Project Method Tailored for Vocational Education

Method & Practice

VETPROFIT

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Author: Hartyányi Mária, Giulia Dakli, Dr. Sediviné Balassa Ildikó

Reviewer: Heide Reimer, Ian Jones, Láng-Veres Zsófia

Editor: Hartyányi Mária

Collaborators and partners

Hartyányi Mária, Kacsur Annamária
iTStudy Hungary Számítástechnikai Oktató- és Kutatóközpont Kft., Hungary

Ekert Sára, Hajnal Sándor, Hegedüs Helén
Magyar Kertészeti Szakképző Intézmények Szövetsége, Hungary

Gradwohl Ágnes, Dr. Sediviné, Balassa Ildikó
Premontrei Szakgimnázium és Technikum, Hungary

Heide Reimer, Henrik Blöthe, Kai Helfers, Ian Jones
DEULA - Nienburg GmbH, Germany

Giulia Dakli, Chiara Spizzichino
Fondazione ITS – Jobsacademy, Italy

Rusznák Réka, Dr. Láng Vince, Fodor Hella
Discovery Center Nonprofit Kft.

Láng-Veres Zsófia
AgriDron Kft.

Dr. Szuvandzsiev Péter
Szuvandzsiev Díszkertészet

IF YOU HAVE ANY QUESTIONS REGARDING THIS BOOK OR THE PROJECT FROM WHICH IT ORIGINATED:

HARTYÁNYI MÁRIA
iTStudy Hungary Számítástechnikai Oktató- és Kutatóközpont Kft.
H-2100 Gödöllő, Testvérvárosok útja 28.
Web: https://www.itstudy.hu, email: edu@itstudy.hu

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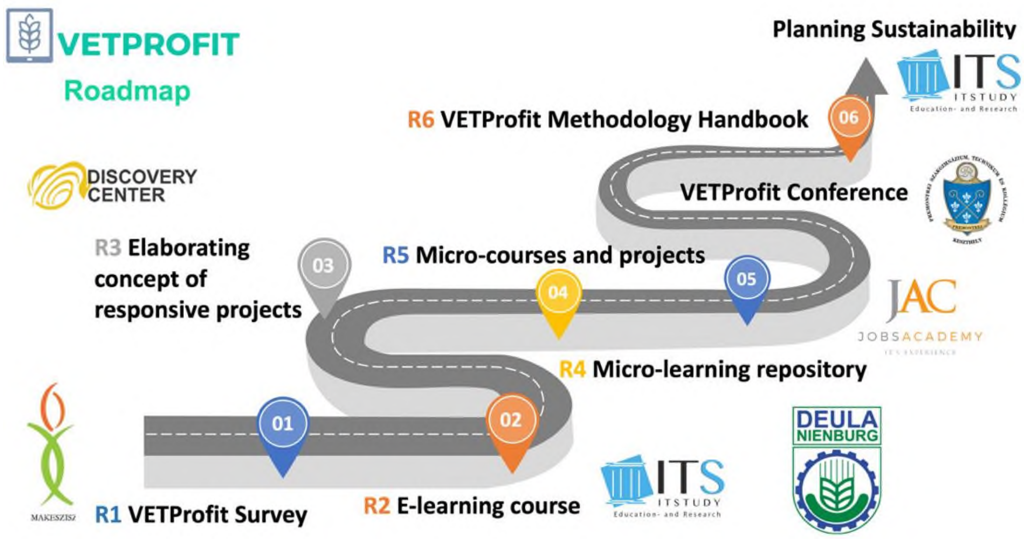
VETProfit Roadmap

The VETProfit project aimed to equip teachers with the skills and knowledge needed to address the challenges of the evolving labour market in vocational training. By collaborating with companies, the project focused on planning and implementing student-led initiatives to tackle real-world problems identified by industry partners. These initiatives were designed to develop the practical knowledge and skills currently in demand, ultimately enhancing students' employability and career prospects.

To achieve this objective, the partnership:

- *Reviewed the curriculum, learning materials and teaching methods used in the initial training of IT and Agricultural sectors in the partner countries.*
- *Developed training and learning materials for VET teachers about the project method, related digital tools, innovative assessment practices and digital content creation.*
- *Assigned real-life project tasks for VET students, in close collaboration of teachers and labour market representatives.*
- *Created a repository of project-based, re-usable, high-quality, motivating digital learning contents with an interdisciplinary approach.*
- *Prepared students for successful project implementation by designing and delivering micro-courses for them.*
- *Created a model to be published as a guide for teachers of other VET institutes.*



This handbook – with results and conclusions of the roadmap above – is warmly recommended to those vocational teachers who are ready to renew their teaching methods to equip their students with the knowledge and skills that the labour market expects of them in our digital age.

We would like to express our thanks to all VETProfit project partners, to all the experts and teachers who worked with us in VETProfit pilots, and to the Hungarian National Agency of Erasmus+ Programme – the Tempus Foundation – for supporting us during the implementation of this project.

Hartyányi Mária, project coordinator

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Introduction

One of the most important products of the VETProfit project is a new model that expands the scope of traditional project-based learning (PBL) to better fit those unique characteristics that fundamentally distinguish vocational education from all other educational sectors. The project concept has been determined by teachers and a business organization jointly related to new technologies that are already being used within the company; however, they have not yet been included in the curriculum. By solving the project tasks, students can test whether the knowledge and skills they have acquired during the training enable them to solve a problem for which they have not been given a ready recipe. The key components of the multidisciplinary model include:

- *The project owner is a company active in the school's professional sector. The representatives of the company develop the project concept collaboratively with VET teachers, involving students in the final decision-making process.*
- *The project scope extends beyond the standard curriculum. Some of the project tasks require the use of a new technology already in operation within the company, and despite the students understanding it, they need to acquire some specific knowledge and skills, so they need to attend a short micro-course – which is jointly conducted by the teachers and the company.*
- *Teachers and the company collaborate to identify knowledge gaps and co-design and deliver a tailored micro-course for the students, developing micro-learning content and Open Educational Resources (OERs).*
- *A comprehensive plan is prepared, which includes a project plan according to the design aspects of business projects (planned products with indicators, activities, schedule, quality control, risk management methods, communication, etc.), and a pedagogical plan that describes how the pre-defined learning objectives (knowledge, professional and 'soft' skills) will be achieved through the completion of specific activities.*
- *The evaluation of the project is a complex process, integrating pedagogical evaluation against the pre-defined learning objectives and assessment of the project products against the planned qualitative and quantitative indicators. During the product evaluation, the company plays the major role, while the pedagogical evaluation is primarily the responsibility of the teachers, but the students are also active participants throughout the entire evaluation process.*

Responsive Project Method (RPM)

VETProfit partners agreed to name the new model “Responsive Project Method (RPM)”. This name reflects the method's capability to enable vocational schools to effectively respond to the challenges of the 21st century labour market.

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Take a step towards the world of work!

Responsive projects are a special type of project-based learning that can increase students' chances in the labour market. Project-based learning is closely linked to the standard curriculum and can be used at any level of education. Students work together on projects that are close to real life, solving real problems or challenges — *but the primary aim of project work is to help them understand the material better than if they were learning from teacher explanations or books.*

RESPONSIVE PROJECT METHOD (RPM)	PROJECT-BASED LEARNING (PBL)

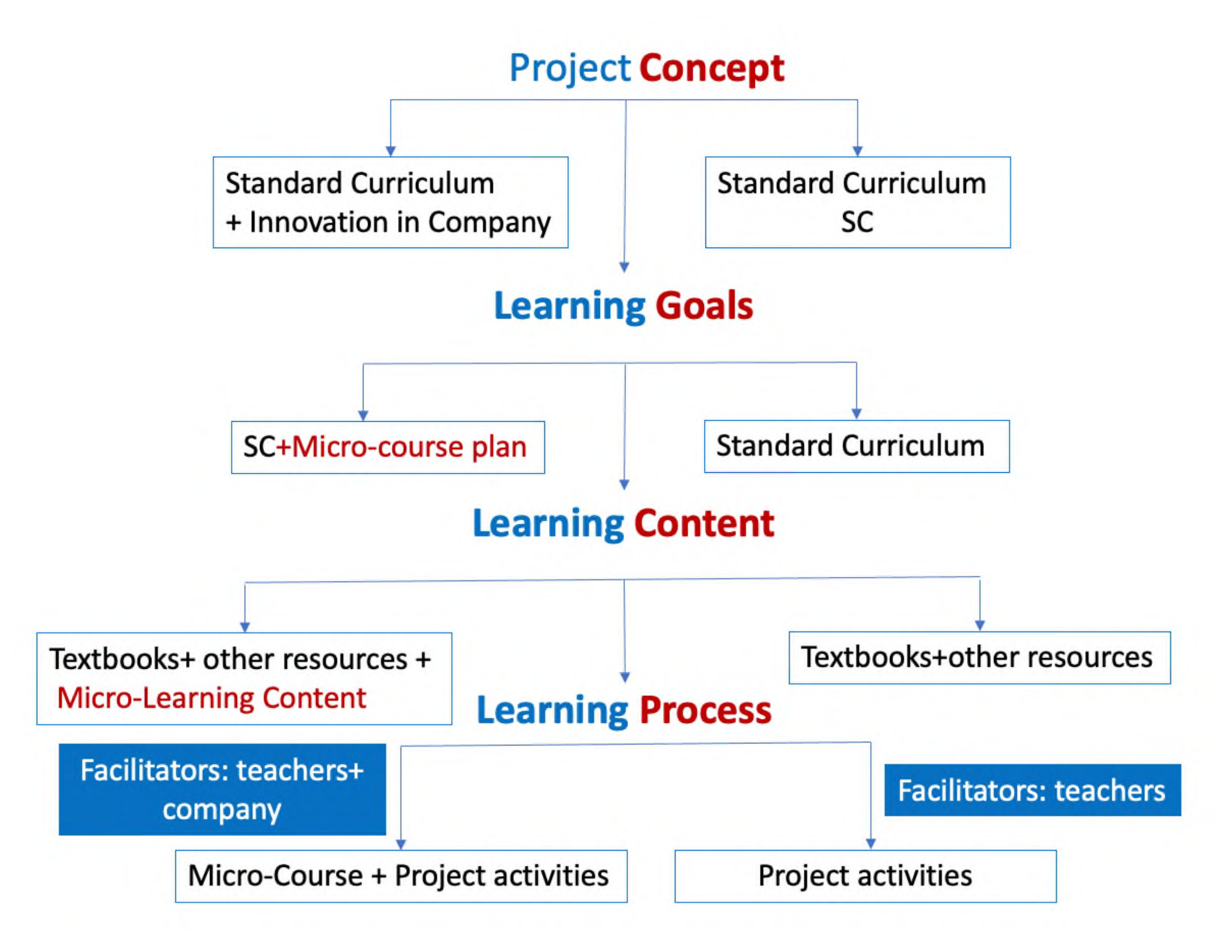

Figure 1. Responsive Project Method (RPM) vs Project-Based Learning (PBM)

This model goes beyond traditional Problem-Based Learning (PBL) frameworks, thereby boosting their applicability and relevance to contemporary labour market demands.

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Figure 2. Students in Szuvandzsiev Ornamental Gardening, Hungary

Teachers play a key role in the process described above: they are the driving force behind the whole "journey". They build networks with surrounding companies, motivate students, develop curricula to fill identified knowledge gaps and professional skills, and help students work as a team throughout the project. The success of the students' project is also the teacher's professional success!

Source: Shutterstock

Beyond acquiring professional knowledge and skills, the students delve into fundamental project management methods, they will understand concepts such as the project life cycle, resource allocation, target groups, product development, and quality standards. Through hands-on experience, they will learn the importance of detailed planning and scheduling, the necessity of identifying potential risks proactively, and the role of continuous monitoring to meet the project's key performance indicators.

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What do the working projects offer to vocational education?

Learning rather than teaching, discovering rather than passively absorbing knowledge, building knowledge creatively, working with others, helping each other to make connections. If the project objectives are sufficiently motivating, participation in the project will help students to get to know themselves better and to understand others, or to convince others of their truth in debates.

Each step of project-based learning involves the coordination of two processes that are interlinked and run in parallel:

- *monitor the learning process, with learning objectives in mind, assess, analyse and provide feedback on learning outcomes.*
- *monitor the students' project against the project triangle, following the project life cycle according to the rules of project management.*

Project-based learning links each step of a student project — from planning to completion — to learning objectives. While the work phases of the students' project follow the life cycle of a business project, the focus is on the learning process running in parallel: the teacher's task is to continuously monitor, control, evaluate the learning outcome (knowledge, skills, responsibility) described in the detailed pedagogical plan, and, if necessary, intervene.

