to be prepared for the course. **During the course:** The teacher shows the videos and explains the method using PPP.
Subject	Welding for designers: Overview of welding methods
License	Free usage

Scenario 2.5 – Content, implementation and former students' expectations and experiences of a Welded Structure Designer training

Aim	Prospective students get to know the subjects that are taught, who the teachers are, what the former students' expectations were and what they prefer from the course, as well as how the education is carried out. - WoS Video - VET for design of welded structures with the iQVet experiences

Activity	Apply the video before new courses.
Method	**Before the course:** Students watch the video to decide if attending to the training.
Subject	Welded Structures Designer – Implementation and experiences
License	Free usage

Work-based learning methods for teaching Welding Inspectors (MHtE)

Scenario 3.1 – CU3 of Testing and Inspection

Aim	Students learn how to design and perform an inspection plan for a welded structure.
Activity	Applying in-person PowerPoint presentations and the technical drawing of a welded structure. Students are encouraged to bring their technical drawings from the workplace. During the hands-on session, the students will design an inspection plan of the selected welded structure according to the knowledge from the classroom presentations and the technical drawings. The trainer guides and supervises the students' activity.
Method	Using original industrial drawings and videos for each testing or inspection step, use blended learning activities. Work-based learning methodology is implemented by planning an inspection of the welded structure according to the technical drawings.
Subject	Testing and inspection of a welded structure and design of an inspection plan.
License	Free usage

Scenario 3.2 – CU6 of Non-destructive Testing

Aim	Students learn the basics and theory of different non-destructive testing methods and their applicability in inspecting welded structures.
Activity	Applying in-person PowerPoint presentations about different non-destructive testing methods. The presentations will be supplemented with hands-on tasks. After the theoretical and ppt presentations, the students will get additively manufactured fillet welds and butt welds. The student's task is to find and register all the imperfections on the samples using the visual testing method. This hands-on task will prepare the students for on-site weld inspection and the appearance of different weld imperfections.
Method	PowerPoint presentations will be used to teach the basic theory and the advantages and disadvantages of different non-destructive testing methods. During the hands-on session, students will evaluate additively manufactured weld samples.
Subject	Theory and applicability of different non-destructive testing methods.
License	Free usage

Scenario 3.3 – CU 7 of Destructive Testing

Aim	Students learn the basics and theory of different destructive testing methods and their applicability in inspecting welded structures.

Activity	Applying online presentations through a learning management system. The online presentations are supported with videos recorded in materials testing laboratories and universities. These videos supplement the theoretical background of different destructive testing methods, highlighting the applicability and implementation of the testing. The student learned how to evaluate the measurement data and how to implement these results into the design stage of an inspection plan.
Method	Online PowerPoint presentation through a learning management system, supported with video material of different destructive testing methods.
Subject	Theory and applicability of different destructive testing methods.
License	Free usage

Scenario 3.4 – Learn about the competence unit CU4 of Production documentation

Aim	The students learn how to construct production documentation for a welded structure. The students will also get familiar with the chronological order of the production of a welded structure, the relevant standards and regulations of pressure vessels, welded pipelines, etc.
Activity	Applying in-person PowerPoint presentations about the production documentation. The presentations are supplemented with hands-on tasks. The students will go through the structure of a production plan with the guidance of the trainer. During the hands-on session, the students paired activities in the design of production documentation with the relevant standards and regulations and the format of the report. The trainer guides the student through these tasks.
Method	PowerPoint presentations will teach the basics of the construction of production documentation. The presentations are supported with work-based hands-on tasks, where the students construct documentation, bringing attention to the standards and regulations.
Subject	How to construct a production documentation. Knowledge of relevant standards and regulations.
License	Free usage

Teaching methods for training of welders and their instructors (IZV)

Scenario 4.1 – Blended learning delivery of theoretical lectures with the use of Brunner curve principle

Aim	Increase the understanding of knowledge delivered during theoretical lectures, by repetition and demonstration of principles during practical lectures.
Activity	*Before the practical lesson, the students go over the theory with the help of the teacher during zoom lectures and by self studying with the use of LMS Moodle. For the example we will take the lecture of defects of welds.* *After the students weld their initial sample, they are shown different types of surface defects on their workpiece and the workpieces of their classmates. With the help of the teacher, they analize the reasons for the defects.* *The samples are taken for X-Ray inspection to analyze for different defects present in the core of the welds. After the X-Ray inspection the samples are taken for destructive testing to further demonstrate the impact such defects have on the mechanical properties of the workpieces.* *With such a system the students learn the importance of attention to detail and the visual inspection of their work. They learn how quality of their work affects the whole product.*
Method	LMS, Zoom lectures, practical work, inspection, Brunner principle
Subject	Reasons for different defects during welding and their impact
License	cc, open for teacher to revise, remix

Scenario 4.2 – Defect generation through AR simulators

Aim	Understanding of defect generation through the use of augmented reality simulators
Activity	*By replacing the typical virtual reality (VR) welding simulator with the more advanced versions of augmented reality simulators (AR) the students are able to see the impact of their work on the workpiece.* *Students get a specific welding configuration, either a fillet weld, plate, etc. through the use of the platform, they are able to see visual representations of different imperfections in the weld.* *Such devices are especially suitable for use in intrudoctory practical lessons when the students are just starting out. AR systems are a big help in developing motorical skill needed for welding, while keeping the working environment clean and use less resources.* *AR also enables the use of theory examination during a practical lecture and comperation of different students results*
Method	AR simulator, blended learning (BL) through simulation
Subject	Introductory MIG/MAG practical lessons
License	cc, open for teacher to revise, remix

Scenario 3 – Extracting silent knowledge in education of welding instructors

Aim	Education of welding instructors to extract silent knowledge and put focus on delivering combined silent knowledge to the student
Activity	*As per the welding instructor guideline developed by the Slovenian welding instructor society, the instructors are educated in all the required subjects required for teaching. To extract silent knowledge, each of the welding instructors is required to write a type of seminar work, which is focused on extracting silent knowledge the instructor already possesses.* *All the deliverables from the instructor training are thoroughly analysed and good practice from all the instructors is included in the practical lessons that are delivered to the students.* *A discussion is organized between students and participating instructors, to offer continuous improvement to the 22 practical exercises being delivered on the MIG/MAG training course.*
Method	Debate, discussion, seminar work, common teaching materials, optimization, learning by doing
Subject	Collection and application of instructors' silent knowledge
License	cc, open for teacher to revise, remix