The first step in project-based learning is not to plan the students' project according to the life cycle of business projects, but to plan pedagogically. The starting point for planning is the standard curriculum, which describes the expected learning outcomes: what students should know and what skills they should have by the end of the learning period.

The life cycle is complemented by a preparatory (zero) step: selecting the topic. The main topic of the project is chosen by the teacher, in line with the standard curriculum requirements. The project phases are therefore structured in this way:

1. *Topic selection*
2. *Setting objectives*
3. *Planning*
4. *Implementation*
5. *Project closure, evaluation*

The main topic of the project should be chosen by the teacher, who can decide whether the learning outcomes for the semester are related to a topic that can be better addressed through a project than through a traditional method.

The descriptors used to describe the learning outcomes in this training are knowledge, skills, responsibility, and autonomy, in line with the European Qualifications Framework for lifelong learning (EQF):

- *'Learning outcomes' means statements regarding what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and responsibility, and autonomy.*
- *'Knowledge' means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories, and practices that is related to a field of work or study. In the context of the EQF, knowledge is described as theoretical and/or factual.*

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- *'Skills' means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the EQF, skills are described as cognitive (involving the use of logical, intuitive, and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).*
- *'Responsibility and autonomy' means the ability of the learner to apply knowledge and skills autonomously and with responsibility. (Council Recommendation, 2017)*

Developing transversal skills by RPs

A highly important component of the model is identifying the professional and transversal (soft) skills the students will gain through the stages of the project lifecycle, for designing, implementing, monitoring and evaluating the working methods and the results of projects.

> *„Companies mentioned **the lack of project management skills and soft skills that are highly needed in real work, such as design thinking, critical thinking, communication skills in the first row.** Companies suggest that there should be more autonomy for teachers, more up-to-date theoretical training, closer cooperation with companies.*"
>
> (VETProfit needs-analysis – interviews with companies)

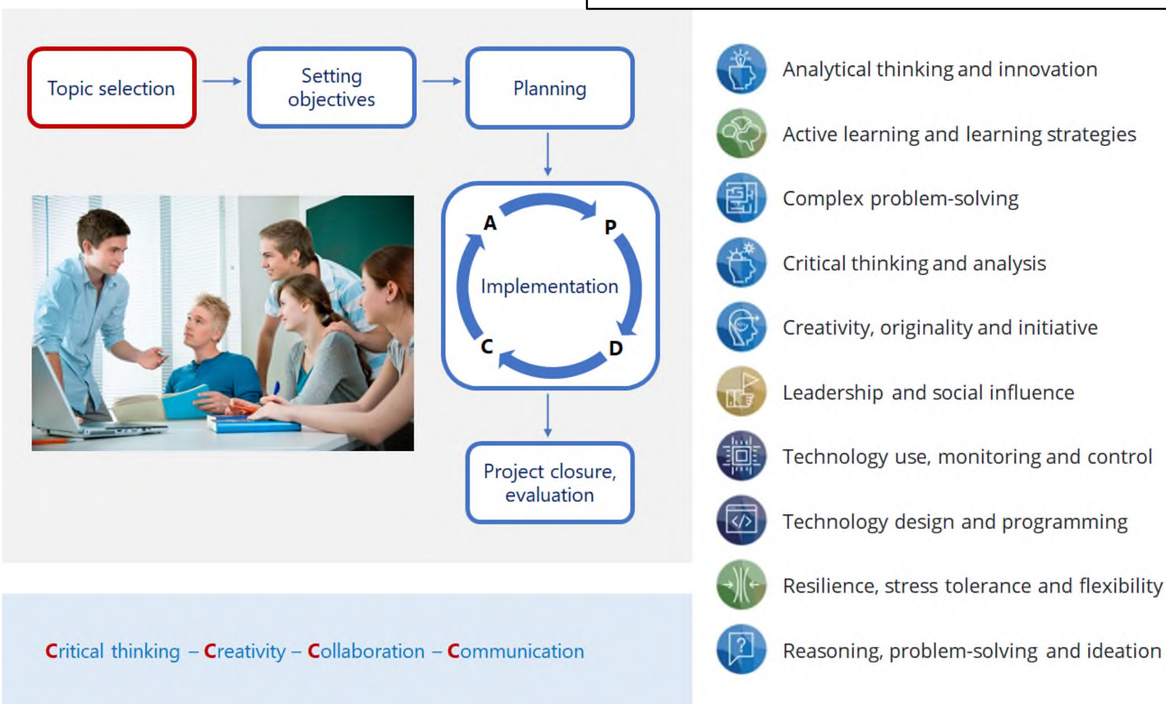

Figure 3. Developing transversal skills through labour market-oriented projects

On the right-hand side of the image, we see the ten generic skills, in order of importance from top to bottom, that the World Economic Forum (Whiting, 2020) predicts will be in greatest demand in the labour market in 2025. These skills are called soft or **transversal skills**. They are not linked to a specific job, profession, task, discipline, or field of knowledge, but are skills that can be applied in a wide variety of workplace situations (IBE, n. d.). To adapt to change and lead meaningful and productive lives, students will increasingly need

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transversal skills (UNESCO, 2014). See Annex 2 with a table with a list of samples, how to link the development of professional and transversal skills to the project activities.

The picture below the life cycle of a pedagogical projects shows the 4Cs, the four learning and innovation skills that are essential to thrive in the 21st century in life and work: creativity and innovation, critical thinking and problem solving, communication, collaboration (P21, 2019). The simple 4Cs acronym encapsulates precisely the four "core skills" without which it is difficult to thrive in the 21st century and which are particularly well developed in project-based learning.

Micro-courses and micro-learning contents

In a responsive project, students are exposed to solutions that are already used by the partner company but are not yet part of the curriculum, and they must solve problems that they have learned little or nothing about.

To give students the skills and knowledge they need for the project, teachers and company representatives are planning a short, intensive "upskilling training" course.

The training should not be longer than 15-20 hours, as the lessons must be integrated into the curriculum. If there is a "free slot" in the curriculum which the teacher can use for the subject he/she considers important, some hours can be included in the official timetable, but it is almost certain that some voluntary hours or extra work will be needed from the students. Of course, they will only be willing to do this if they see it as important for their future.

Upskilling courses are increasingly common in the world of work. In addition to the traditional training programmes that last for years, **micro-courses are** spreading around the world, offering a chance to catch up with the latest technologies, procedures and methods, either for free or for money.

The growing demand for micro-courses has put the spotlight on quality course design. The shorter the course, the shorter the time frame, the more precisely the output needs to be formulated, the more methodical and tightly planned, leaving minimal room for contingency. In a three-year vocational training programme of almost 1000 hours per year, one or two hours not going as planned is not an insurmountable obstacle, but the same two hours in a 20-hour intensive course is a loss of ten percent.

In 2022, the Council of the European Union published a recommendation describing the conditions that must be met before a trainer can certify learning outcomes after a short cycle of training by issuing an officially recognised "**micro-credentials".**

A "micro-credential" is a document certifying the learning outcomes achieved by a learner after completing small units of learning. These learning outcomes are assessed according to transparent and clearly defined criteria. The learning outcomes leading to micro-credentials are intended to equip learners with specific knowledge, skills and competences that meet social, personal, cultural, or labour market needs. Micro-credentials are the property of the learner and can be shared and carried throughout their career. They can stand alone or be combined into larger certificates. Micro-credentials are underpinned by quality assurance based on standards accepted in the sector or field of activity (Council Recommendation, 2022).

Since a key element of the responsive project method is the micro-course in which students acquire the knowledge and skills necessary for the new technology, we developed a template for the design of the micro-course, which follows the recommendation issued by the Council of the European Union, containing the data necessary for issuing a micro-certificate certifying successful completion of the training. The

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Recommendation does not address the requirements for courses leading to micro-certificates, but the mandatory elements suggested in the table suggest the requirements for the course. These include all the elements marked as mandatory:

- *the workload required to obtain the certificate (in ECTS credits, if possible)*
- *description of learning outcomes*
- *the level of learning experience required to obtain the certificate, according to the EQF or the Framework for Higher Education (QF-EHEA).*
- *the method and type of evaluation.*
- *the form of participation in the training (type of training).*
- *the quality assurance procedures used to support the certificate.*
- *the prior knowledge required for enrolment.*

Based on the recommendation, legislation on the issuance of certified micro-certificates has started to be developed in most EU countries. In Hungary, it is not yet allowed in formal vocational training, but in adult education there is already legislation on the issuance of "micro-certificates".

VET teachers who participated in RPM pilot designed micro-course for students to acquire the knowledge and skills necessary to implement the responsive project successfully. The course design and the micro-certificates followed the recommendation. However, as the national regulation of micro-credentials wasn't completed that time, students who successfully completed the course were awarded by a certificate issued by the by their school and the company involved.

Collaborative development of Micro-Learning Contents

One of the biggest challenges facing vocational education and training in the 21st century is undoubtedly how to provide students with up-to-date, up-to-date curriculum, since it is impossible to keep up with the pace of technological change with traditional textbooks. Those vocational instructors who undertake this are forced to create their own digital micro-learning material, videos and presentations, which, in addition to their daily work, often puts a serious strain on.

The solution requires a fundamental change of attitude in the teaching community: without sharing digital content among themselves, without continuous "recycling", without cooperation in curriculum development (also with students!), the chances of transmitting up-to-date knowledge are minimal.

In the RPM model presented in the previous chapters, students should be prepared to be able to solve tasks related to the new technology. The necessary micro-learning materials are developed by the teachers managing the project, together with the staff of the external company, with the involvement of students. To share the finished content, the VETProfit consortium has developed an online database, where teachers and companies participating in the escorts have so far uploaded more than a hundred free digital "curriculum crumbs" for the responsive project in the field of IT and agriculture.

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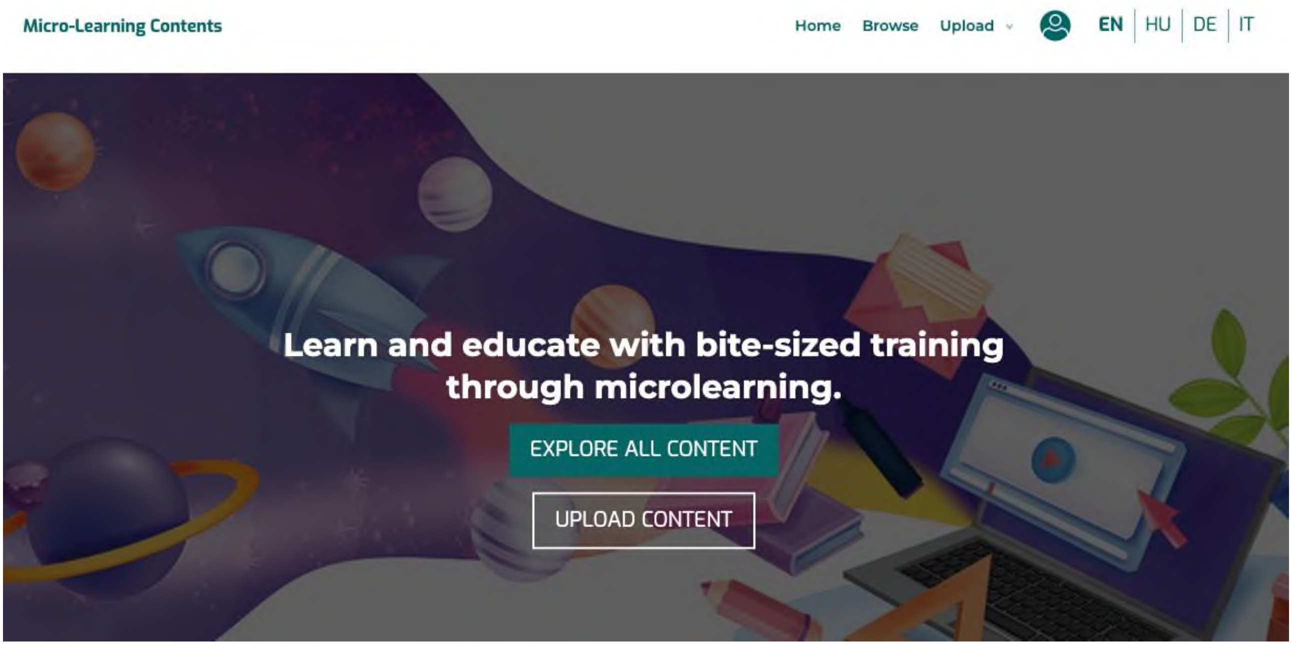

Figure 4: https://mlc.itstudy.hu/en

MLC web-application enables teachers to:

- *browse for free useable micro-learning units without registration,*
- *carry out a precise search for microlearning contents from multiple aspects,*
- *download or share and reuse MLCs in 4 languages (DE, EN, HU, IT),*
- *do self-registration easily,*
- *upload content (own or published as an OER) in pre-defined formats*

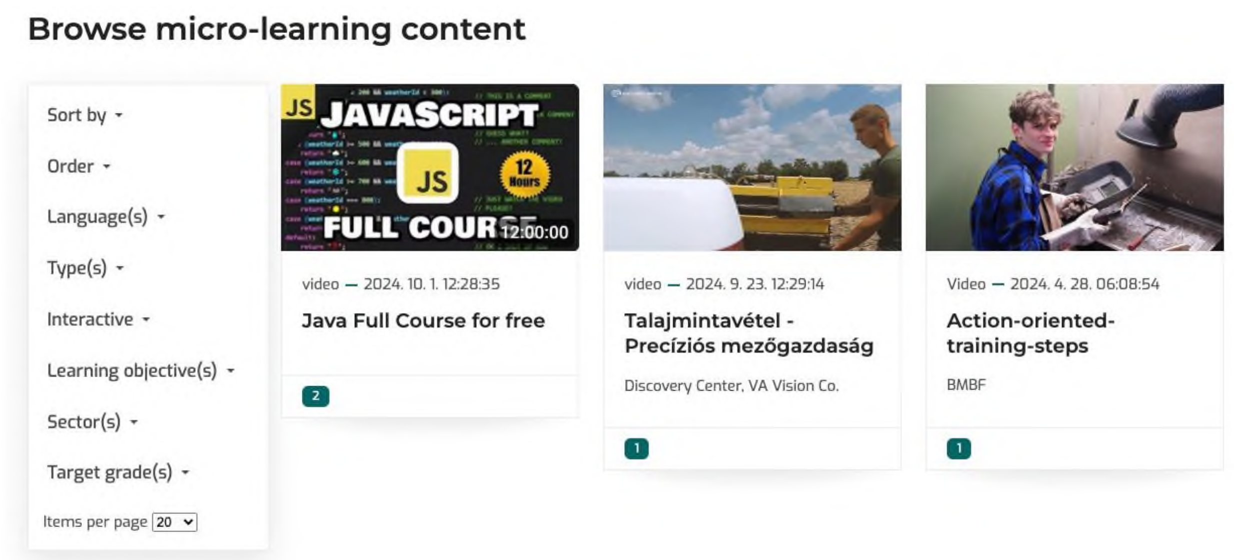

Figure 5: Browsing in MLC database

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A key benefit of the MLC repository developed in the VETPROFIT project is the collaboration of five partner educational institutions that pool their expertise and resources to create and share high-quality learning content. This co-operation created a comprehensive and up-to-date repository that improves the efficiency and quality of vocational education and training.

To access the repository, use this LINK: https://mlc.itstudy.hu/en

Planning and implementing responsive projects

Together with representatives of the companies, teachers choose a project idea for the students. Only rollpart of the knowledge needed to solve the tasks is included in the curriculum. The company is the owner of the project, and the project tasks are defined by its representatives in collaboration with teachers.

Two fundamentally different plans need to be drawn up. One is the actual project plan, which is put together by the students with teacher support. Like a business project plan, the project plan includes milestones, activities, deadlines, and responsibilities.

The second is the pedagogical plan for the project, which is drawn up by the teachers and some details of which (for example, who will evaluate the results and how) are shared with the students. The pedagogical plan links the activities to the learning objectives. It describes, point by point, how the completion of each activity will lead to the acquisition of new knowledge, what skills will be developed and how they will be assessed.

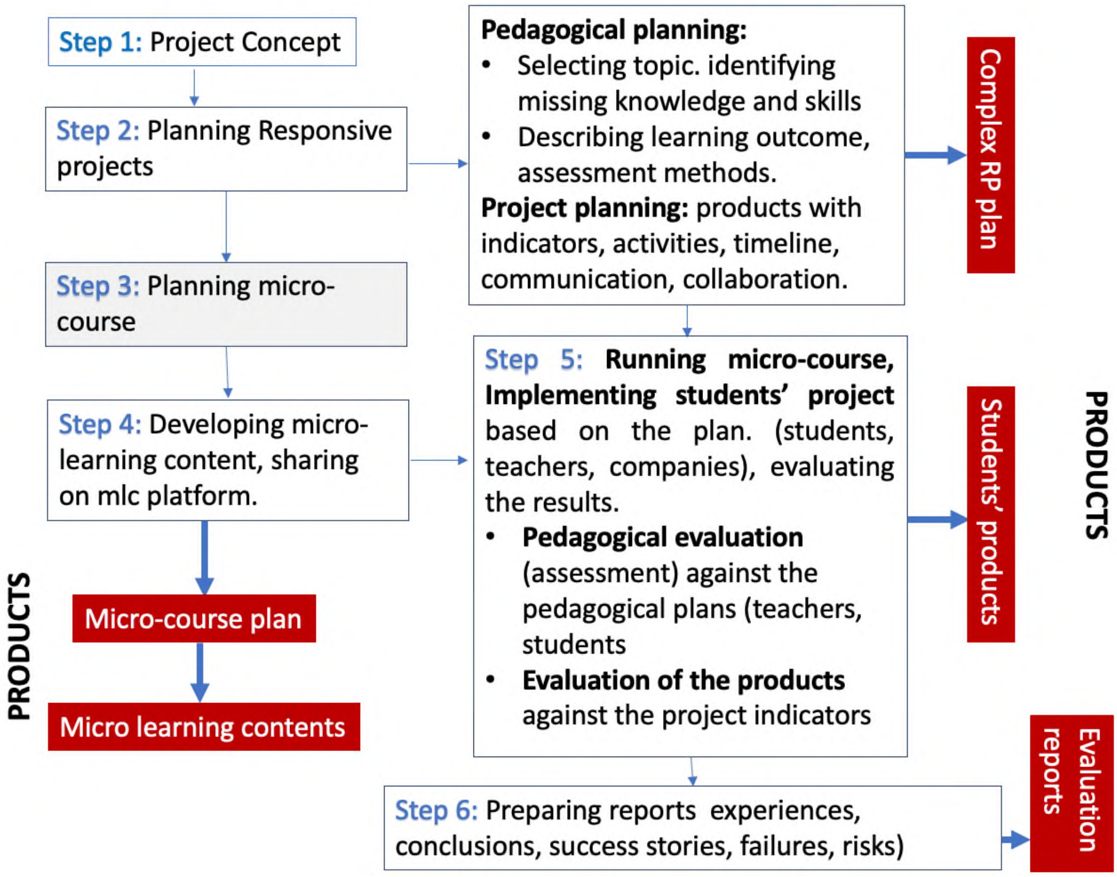

Figure 6. Steps of Implementing Responsive Projects

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Students and teachers with the representative of the company identify what knowledge and skills are missing to complete the project tasks which weren't included by the curriculum. Teachers will plan short preparatory micro-courses for the areas of deficiency. The micro-course and project work is an additional task for students, they undertake it voluntarily.

In parallel with the micro-course, a detailed project plan is developed jointly. Students work independently on the project but also receive help from their teachers and a representative of the company. The design and implementation of the project follows the life cycle and project management rules common in business projects.

At the end of the project, students report on the results and products of the project to the project owner (company representative) in a (virtual) presentation. The presentation is an opportunity for the company to hire new staff and for the students to find a job.

Project closure and evaluation consist of two closely interrelated parts:

- *Evaluation of products created by students in the project based on quantitative and qualitative indicators*
- Evaluation *The learning outcomes achieved (knowledge, skills) based on the learning objectives set.*

For example, if the aim of the project was to design and build a kitchen garden, the finished garden should be presented and evaluated in several ways, against the planned objectives and indicators. In parallel, the new knowledge and skills acquired by the students, the results of the individual and group development process in the project should be assessed and compared with the intended learning outcomes.

These steps will help you to complete the project-based learning and to evaluate the overall learning process. By concluding the project, teachers and students can gather experiences and lessons learned to improve future projects and learning processes.

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VETProfit course – a preparing teachers

The VETProfit partnership has developed a blended training course for VET trainers that prepares them to plan a real project with company partners and develop a micro-course for students that cover the knowledge and skills gaps they will need to successfully implement the project.

The pilot training took place on an e-learning platform created in the Moodle framework, where participants had the opportunity to communicate with each other and with mentors in the forums.

Higher value-added jobs, project-oriented work, robotization, automation, digitalized work environment, ...

These are just some of the challenges that VET teachers, trainers and institutions themselves face daily. In this course the teachers will gain practical guide for planning real-life projects together with industrial partners, developing and delivering micro-courses focusing on the knowledge and skills gaps the students need for successful implementation of the projects.

Is there an opportunity, tool or method in the hands of VET teachers that can move learning outcomes towards current demand beyond the usual teaching framework? VETProfit partnership offers help in this regard for VET teachers by the course titled

Project method tailored to vocational training

(Student project + 3M= Microcourse + Micro-learning content + Micro certificate)

In this course the teachers will gain practical guide for planning real-life projects together with industrial partners, developing and delivering micro-courses focusing on the knowledge and skills gaps the students need for successful implementation of the projects.

This training presents a method by which teachers of VET institutions will be able to reduce the "skill gaps" constantly indicated by the labour market by mobilising their own internal professional and pedagogical resources and creative energies. The training prepares participants to expand their own professional and digital portfolio with a special project method and to develop and deliver project-based micro-courses for their students for covering the gaps.

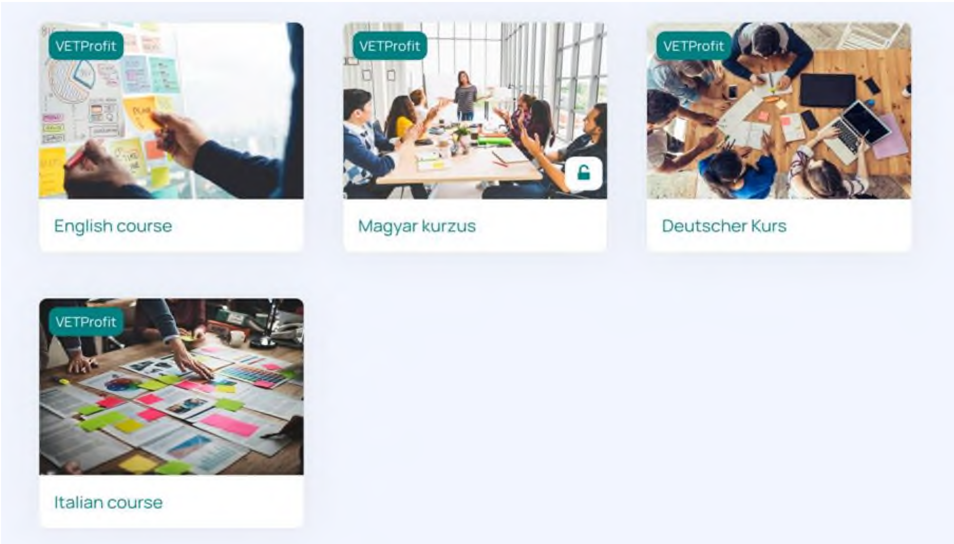

Figure 7. VETProfit courses

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At the end of the course the participants will be able to develop real-life **projects tasks** and related **interdisciplinary, project-based digital learning content** for the VET students in specific qualification that belong to Agriculture and forestry and/or IT sectors.

Topics covered

- *Applying project methods in VET in line with labour market needs.*
- *Pedagogical design of student projects based on learning outcomes.*
- *Project planning by project lifecycle, allocation of resources, deliverables, tasks, scheduling (Gantt chart).*
- *Application of innovative student assessment methods in student projects.*
- *Develop, deploy and share creative microlearning materials as a Open Educational Resources.*
- *Development and evaluation of transversal skills (communication, collaboration, critical thinking, creativity, etc.) by using project method.*
- *Formulation of learning objectives in the European Qualification Framework.*
- *Design of a microcourse based on learning outcomes.*
- *Use digital tools in the design and implementation of student projects.*

Modules of the training

- *Module 1. Project-Based Learning and Responsive Projects*
- *Module 2: Innovative **assessment practices** for VET*
- *Module 3. Digital tools in PBL and in RP*
- *Module 4: Planning and developing micro-courses*

Course participants complete the following assignments in group work, in close cooperation with external company staff.

- *Project concept aligned by the pedagogical goals*
- *Detailed project plan, linked to the pedagogical plan*
- *Learning outcomes-based pedagogical and microcourse plan*
- *Project report and evaluation*

For the submission predefined templates can be used. To meet the requirements, one online test per individual must be completed with a minimum score of 75%.

The learning outcomes in the training programme were defined in accordance with the European Qualifications Framework (EQF) and the recommendations of the EU's developed digital competence frameworks (DigComp 2.2 and DigCompEdu).

The e-learning platform: https://course.vetprofit.itstudy.hu/ .

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Responsive Project Plan – Structure and Content

The project plan consists of three major sections:

1. *Project basics*
2. *About the project*
3. *The project plan linked to the pedagogical plan*

The largest is the Section 3, which contains the plan of the student project with the planned products, activities, schedule, presents the professional knowledge and skills needed for its implementation to be developed in a micro-course, and details by activity what professional knowledge and skills, project management knowledge and skills, and what transversal and digital skills students will acquire by completing the given activity.

I. Basic figures of the project

- *Title of the project*
- *Sector*
- *EQF level*
- *Qualification*
- *Special area*
- *Estimated duration (weeks)*
- *Estimated teaching input (hours)*
- *Estimated student input (hours)*
- *Planned start*
- *Institution (school)*
- *Labour market partner*
- *Collaborators*
  - *from the company:*
  - *from the school:*

II. II. Presentation of the project

The "why"	The problem that the project aims to solve	Why is the project important? What problem does it answer? What is its importance for the company? How it improve processes, work effectiveness, etc.?
The "what"	*The specific objective of the project*	What to do? A brief summary of the activities to be carried out in the project.
The "with which tool"	Tools and equipment needed (the "	What kind of tools, equipment will be needed to carry out the tasks?
The "where"	Implementation environment	What is the terrain of the project activities? On the company premises, at school, etc.
Occupational health and safety regulations (if any)		

III. Project Plan

1. Introducing the project team

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Knowing the objectives of the project, the team composition, the list of students, the planned division of labour (as an example, you can enter the functions you have indicated on the application form of students, such as organiser, time manager, expert, etc.).

2. Working methods, communication, evaluation

Briefly present the following:

- *How is the communication between project members handled?*
- *How are the activities carried out documented?*
- *How are intermediate results evaluated and feedback given?*
- *What IT platform will be used to implement the project?*

3. Results, products, performance indicators (indicators)

Quantitative and qualitative indicators to demonstrate that the project deliverables have been delivered as planned. At least 2-3 products/ outputs delivered by the studenty during the project.

	Title	Description	Responsible (students)	Format (xlsx, ppt, pdf, software, app, mp4 …)	Indicators (pieces, pages, seconds)	Evaluator (teacher, company, team, expert, etc.)
1.						
2.						
….						

4. Required knowledge, skills, responsibility and autonomy

In the first column, list the activities planned for the project. The other columns indicate the knowledge and skills needed to carry out these activities and the level of autonomies (whether the activities are to be carried out independently or with assistance).

Activity/ milestone	Knowledge	Skills	Responsibility and autonomy

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5. Missing knowledge, skills (planned to deliver by micro course)

The identification of the missing skills is preceded by an input diagnostic assessment, which teachers carry out using the method used in their school (interview, pre-assessment, interview, etc.).

The table includes the same activities as above with the missing knowledge, skills, which are not included in the curriculum and which will require a “upskilling" micro-course to acquire.

Activity/ milestone	Knowledge	Skills	Responsibility and autonomy

6. Pedagogical plan by activities

In fact, the pedagogical planning started with the choice of the topic, as many issues (such as whether the project should cover more than one subject) had to be decided before the specific objectives were set. However, the detailed pedagogical plan can only be developed on the basis of a detailed list of planned activities.

The pedagogical plan is nothing more than the completion of a list of activities in the Gantt-chart (see in the next point), with learning outcomes linked to the activities: what new knowledge the students will acquire by completing the activity, what skills they will develop while working on the activity, and how the teacher will check and evaluate whether the learning objectives have been achieved.

In addition to professional learning outcomes and skills, the pedagogical plan should also present project management knowledge and skills acquired during the activities, as well as digital and transversal skills that can be acquired.

The pedagogical plan should include a table for each activity of the project with the details on:

- ***Learning outcomes*** *(professional, project-based, digital)*
- ***Methods*** *(more modern methods than frontal teaching used to achieve the objectives*
- ***Monitoring, evaluation and feedback*** *methods during and at the end of the activity (formative evaluation is the very essence of the project method).*

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The pedagogical plan is one of the most important parts of the project plan: it links the learning goals to the project activities.

Title of the activity:			
Description of the activity:			
Learning outcomes	**Knowledge**	**Skill**	**Responsibility and autonomy**
Professional:			
Project management knowledge and transversal skills:			
Digital skills:			
Working methods, tools and tools			
Monitoring, evaluation, feedback			
During the implementation of the activity (professional, project, digital, or at least one of these)			
On completion of the activity (professional, project, digital, or one of these)			

Table 1. Linking learning outcomes to project activities (template)

The last part of the table should include an explanation about the evaluation as well, what, when to evaluate and who will do it.

1. *Professional knowledge: can you explain, can you formulate?*
2. *Professional skills: can you use the equipment? Can you find the bug? Can you find the error? Can you fix it?*
3. *Project management knowledge: what is a milestone? What is a product? Why is documentation necessary? What agreements are needed?*
4. *Transversal skills: how effective is our team? How is my own performance? Was there conflict, if so, could we manage it? Was I able to convince others? Was the team able to solve the problems that arose?*
5. *Digital skills: What kind of digital tools should be used and what are the digital skills of students to develop by this activity?*

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Example 1

Activity:	T11 TECHNOLOGICAL PROCESSES OF WINEMAKING. DISCUSS AND RECORD THE INFORMATION GATHERED.		
Description of the activity:	Agreement on the project's purpose, work phases, agreement on tasks, working methods (specific roles, division of labour, communication, documentation, evaluation, etc.) To learn about the basic technological processes of winemaking using different methods and tools (searching on the internet, site visit, video conference). To discuss, analyse and record the information gathered together).		
Learning outcome	**Knowledge**	**Skill**	**Responsibility and autonomy**
Professional:	Listing the basic processes of wine technology and explaining the essence of each process.	Deciding whether an internet resource on wine technology is professionally credible or not. Presenting the information on a process to others in a joint meeting.	Collecting professional materials independently, finalising the description of the process based on teacher guidance.
Project management knowledge, transversal skills:	Explaining why careful planning is needed in the project. List the working phases of a project, explaining the meaning of the terms "deliverable/product", "work stage", "division of work", "documentation".	Ability to select the tasks that best match own skills. Ability to plan own tasks, and to document it following a common agreement.	Independently completes the tasks undertaken in the job-sharing scheme on time.
Digital skills:	Searching the internet for digital resources on wine technology. Join the online conferences, get involved in the design on a common digital working area. Prepares his/her own work plan in digital format and shares it with others on the common online work platform.		
Working methods, tools and tools	Project kick-off meeting, developing and documenting of individual and joint work plans and agreements on a platform suitable for teamwork. Teamwork: joint analysis of resources collected individually by team members. By prior agreement, each team member collected information on at least one basic wine technological process. The collected material was uploaded to the common platform. The result is presented in 5-10 minutes by the learner who collected the source material (or, if previously agreed, the learner responsible for each process).		
Monitoring, evaluation, feedback			
Assessment, feedback during the activity.	In the team meeting, team members will evaluate each presentation using a 3-2-1 method: 3: write/say three positive things about the presentation! 2: write/say two suggestions: what could be improved about what you heard or saw? 1: write/say one negative thing that the others did not like. The owner of the process reacts to the opinions of the others and a common agreement is reached on what could/should/should be improved in the presentation of the process (if any) and this agreement is documented. Feedback: the process owners present the final version at the next meeting.		

Table 2. Linking learning outcomes to project activities (Premontrei)

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Example 2

Activity:	Practical applications of autonomous chopping robots		
Description of the activity:	Participants will take part in an introduction to GPS in agriculture that includes theoretical explanations, practical demonstrations, discussions and exercises. They will learn about and use digital tools and aids to understand the basics of GPS and its applications in agriculture.		
Learning outcome	**Knowledge**	**Skill**	**Responsibility and autonomy**
Professional:	Understanding how GPS works and its significance for agriculture. Knowledge of the various applications of GPS in agriculture such as field surveying, tractor control and harvest management.	Ability to use GPS tools and technologies for field surveying and location determination. Mastering the use of digital GPS tools to mark field boundaries and locations.	Willingness to actively participate in discussions and practical exercises during the introduction. Openness towards new digital technologies and their application in agriculture. Team orientation and co-operation during practical group work. Independent use of GPS tools and technologies to solve tasks during the practical exercises. Responsible participation in group activities and contribution to the success of the team.
Project management skills, transversal skills:	Review progress in relation to milestones and product development. This enables deviations to be corrected in good time and ensures that the project runs smoothly.	Evaluation of the quality of the products created, documentation and compliance with agreements. This serves to reflect on the entire project process and to identify success factors and potential for improvement.	Carries out the tasks assumed as part of the job-sharing arrangement independently and on time.
Digital skills:	Acquisition of basic digital skills for the use of GPS software and applications. Ability to interpret and use digital maps and GPS data for agricultural purposes.		
Working methods, tools and aids	Application of project management tools for the planning and implementation of GPS projects in agriculture. Use of communication tools and digital platforms for team communication and collaboration during activities.		
Monitoring, evaluation, feedback			
Work on a project.	1. Expertise: -Evaluation during the activities: Reviewing the knowledge and skills acquired by participants during the learning process. This helps to track learning progress and make adjustments where necessary. -Evaluation at the end of the activities/projects: Assessment of the participants' ability to apply the expertise learnt and solve complex problems. This serves to determine competence levels and identify areas for development. 2. Project management knowledge: -Evaluation during the project: Review of progress in relation to milestones and product development. This enables timely correction of deviations and ensures that the project runs		

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Activity:	Practical applications of autonomous chopping robots
	smoothly. -Evaluation at the end of the project: assessment of the quality of the products created, documentation and compliance with agreements. This serves to reflect on the entire project process and to identify success factors and potential for improvement. 3. Transversal skills: -Evaluation during the project: assessment of team dynamics, individual performance and conflict resolution. This enables early intervention in the event of problems and the promotion of effective collaboration. -Evaluation at the end of the project: Reflection on the overall performance of the team, the individual contribution to teamwork and the ability to solve problems. This supports the identification of strengths and development areas for future projects.
Assessment of professional knowledge at the end of the activity	Sheet A) Self-assessment forms before and after the activity
Assessment of the transversal (soft) competences acquired in the project work	Sheet B) Opinion sheets on the project and feedback on the trainer

Table 3. Linking learning outcomes to project activities (DEULA)

Guideline for planning evaluation

1. Assessments and feedback during the project

If students don't get feedback on their results while working on a project, it's easy to get discouraged and end up failing the whole project. On the other hand, if there is no evaluation, no feedback, then there is no possibility of correcting errors; and this applies to the work of both students and teachers.

Compared to traditional lessons, project work provides more opportunities for formative assessment. For example, it is enough to jointly evaluate orally a presentation made by one of the team members. In the process, team members develop their collaboration, presentation and communication skills, learn to accept criticism and, of course, jointly evaluate their own presentation: what was good, what could be improved in the next one. This can be the real developmental (formative) evaluation!!

Method

1. *A short online questionnaire (Google form), as automatic analysis greatly facilitates the work. Digital tools: Mentimeter, Kahoot, Linoit (Teams / Moodle / Google Classroom) + pre-work Quizlet, WordArt. (You can find a description of them here: https://dmc.prompt.hu/hu . Kahoot can be especially good for getting quick feedback.*
2. *Discussion, discussion verbally. In this case, however, it is very important to make notes of the most important posts!*

Examples

1. ***Students' self-assessment**: role in teamwork, success of own presentation, evaluation of the quality of the subtask (e.g. uploading a description of a tool to the common website), evaluation of effectiveness of collaboration, evaluation of one's own communication skills in cooperation (have you succeeded in convincing others in discussions?), results of own learning, acquisition of professional knowledge, etc., have problems been solved?*

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2. ***Teacher evaluation****: Evaluation of own work, evaluation of team performance (products, knowledge, cooperation, communication, etc.), evaluation of individual performance of students, evaluation of company participation (intensity, quality of professional support).*
3. ***Evaluation of the company employee:*** *Working method, knowledge, skills of students, learning skills, project results, etc.*

2. ***Evaluation*** *at the end of the responsive projects****:***

- ***Measure and evaluate the products (outcomes) of the project, which can be many and varied:*** *SW application, a WEB-site, an exhibition, a presentation, building a garden (e.g.), etc.*
- ***Measure and evaluate learning outcomes achieved,*** *both in terms of professional knowledge, skills and transversal skills****) at the end of the project.***

7. Gantt chart

The Gantt chart lays out the entire project timeline on a horizontal bar chart. Each bar represents a specific task or component of the project, spanning from the projected start to the anticipated completion date. It is structured with a list of project tasks on the vertical axis and the project time span on the horizontal axis. Bars of varying lengths represent individual tasks, showing their duration and overlap. The chart might also include milestones, which are key dates by which certain aspects of the project should be completed, and dependencies that indicate how tasks are linked, showing which tasks must be completed before others can start. The timeline should include the schedule of micro-course to prepare students and develop the missing knowledge/skills, it might be a milestone.

Planned activities, timetable												
Duration: xx weeks (day.month.year. - day.month.year)	1	2	3	4	5	6	7	8	9	10	11	12
Management tasks												
Project kick-off meeting												
Team meetings												
Milestone 1: designing and delivering a micro-course												
Milestone 2: Activities												

Responsive Project plans and reports – Take away

VETProfit consortium developed a platform for VET teachers to share project-plans and micro-learning contents they created for RP projects: https://mlc.itstudy.hu/ (See details about MLC in the next section!).You find here several examples for complex project plans shared by teachers who took part in piloting RPM method.

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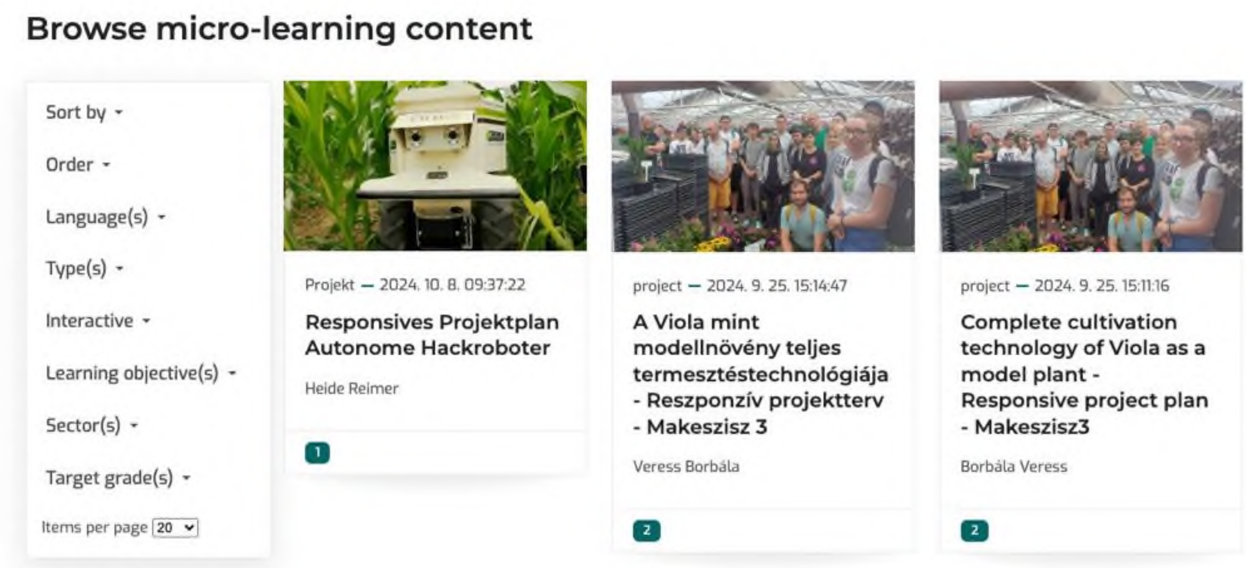

Figure 8 [Project plans on MLC platform]

Experiences of RPM pilots – Overall evaluation

The results of the nine projects will be shared in each partner country as good practices for vocational education and training, and a draft model of the innovative teaching-learning method will be developed. This model includes the production and sharing of reusable digital micro-learning content applied in mini-courses with a project-based approach focused on the labour market needs. The plan of student projects and the micro-courses were prepared in English, while student projects and micro-courses were implemented in each country's national language. Project Reports were also prepared in English.

Key performance indicators included nine student projects covering at least five different topics, all documented in national languages and shared on national VET-related platforms. Italy planned to deliver two projects, Germany two projects, and Hungary five projects. Each country was to produce a structured documentation for the entire process, detailing the micro-courses and student projects in English.

Activities that have been carried out in Hungary, Germany and Italy:

- Delivery of micro-courses for students to enable them to perform project tasks: Teachers implemented mini-courses for students, using digital learning content available in the online repository partly online in the school's learning environment and partly offline.
- Implementation of projects by teams of students in three countries were implemented according to the prepared project plans.
- Evaluation, reporting, and presentation of project results by involving all stakeholders: the activity involved monitoring and reporting on every step of the process.

The piloting phase was conducted across three countries, with Italy and Germany each hosting 2 projects, while Hungary led the way with a total of 5 projects. This distribution allowed for a diverse range of experiences and insights, contributing valuable perspectives from each country involved.

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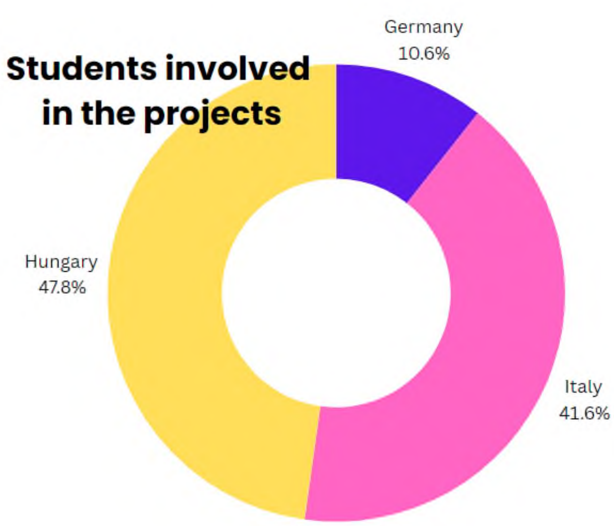
From an analysis of the individual project reports developed by the VETProfit partners, there follows some statistics on the Micro-Courses and Student Projects carried out in each VET institution.

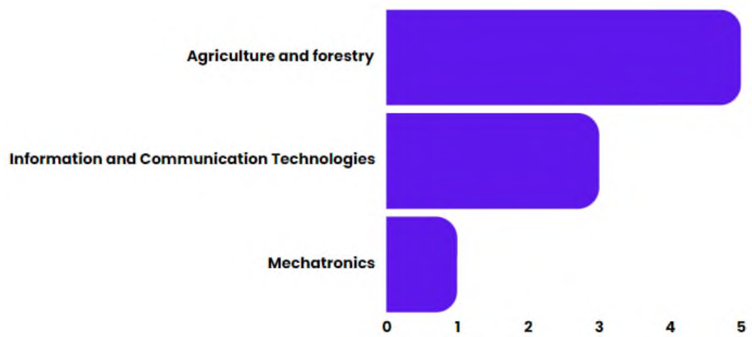
Number and age of the students: The projects involved an average of 12 students each, with a minimum participation of 6 and a maximum of 27 students per project. Italy contributed 47 students, Germany contributed 12, and Hungary contributed 54, resulting in a total of 113 students involved across all projects.



There is a mix of both younger students (14-15 years) and adults (18+ years), with most ages falling within the 14-19 range. This indicates a focus on both higher education and secondary vocational training. The EQF levels correspond to advanced vocational training stages, with levels 4 and 5 indicating post-secondary education and entry-level higher education. EQF level 3 includes secondary education with initial vocational training, which aligns with the 14-15 age group involved.

Sectors: The types of courses and sectors involved include:

Agriculture and horticulture: This is the most common course category, emphasizing a strong focus on agricultural and environmental vocational education. Courses within agriculture cover fields like soil cultivation, plant protection, arable farming, horticulture, and organic farming.



Information Technology and Telecommunications. Courses within ICT covering software development, digital education, and technological skills

Mechatronics: only one course in this field was involved.

Duration: The total duration of the projects, including both the micro-course and the student project work, was around 10 weeks, with a flexible range that allowed for a maximum duration of up to 20 weeks and a minimum of 3 weeks.

The total duration of the micro-course, expressed in hours, averaged 31, with a minimum of 10 hours and a maximum of 96 hours. Student project work had an average duration of 50 hours, with a minimum of 15 hours and a maximum of 240 hours; however, excluding the 240-hour outlier, the average was significantly lower, at around 26 hours.

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By looking at how each of the nine projects was carried out, we can spot some shared features as well as key differences. These help us understand the various ways the responsive project methodology can be applied.

Common points across projects:

1. Communication and collaboration tools: All projects used a blend of in-person meetings and digital tools (e.g., Google Drive, Teams, Moodle, Chat platforms) for communication and coordination. These tools allowed teams to document, share, and review project progress collaboratively.

2. Mentorship and guidance: Each project included mentorship or guidance from teachers and industry experts (entrepreneurs, company representatives) who supported the students in learning new skills and provided ongoing feedback.

3. Real-world application and hands-on learning: All projects emphasized practical, real-world tasks that aligned closely with industry requirements, giving students hands-on experience with tools, technologies, and methodologies relevant to their future careers.

4. Digital competence development: A consistent aim was to improve students' digital skills and technical competences through exposure to industry-standard software, digital platforms, and data-processing tools.

5. Documentation and reflection: Documentation was a core component in each project, whether through shared digital spaces (like Moodle or Google Drive) or structured reporting formats, fostering a reflective learning process where students documented and assessed their contributions.

Main differences between projects:

1. Platforms and tools used: While some projects used Moodle for a structured educational environment, others relied on Google Drive and Teams for file sharing and communication. Different projects incorporated specific software tied to the industry involved (e.g., Node.js in web development or GIS tools for agriculture).

2. Scope of company involvement: In some cases, companies provided hands-on resources and support tailored to the project's technical requirements, such as proprietary software or specialized agricultural equipment. Projects that involved advanced technology, like multicopters for pest control or autonomous robots for agriculture, required a specialized environment and substantial technical preparation by the companies.

3. Assessment methods: Assessment approaches varied: some projects used diagnostic tests, self-assessment, and peer assessment, while others follow more structured interim evaluations and milestone tracking.

4. Learning environments and project settings: The practical environment differed significantly among the projects, with some taking place in a classroom or laboratory and others requiring on-site agricultural settings or controlled environments.

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Evaluation methods

The nine projects all focused on matching student performance with clear learning goals, using digital tools for teamwork and tracking, and building both technical and soft skills. The main differences were in how structured the assessments were, the specific tools used, and how much industry partners were involved. These differences show that the responsive project method is flexible and can be adjusted to focus on technical skills, real-world problem-solving, or soft skill development, depending on the project’s goals and setting.

Common points

Alignment with learning objectives: All evaluations compared students' performance against predefined learning objectives, such as knowledge, skills, attitudes, responsibility, and autonomy.

Mixed evaluation techniques: Most methods used a combination of formative (ongoing) and summative (final) assessments, allowing for real-time feedback and reflection on learning progress.

Digital tools for assessment and documentation: Each project used digital platforms (like Teams, Quizlet, and Redmenta) to facilitate assessment, collaboration, and documentation. Shared digital workspaces were also common for recording results and feedback.

Focus on soft and technical skills: Projects consistently evaluated both technical skills (such as programming or backend development) and soft skills (like collaboration, responsibility, and independence).

Self-assessment and peer assessment: Several projects incorporated self-assessment and peer review, allowing students to reflect on their own learning and assess their peers’ contributions.

Incorporation of real-world skills: All projects encouraged autonomy and real-world problem-solving skills, often with guidance from industry partners or mentors.

Iterative feedback: Many projects included continuous feedback cycles (e.g., AGILE-SCRUM-inspired reviews), promoting an iterative approach to improve student work and skill development.

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Key Differences

Specific assessment techniques: Some projects used traditional tests (Redmenta, Quizlet) to gauge knowledge retention, while others employed practical evaluations like live presentations and group exercises. A few projects, particularly those focused on technology (e.g., multicopter programming), included before-and-after questionnaires to measure progress explicitly in technical knowledge and confidence.

Structure of feedback: Some projects emphasized diagnostic assessments at the beginning (e.g., project topic tests by teachers or business partners) and used them to customize learning pathways. Others used more informal feedback loops during ongoing project tasks (e.g., peer feedback after each presentation), allowing for real-time adjustments and skill enhancement.

Involvement of external partners: Projects with industry partners (like Schneider Electric) featured detailed, structured evaluations, such as tracking development through milestones in GIT and documenting prototype progression. Other projects, particularly those without direct industry partnerships, focused on internal evaluations managed solely by teachers and mentors.

Emphasis on digital skill evaluation: Some projects explicitly assessed digital competencies (like online discussions, creating digital plans, or searching digital resources) while others evaluated them more indirectly as part of overall performance.

Evaluation criteria and performance thresholds: While all projects assessed knowledge and skills, criteria varied in specificity; one project used defined thresholds (failing, passing, excellent), whereas others relied on more qualitative evaluations. Scoring systems and outcome measurement methods also varied, with some projects scoring outcomes using detailed rubrics or a committee, and others using simple pass/fail scales based on competency achievement.

Inclusion of soft skills: Certain projects placed an explicit emphasis on assessing soft skills (e.g., self-management in AGILE-SCRUM teamwork), while others primarily evaluated technical competencies or general project outputs.

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Feedback from the VET institutions

From the experiences gathered, it is clear that collaborative projects between educational institutions and companies play a crucial role in developing students' practical and professional skills, making them more prepared for the workforce. Despite the significant effort required from educators, the results show that the initial challenge is more than compensated by the students' enthusiasm and the acquisition of new skills in a real and engaging learning context.

Main Strengths:

- *Enhanced Practical Skills and Job Readiness: Collaborative projects with companies provide students with hands-on experience and relevant skills, bridging the gap between academic learning and industry requirements.*
- *Fostering Independence and Responsibility: By integrating self-assessment and peer assessment, students develop a realistic self-image and a greater sense of responsibility, crucial for their personal and professional growth.*
- *Dynamic Industry Collaboration: Continuous partnerships with companies ensure that curricula stay aligned with current market needs, which benefits both students and educators in adapting to industry trends.*

Obstacles:

- *Initial Planning and Implementation Effort: These projects require significant time and effort from educators to set up and manage, which may be challenging for institutions with limited resources.*
- *Potential Risks with the Responsive Methodology: While beneficial, the responsive project approach can pose risks, such as technical issues or difficulties in keeping students aligned with project goals in a fast-paced environment.*

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Summary

Education, and vocational training in particular, worldwide, is facing challenges to which it is impossible to provide a single, satisfactory methodological and pedagogical response. There are many other demands on VET institutions in addition to responding quickly to the needs of the labour market. The very different learning habits and learning needs of students growing up in the digital age require a continuous, daily renewal of methods.

The project approach is therefore far from alien to teachers and students, and especially to the managers responsible for the continuous improvement of the school.

In everyday and business projects, learning is not an objective, but everyone learns from a project, at organisational, team and individual level as well. Projects involve overcoming unexpected obstacles, solving problems together, making decisions that are acceptable to team members from different professional backgrounds, meeting deadlines and managing resources wisely. By working on a project, as a secondary outcome, skills such as openness to learning from each other, debating, persuasion, problem-solving, time management, and adaptability are constantly being developed and improved.

The history of the project method demonstrates that it can take several decades for a methodological innovation to go from being an idea to becoming a living, teaching practice. The critique of outdated teaching methods in schools during the first industrial revolution is still relevant today, in the era of the rise of artificial intelligence.

The project method is promising — especially the responsive version organised in partnership between companies and schools. But two things should not be forgotten.

One is that there is no single method that meets all needs, but we can choose from a variety of techniques and apply them flexibly, adapting them to the situation and the need to be met (Bécsi, 2018, p. 147).

The second thing the world should understand, but especially the education politicians and parents who entrust their children to teachers: teaching is one of the most wonderful and difficult professions, requiring a talent and dedication that few can match, and society should highly value those who do it. While we still know very little about the nature of learning, it is the task of teachers to master to perfection a task that is infinite, only partly known and often influenced by factors that are completely unknown!

The complexity of learning and teaching was evident to all those who seriously considered the amount of work and pedagogical talent required to get the project method right.

The fact that the project method is gaining ground from America to Europe, and its application in vocational education and training is not only a recommendation, but also a legal obligation in several countries, is a reason for optimism.

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Good practices – Example of project plans and reports

In this chapter, we present excerpts from the work of teachers who were working in planning, and implementation of student projects and micro-courses. The complete documentation of each project is divided into three main parts corresponding to the work phases: the project plan, the micro-course plan, and the project report. While it is not feasible to include the full documentation of all nine projects implemented during the VETProfit experiment in this book, we hope that this curated selection proves valuable for educators looking to integrate the methodology into their own teaching practices.

JavaScript web back-end application

<table>
<tr><td colspan="2">Project title:</td><td>JAVASCRIPT WEB BACK-END APPLICATION</td></tr>
<tr><td colspan="2">Professional sector:</td><td>ICT - WEB SOFTWARE DEVELOPMENT</td></tr>
<tr><td colspan="2">EQF level of the correspondence course:</td><td>5</td></tr>
<tr><td colspan="2">Qualification obtained at the end of the course:</td><td>WEB DEVELOPER - BACKEND DEVELOPMENT WITH JAVASCRIPT</td></tr>
<tr><td colspan="2">Topics:</td><td>BACKEND WEB DEVELOPMENT WITH JAVASCRIPT</td></tr>
<tr><td colspan="2">Total project duration (weeks)</td><td>12</td></tr>
<tr><td colspan="2">Planned teacher commitment (hours):</td><td>0 (LECTURES-REVIEWS HELD BY COMPANY REPRESENTATIVE)</td></tr>
<tr><td colspan="2">Planned student commitment (hours):</td><td>35 (+28 PROPAEDEUTIC MICROCOURSE)</td></tr>
<tr><td colspan="2">Planned commitment for the company (hours):</td><td>35 (+28 PROPAEDEUTIC MICROCOURSE)</td></tr>
<tr><td colspan="2">Planned start of the project:</td><td>Mid-March 2024</td></tr>
<tr><td colspan="2">Name of institution (school)</td><td>JOBS ACADEMY</td></tr>
<tr><td colspan="2">Enterprise involved:</td><td>GIACOMO BELLO, SOLE PROPRIETORSHIP (https://www.belloinfo.it/)</td></tr>
<tr><td rowspan="2">The plan was developed</td><td>company (name and surname contact person):</td><td>GIACOMO BELLO, SOLE PROPRIETORSHIP (https://www.belloinfo.it/)</td></tr>
<tr><td>school (name and surname teacher):</td><td>JOBS ACADEMY, DIEGO BERNINI (SOFTWARE AREA COURSE LEADER)</td></tr>
</table>

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Project plan

	Product title/output	Description	Responsible student	Format (xlsx, ppt, pdf, software, app, mp4 ...)	Indicator	Evaluator (teacher, company, team, expert, etc.)
1.	APPLICATION CONCEPT	PRESENTATION (PDF FORMAT OR SIMILAR) PRESENTING THE IDEA OF THE WEB APPLICATION TO BE REALISED	ALL STUDENTS IN THE GROUP	PDF / PPT / other presentation format	CREATIVITY AND ORIGINALITY OF THE IDEA FEASIBILITY OF THE IDEA	COMPANY in correlation with the reference TEACHER
2.	APPLICATION BACKEND CODE - INTERMEDIATE MILESTONE	RELEASE OF WORKING APPLICATION BACKEND CODE (EVEN WITH EXTREMELY MINIMAL FUNCTIONALITY) FROM AN INTERMEDIATE MILESTONE (APPROXIMATELY AFTER 17-20 CLASSROOM HOURS)	ALL STUDENTS IN THE GROUP	WEB-ACCESSIBLE SOFTWARE	PERFORMANCE OF FUNCTIONS STRUCTURE AND QUALITY OF THE CODE	COMPANY in correlation with the reference TEACHER
3.	APPLICATION BACKEND CODE - FINAL RELEASE	RELEASE OF THE BACKEND CODE OF THE WORKING APPLICATION WITH THE FINAL FUNCTIONALITIES	ALL STUDENTS IN THE GROUP	WEB-ACCESSIBLE SOFTWARE	PERFORMANCE OF FUNCTIONS STRUCTURE AND QUALITY OF THE CODE	COMPANY in correlation with the reference TEACHER

Knowledge, skills, responsibilities and autonomy required

The first column lists the activities envisaged by the project (min. 3-4). The other columns indicate the knowledge and skills required to carry out these activities and the level of autonomy required of the student to carry them out (specify whether the activities can be carried out independently by the students or require the assistance of an expert).

Activities/ milestone	Required knowledge	Required skills	Level of responsibility and autonomy required
T1 CONCEPTION AND PROPOSAL	Web system languages and technologies; structure of a web application	Devising and proposing a design proposal for a web application	AUTONOMOUS WITH COMPANY LECTURER SUPPORT
T2 INCREMENTAL DEVELOPMENT TO REACH INTERMEDIATE MILESTONE	JavaScript with NodeJS; REST API	Knowing how to implement the backend of a web application with JavaScript and NodeJS with a REST API approach	AUTONOMOUS WITH COMPANY LECTURER SUPPORT

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Activities/ milestone	Required knowledge	Required skills	Level of responsibility and autonomy required
T3 DEVELOPMENT TO ACHIEVE FINAL RELEASE	JavaScript with NodeJS; REST API	Knowing how to implement the backend of a web application with JavaScript and NodeJS with a REST API approach	AUTONOMOUS WITH COMPANY LECTURER SUPPORT

Missing knowledge and skills (to be included in the micro-course)

The identification of missing competences is preceded by a diagnostic entrance assessment, which teachers carry out using the method usually used in their institution (oral examination, test, interview, etc.).

The table must include the same activities as the table above, this time specifying which of the required knowledge and skills are currently missing because they are not included in the course curriculum. These knowledge and skills will require the teacher to provide a micro-course of 'upskilling' to be acquired by the students.

Activities	Missing knowledge	Missing skills	Level of responsibility and autonomy required
JAVASCRIPT LANGUAGE BASICS WITH NODE JS (by means of 28 hours of workshop lessons held by the company from mid-January to mid-March, before the start of the project)	USE OF THE JAVASCRIPT LANGUAGE WITH NODE JS	REALISATION OF WEB BACKENDS WITH JAVASCRIPT AND NODEJS	LECTURES GIVEN BY THE COMPANY LECTURER FROM MID-JANUARY 2024 TO BEFORE THE START OF THE PROJECT

Activity-based teaching plan with description of learning outcomes

Activities:	T1 CONCEPTION AND PROPOSAL		
Description of activity:	Initial moment when each group defines its own web application project to be realised.		
Learning outcomes	**Knowledge**	**Skills**	**Responsibility and autonomy**
Professional skills:	Structure and organisation of a web application Basic elements of an application presentation	Knowing how to define your own web application proposal Knowing how to present your own web application proposal	Carry out and present a creative and feasible application proposal (relying on review - approval by the business teacher)
Project management knowledge and soft skills:	Managing group dynamics in order to reach a common proposal	Communicating effectively	
Digital competences:	Use of multimedia presentation tools		

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Activities:	T1 CONCEPTION AND PROPOSAL
Working methods, tools and equipment	Group work; personal laptop and presentation software tools
Monitoring, evaluation, feedback	
During the implementation of the activity	Monitoring and feedback from the company lecturer
At the end of the activity	Approval of the proposed project (with any modifications to be accepted)

Activities:	T2 INCREMENTAL DEVELOPMENT TO REACH INTERMEDIATE MILESTONE		
Description of activity:	Realisation of a prototype of the proposed web application - intermediate release (minimum feature set)		
Learning outcomes	**Knowledge**	**Skills**	**Responsibility and autonomy**
Professional skills:	JavaScript language with NodeJS; REST API	Knowing how to realise backend web applications with JavaScript and NodeJS	Programming functions defined at the beginning of the project Troubleshooting Remodelling of objectives in itinere.
Project management knowledge and soft skills:	Working basis according to the AGILE approach and SCRUM methodology	Knowing how to plan work Knowing how to communicate with the auditor	
Digital competences:	Use of specific software development tools (including at least programming environment and GitHub)		
Working methods, tools and equipment	Software development mode inspired by the AGILE approach and SCRUM; personal laptop; software development tools		
Monitoring, evaluation, feedback			
During the implementation of the activity	Monitoring and feedback from the company lecturer during the execution of the activity		
At the end of the activity	Intermediate qualitative assessment (intermediate work status)		

Activities:	T3 DEVELOPMENT TO ACHIEVE FINAL RELEASE		
Description of activity:			
Learning outcomes	**Knowledge**	**Skills**	**Responsibility and autonomy**
Professional skills:	JavaScript language with NodeJS; REST API	Knowing how to realise backend web applications with JavaScript	Programming functions defined at the beginning of the project

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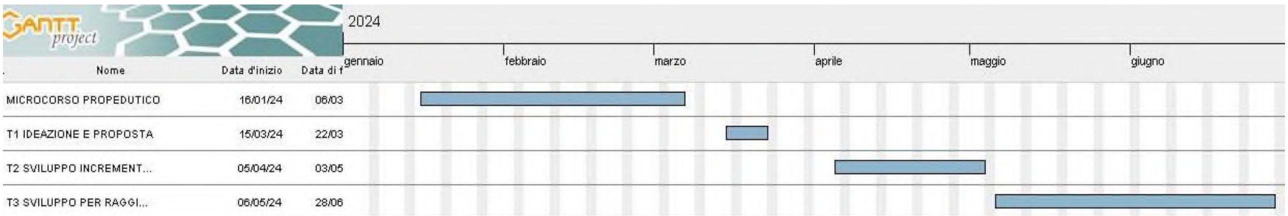
Activities:	T3 DEVELOPMENT TO ACHIEVE FINAL RELEASE		
		and NodeJS	Troubleshooting Remodelling of objectives in itinere
Project management knowledge and soft skills:	Working basis according to the AGILE approach and SCRUM methodology	Knowing how to plan work Knowing how to communicate with the auditor	
Digital competences:	Use of specific software development tools (including at least programming environment and GitHub)		
Working methods, tools and equipment	Software development mode inspired by the AGILE approach and SCRUM; personal laptop; software development tools		
Monitoring, evaluation, feedback			
During the implementation of the activity	Monitoring and feedback from the company lecturer during the execution of the activity		
At the end of the activity	Evaluation in thirtieths of the activity carried out, taking into account the results and what was observed by the company lecturer in the classroom reviews		

Gantt Diagramm



Micro-course plan

Basic Information

- **Title:** BASIC ELEMENTS OF NODEJS
- **Responsive Project:** JAVASCRIPT WEB APPLICATION
- **Professional Qualification:** Web Development
- **EKKR/MKKR Level:** [Level not specified]
- **Authors:** Diego Bernini (Coordinator), Giacomo Bello (Instructor)
- **Institution/Vocational Training School:** Jobs Academy

Objective of the micro-course

The course aims to provide essential foundational knowledge for programming with JavaScript using the NodeJS system. JavaScript can be applied to two main areas of a web system:

- *On the frontend, for creating user interfaces, combined with HTML and CSS.*
- *On the backend, for implementing application logic (algorithms, database interaction).*

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Frontend operations are handled by the browser; for backend development with JavaScript, the NodeJS system is required, which interprets JavaScript code.
This course provides basic elements to create backends using NodeJS.

Entry Requirements
Basic programming knowledge in JavaScript for frontend development.

Learning Outcomes

Knowledge	Skills	Responsibility and Autonomy
Basic elements of JavaScript in the context of NodeJS	Ability to write backend applications in JavaScript with NodeJS	Proceed with development, independently solving problems and errors
Basic functionality of NodeJS	Ability to use NodeJS's basic features	

Themes with weights
- Basic functionalities: 30%
- HTTP context and protocol: 40%
- Database management and Object Relational Mapping (ORM): 30%

Duration, Workload, Participant Tasks
- Micro-course duration: 28 hours (from 19/01/2024 to 08/03/2024).
- Online lessons: None.
- Estimated workload:
  All work is conducted in-class within the 28-hour timeframe.

Tasks to Complete
As this is a preparatory course, no specific tasks are assigned. Teaching involves presenting concepts and conducting related examples/exercises in class with the instructor.
Evaluation, Performance Levels, Certificate:
- Assessment Methods (e.g., tests, exercises):
  - Ongoing evaluation of exercises, final submission required.
- Performance Threshold:
  - 0–60: Failed
  - 60–80: Passed
  - 80–100: Excellent

Performance Levels (%) and Expected Learning Outcomes:
- 0–60: Insufficient mastery of JavaScript and NodeJS.
- 60–70: Acceptable mastery of JavaScript and NodeJS.
- 80–90: Excellent mastery of JavaScript and NodeJS.
- 90–100: Exceptional mastery of JavaScript and NodeJS.

Certificate Title

There is no specific certificate; this is a recognized module within the ITS Web Development program at Jobs Academy.
Issuing Institutions: Jobs Academy

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Human Resources

Position	Responsibilities	Person(s)
Professional Leader	Supervises learning activities, ensures the professional quality of the micro-course, supports teaching activities.	Giacomo Bello, Entrepreneur and Trainer
Teachers/Trainers	Prepares teaching materials, conducts lessons, monitors participant progress, evaluates learning outcomes, and maintains contact with the professional leader.	Giacomo Bello, Entrepreneur and Trainer
Education Manager	Manages administrative tasks related to the course.	Diego Bernini, Coordinator of IT courses at Jobs Academy

Learning environment: Microsoft Teams will be used to share materials.

List of digital tools (free and self-produced)

Educational Material	Format, Contact Details	Creator
Project developed during lessons	Source code: GitHub Repository	Giacomo Bello
Framework Documentation	Website/PWA: AdonisJS Guide	Harminder Virk
NodeJS Documentation	Website: NodeJS API Docs	OpenJS Foundation

Technical Requirements

- **Provided by the institution/school:** WiFi with internet access.
- **Required for participants:** Own laptop with NodeJS installed.

Quality Assurance

The IT course coordinator at Jobs Academy (Diego Bernini) periodically meets with students for feedback on the learning experience and teaching methods.

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Project report

Acknowledgments

We would like to extend our thanks to the company representative, teacher, and students who contributed their time, effort, and expertise to make this project a success. Their commitment and collaboration have not only enriched the learning experience but also strengthened valuable industry-education partnerships.

Goals and preparation of the project

The project aimed to deepen students' understanding of JavaScript, a language increasingly used in web software development, particularly at the backend level with Node.js. Junior developers often lack strong backend skills in this language, so this project focused on strengthening these competencies by guiding students through the prototype development of a backend subsystem for a web application.

Bello https://www.belloinfo.it/ is a software development company specializing in creating custom software solutions, mobile applications, e-commerce sites, and management systems (such as CRM and ERP) for businesses and professionals. They focus on building tailored digital tools to streamline client operations and improve online presence with secure, user-friendly applications for both internal and public use.

Figure 9 Micro-course at Jobs Academy (Italy)

Supervised by a company representative serving as teacher-mentor, students in groups of at least two were encouraged to design project proposals that matched their personal interests and passions, with the sole requirement of using JavaScript with Node.js for backend development. With 35 classroom hours allocated for this hands-on project, students had direct access to technical support and iterative feedback from the mentor, promoting skill acquisition in real-world contexts.

The pedagogical structure of the project included 28 hours of preparatory lab lessons led by the company representative, where students learned the fundamentals of JavaScript with Node.js, building on their basic programming knowledge of frontend JavaScript. The course covered essential backend programming skills,

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clarifying JavaScript's dual role in frontend interface creation and backend application logic through Node.js, including algorithm development and database interactions. Learning objectives focused on foundational elements of Node.js functionality and backend development with JavaScript. Assessment methods involved continuous formative exercises and a final project submission to gauge skill progression. The microcourse provided specific materials and structured lessons, integrating topics from programming, web technologies, and backend infrastructure, and sought to address key skill shortages in backend development. By project completion, students documented their work and showcased their developed backend prototypes, consolidating the practical competencies needed for junior web development roles.

Project implementation

Students were divided into groups of at least two participants and worked in a collaborative environment inspired by AGILE-SCRUM methodologies, which are commonly employed in modern web software development. Each member of the group was assigned specific technical tasks, ensuring that all students actively participated in communication and the presentation of their work. The project used several resources and digital tools, including personal laptops, a Node.js development environment, and an internet connection to facilitate coding and research. Microsoft Teams served as a platform for asynchronous interaction and document sharing, enhancing collaboration beyond the classroom.

The project spanned 35 classroom hours, during which a company representative closely monitored the students' progress. This involvement was significant, as it provided continuous feedback through various intermediate reviews and a final evaluation of the students' efforts. The nature of the project focused on developing a backend software application, leading to incremental releases managed via the GIT version control system on GitHub. This structured approach allowed students to document their work effectively and ensured a thorough closing process, wherein they reflected on their contributions and the overall outcomes of the project.

Project evaluation

The pedagogical evaluation confirmed a strong alignment between the project's learning objectives and outcomes, demonstrating success in meeting key competences. Designed to address backend development gaps, the project's 28-hour preparatory micro-course provided essential JavaScript and Node.js skills under the company mentor's guidance, establishing a solid technical foundation. The project's implementation phase further enhanced students' skills in communication, collaboration, and autonomy. Using AGILE-SCRUM-inspired methods, Microsoft Teams, and GitHub, students engaged in realistic teamwork, managing tasks, feedback cycles, and documentation, which closely mimicked professional environments. The final presentations highlighted students' independent work on backend prototypes, demonstrating not only their technical competences but also their growth in responsibility and self-management. Overall, the methodology achieved the learning objectives, preparing students with both backend skills and the autonomy needed for future development roles.

Success stories, failures, risks, impact

Feedback from students, the teacher, and the company representative involved in the project was very positive, highlighting both the learning impact and the collaborative success of this experience. Students appreciated the project for its blend of theoretical and practical learning, noting that the microcourse provided them with essential foundational skills that they could apply directly in the project phase. Many students felt a strong sense of individual accomplishment and personal growth, especially in learning new backend development skills with Node.js. They also emphasized the benefits of teamwork, recognizing that the AGILE-SCRUM-inspired structure helped them manage tasks effectively and gain insight into real-world

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project workflows. While some students identified initial difficulties in coordinating team tasks, they acknowledged these as valuable learning experiences that enhanced their collaborative and technical skills over time.

The involved teacher reported that the project met pedagogical goals successfully, reinforcing both technical and soft skills among students. One key success factor was the mentorship provided by the company representative, Giacomo Bello, which gave students access to industry insights and feedback that enriched the learning experience. The teacher found the iterative feedback sessions particularly beneficial for skill acquisition, as students could continually refine their work in line with real-world standards. However, some challenges arose, such as adapting students to the AGILE-SCRUM method and managing the fast-paced development timeline. Furthermore, the implementation of the responsive project methodology proved to be very time consuming, especially in its planning phase. Overall, reflecting on the experience, teachers considered the project a success and highlighted the benefits of embedding industry collaboration in the curriculum to bring classroom learning closer to professional practice.

From an institutional perspective, the project had a positive impact on teaching methods and professional development within the school. It encouraged deeper collaboration among teachers who, for this project, had to work closely with the company representative and adapt their teaching to align with industry practices. This collaboration not only strengthened cross-disciplinary ties but also fostered a shared commitment to modernizing technical education. The project’s success has motivated the institution to consider incorporating similar project-based learning approaches in future courses, as the approach has proven effective in engaging students and providing them with practical skills highly relevant to their future careers.

The company representative also viewed the collaboration as a valuable and mutually beneficial experience. By engaging with students, the company gained insights into emerging talent and had the opportunity to shape a curriculum that reflects current industry needs. The representative expressed that, although mentoring required time and effort, the chance to directly contribute to the students' professional readiness was worth it.

In terms of tools and methods, several elements of the project have strong potential for future use. The main lessons learned from this project centered on the value of real-world relevance in technical education and the importance of adaptability in teaching methods. The project confirmed that embedding authentic industry practices within a learning environment not only enriches students' educational experiences but also prepares them for the realities of the job market. With minor adjustments, the methodology and tools used in this project offer a sustainable and impactful model for vocational education that can be replicated in future courses, ensuring that students continue to acquire both the technical and professional skills essential for success in today’s workforce.

Conclusions and recommendations

Based on what we learned from this project, we suggest expanding similar hands-on projects to other vocational courses in our Institute. To improve cooperation between Higher Education VET teachers and companies, it would help to set up formal partnerships, where mentors from companies provide ongoing feedback and guidance, and project goals are clear and connected to real industry needs. Using responsive projects in our software development course has brought great benefits, as it helped students build relevant skills and adapt to real-world challenges. However, it also brought risks, such as keeping students on track with a fast-paced project. Overall, the experience showed how valuable it is to work with industry partners in education, giving students both practical skills and confidence to enter the job market.

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Links

- *Project completed during class sessions:*
  - *https://github.com/backjello/adonis-jac (by Giacomo Bello)*
- *Training material:*
  - *https://v5-docs.adonisjs.com/guides/introduction (by Herminder Virk)*
  - *https://nodejs.org/docs/latest/api/ (OpenJS Foundation)*
  - *https://mlc.itstudy.hu/en/mlc-browser/java-full-course-free*
- *Students project:*
  - *https://mlc.itstudy.hu/it/mlc-browser/progetto-didattico-java-back-end-application*
  - *https://mlc.itstudy.hu/en/mlc-browser/presentation-responsive-project-java-back-end-application*
- *Students' project work:*
  - *https://mlc.itstudy.hu/it/mlc-browser/project-work-adonis-med*
- *Company's website:*
  - *https://www.belloinfo.it/*

Recording pesticide treatments – Application development

Project report

Project title	Development of an application to support grape processing and winemaking
Target group (age, course, sector)	Information Technology and Telecommunications Sector, 10th Grade, 16-year-old Students
Institution and country	Premontrei Vocational High School and Technical School, Keszthely, Hungary
Company/ies involved in the project	Babelhal Web Studio Ltd. (Zoltán Galántai Fekete)
No. of participating students	15
Teachers (name, last name)	Csilla Kádár, József Kovács Éva Magdolna Cservékné Kiss, Ágnes Gradwohl, Előd Zsolt Baranyai
Overall project duration (weeks)	12 weeks
Duration of the micro-course (hrs and lessons)	40 hours
Duration of the project work (hrs)	10 hours of theory, 20 hours of practice, 10 hours of individual work

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Acknowledgments

We would like to express our gratitude to Zoltán Galántai Fekete, the co-managing director of Babelhal Web Studio Ltd., to the participating teacher colleagues, and to the external expert, Ildikó Sedivinė Balassa, for their dedicated and successful work on the project. Special thanks go to the mentor teachers (Csilla Kádár, József Kovács, Éva Magdolna Cservékné Kiss, Ágnes Gradwohl, and Zsolt Előd Baranyai), as well as to all the students involved in the project work, whose creative problem-solving efforts we are very proud of! Also thanks to the past and present school leaders who made the participation possible.

Figure 10 Project presentation of students (Premontrei Vocational Gymnasium and Technicum, Hungary)

Goals and preparation of the project

The specific goal of the project was to develop a specialized application to support the execution of plant protection tasks—primarily by providing relevant and accurate information to ensure that tasks are scheduled with appropriate timing and content. According to the plan, the program aids in organizing and scheduling plant protection activities and facilitates continuous and rapid responses, ultimately supporting the completion of necessary tasks with relevant information.

We also aimed to develop the soft skills, professional competencies, and capabilities necessary for the proficient and timely completion of tasks. Throughout the project, students were expected to familiarize themselves with and accurately assess the client's needs to achieve the most precise outputs/results possible, as well as to plan and develop a program that met the expected functionalities. During the tasks of needs assessment, program planning, and development, our goal was to refine logical thinking and systems thinking, enhance collaboration in the project, and improve time management, self-evaluation, and accountability in task execution. In addition to this, it was essential to understand the agricultural and technological processes of spraying, as well as to learn questioning techniques to effectively conduct user needs assessments.

The learning area was related to programming (specifically using the Python programming language), but we also aimed to familiarize students with new digital tools (such as the Django framework and Figma) while enhancing their application skills. A key objective of the micro-course was for students to acquire extra knowledge and skills beyond the standard curriculum; to practice and develop collaborative thinking and working, share knowledge, and improve their individual and social competencies.

Project implementation

The project team communicated through personal meetings and digital tools. The latter was particularly important, as one of the primary goals was to enhance digital skills.

The entrepreneur provided students with new, practical knowledge through his specific agricultural and IT experience, while the teachers supported the successful resolution of project tasks by developing and sharing micro-materials. It was inspiring for the students to work together on real problems, allowing them to develop and decide on joint solution alternatives.

The entire project's implementation was tracked and documented in a shared digital space. The school utilized a Moodle system, which provided an opportunity for all project participants (students, teachers, and entrepreneurs) to work together and share the results of every activity and phase. Feedback and evaluations also took place within this platform.

The project's success is clearly rooted in the project-based methodology and in the mentoring roles that the teachers and entrepreneur assumed to support the students.

Furthermore, it is noteworthy that the students significantly enhanced their digital competencies and collaborative skills, as well as refined their soft skills through the learning and application of the new tools.

Project evaluation

In the evaluation of the project, the students were assessed through input, formative, and final evaluations based on learning outcomes. The aim was also to evaluate the product (the completed and documented program).

TYPE OF MEASUREMENT AND EVALUATION	SUBJECT OF MEASUREMENT AND EVALUATION	METHODS, TOOLS	EVALUATOR
Diagnostic	Knowledge and experience of the student group regarding the project method	Discussion, test	Mentor (teacher)
Diagnostic	Students' knowledge about the project topic	Test questions using digital tools after a preparatory visit.	Business partner (company leader) and mentor teacher
Formative Evaluation 1.	Planning of application development (features, database)	Based on the uploaded summary and mind map	Mentor teacher evaluates and provides feedback
Formative Evaluation 2. + Self-assessment, peer group assessment	The functions and operation of the application	Testing the completed program	Student group, Mentor teacher, Entrepreneur
Summative Evaluation	Evaluation of the finished product and its presentation	Scoring based on criteria table	Designated "committee"
Summative Evaluation	Measurement of individual student	Tasks prepared in advance by the mentor teacher	Mentor teacher

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	knowledge and comparison with learning outcome requirements		

The final project evaluation was comprehensive, during which we gathered and summarized experiences, sharing them with the teaching staff.

Success stories, failures, risks, impact

'The students were able to familiarize themselves with the entire project workflow, which made them more motivated and allowed for a better understanding of their individual abilities, while their progress was continuously visible. The main challenges were adhering to deadlines and the need to catch up absent students—some had fallen behind during the process or struggled to master new programs. Looking back, based on these experiences, I would plan the division and composition of smaller groups differently next time, as we gained better insights into the students' characteristics, their ability to collaborate, and any personal conflicts, along with the fact that their professional knowledge and areas of interest were quite diverse, which we could take into better consideration next time. I would highlight the importance of maintaining communication with the entrepreneur and the introduction to the work processes encountered in the business sector, as well as their pitfalls. The professional expertise of the entrepreneurs was exceptional. In terms of assessment methods, the students gained insights into evaluating each other's work and realistic scoring' **(teacher)**

'I am very happy that I could participate in the project. It gave me a chance to get a taste of what kind of tasks I might receive in a workplace in the future. I think I contributed quite well to the project and its tasks. I had the opportunity to try working behind the scenes at an official presentation, and during our collaboration, we did a lot of things in class that aren't included in the curriculum—so we learned a lot from all of that. Additionally, I learned many things from my classmates as well: they helped me when I didn't understand something, and if I made a mistake, they didn't just correct it for me but helped me understand the task. When someone asked me for help, I also tried to make sure that I wasn't just doing it for them but helping them understand what they did wrong or what could have been done better or differently. Overall, this project was truly only a positive experience for me.' (**student)**

'During the project, I found the knowledge gained in the micro-course to be very useful, as it helped me solve practical tasks. My individual successes mainly appeared in problem-solving and developing new approaches, although there were setbacks as well, primarily due to technical challenges. I evaluated teamwork positively, as collaboration and good communication strengthened the bonds among team members. Overall, the project contributed to the development of my communication skills, problem-solving abilities, and project management skills, but I feel that my technical knowledge still has room for improvement.' (**student)**

'The project provided an opportunity to apply both the technologies we had learned and those that were new to us, such as the Django web development framework for backend functionalities and HTML, CSS, and JavaScript for creating the user interface. The materials from the micro-course available on Moodle helped us understand each technical step and laid the groundwork for starting the project. We tackled problems together, sharing our new experiences and knowledge. Additionally, we used ChatGPT to supplement our understanding. One of my greatest successes was when I managed to grasp and master the use of Django and Figma, and at the end, I could look back at the final result with satisfaction. I experienced teamwork as a positive experience, with collaborative problem-solving and mutual support contributing to our progress throughout the project. During the project, we were also able to further develop our existing HTML, CSS, and JavaScript skills. Moreover, we got acquainted with new tools like the Figma design program and the Django

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web development framework. We significantly improved our teamwork and collaborative problem-solving abilities, which will be a great advantage for our future projects. I believe there wasn't any aspect of the project where I didn't experience personal growth.' (**student)**

'I believe that overall, it was worth it. There were many aspects that could have been done better if there had been clearer goals during the project brainstorming phase regarding the target age group and the prior knowledge of the students. Unfortunately, the micro-course materials can only be effective if the knowledge gap is not too large. In this regard, it would have been helpful to know this earlier, as we could have devised more suitable and realistic project-based tasks. This would have allowed us to manage the available time frame more effectively. Participation in the project indeed required a lot of work. I can wholeheartedly recommend it to those businesses that feel committed to providing the best and highest quality education for the future generation, approaching it from a non-profit perspective. I personally do not regret my involvement. I have reservations regarding micro-courses! I believe that only well-thought-out and hierarchically organized micro-courses can be viable in the long term. However, their production is quite time-consuming and ensuring the appropriate quality poses challenges. I think it's a good idea to organize micro-courses into an online knowledge repository within the project, but it would only become truly useful if topics that build on each other were collected over many years. (**entrepreneur)**

'Participation in the VETPROFIT program holds significance for a participating institution from multiple perspectives. Building international connections can bring new viewpoints and fresh ideas that enrich the content of education, as well as the professional development of teachers and students.

The modern pedagogical tools and methods applied during the program can contribute to enhancing the effectiveness of teaching; incorporating new learning methods can inspire educators, allowing them to renew themselves and apply new approaches in the classroom. The program provides institutions with a better understanding of labour market trends and demands, enabling them to develop training content that aligns more closely with market expectations, thereby increasing students' competitiveness. Participation in the program enhances the professional development opportunities for teachers and instructors. Acquiring new experiences and collaborating with educators and vocational training stakeholders from different countries can have a motivating effect on teachers and increase their commitment to their work. Furthermore, participation in the program and the successes achieved can strengthen the institution's reputation, helping it become more recognized and attractive to students and parents. Such international cooperation often contributes to the development of quality management systems and standards, which can enhance the institution's competitiveness in the long run.' **(school principal)**

Conclusions and recommendations

We find it important to share our experiences with vocational institutions because we understand how much work it is for educators to plan and implement projects.

We want to inspire everyone to see that the effort invested is worthwhile. It is true that a lot of hard work is required, but the beginning is the only difficult part! When you carry out a student project and see the enthusiasm, curiosity, and results of the students, you realize that it is worth it. Students love to create, work in teams, solve problems, discover new things, seek, and research.

They enjoy making decisions independently, but we need to be there to assist them when they require a bit of support or correction. It's not easy to determine how much to let go of their hands, but we must trust them. Perhaps most importantly, we should continuously follow their work; we can use formative assessment for this purpose (reflecting and always providing feedback). Involving them in the evaluation

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process (self-assessment, peer assessment) can increase their sense of responsibility and help shape their realistic self-image.

These special projects can yield particularly significant results. Not only can teachers successfully plan and implement the project method, but there is also a great need for collaboration with businesses and companies in dual training and vocational placements.

Let us have as many great entrepreneurial partners as possible for joint projects, as this benefits everyone involved. Most importantly, through this process, students can acquire competencies that give them an advantage in the labor market. As teachers, we will also be able to utilize the planned project and the valuable experiences gained in the coming year!

As an institution leader, I recommend the project method to all schools for teachers and students, as well as collaboration with entrepreneurs and responsive projects. I also advocate for the joint analysis of every such student project within the faculty, so that educators can inspire each other and share experiences to support their own development and that of their students, which in turn contributes to the effectiveness of the organization.

Links

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- *E-learning platform:*
  - *https://vtk.premontrei-keszthely.hu/moodle/course/view.php?id=746*
- *Webpage of partner company:*
  - *https://babelhal.hu/*
- *Babócsy Ildikó Bevezetés a projektmódszerbe*
  - *https://www.youtube.com/watch?v=BTfbXciayNQ*

Grape processing and winemaking - Development of an application

Project report

Project title	Development of an application to support grape processing and winemaking
Target group (age, course, sector)	Information Technology and Telecommunications Sector, 10th Grade, 16-year-old Students
Institution and country	Premontrei Vocational High School and Technical School, Keszthely, Hungary
Company/ies involved in the project	Natúr Ízek Szociális Szövetkezet (Fatér Balázs István)
No. of participating students	15

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Teachers (name, last name)	Csilla Kádár, József Kovács Éva Magdolna Cservékné Kiss, Ágnes Gradwohl, Előd Zsolt Baranyai
Overall project duration (weeks)	12 weeks
Duration of the micro-course (hrs and lessons)	40 hours
Duration of the project work (hrs)	10 hours of theory, 20 hours of practice, 10 hours of individual work

Acknowledgments

We would like to express our gratitude to Balázs István Fatér, the leader of Natúr Ízek Social Cooperative, as well as to the participating teacher colleagues and the external expert, Ildikó Sediviné Balassa, for their dedicated and effective work in support of the project. Special thanks go to the mentor teachers (Csilla Kádár, József Kovács, Éva Magdolna Cservékné Kiss, Ágnes Gradwohl, and Zsolt Előd Baranyai) and to all the students involved in the project work, whose creative problem-solving contributions we are very proud of! Also thanks to the past and present school leaders who made the participation possible.

Goals and preparation of the project

The project aimed to develop specialized software that meets the needs of the business (specifically, software to assist in adhering to wine cooling technology). The program continuously provides the company with important information, enabling necessary interventions (e.g., cooling wine to the appropriate temperature).

The project offered a unique opportunity for collaboration and teamwork for the entrepreneur, teachers, and students alike. The students were curious and embraced the new knowledge, working together with their teachers to design and develop the software that supports the newly learned technological process.

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The project also provided students with the chance to enhance their professional knowledge while developing their problem-solving, collaboration, and communication skills. They practiced the joint use of new digital tools, time management, and self-reflection in task completion.

The learning area was related to programming (using the Python programming language), with a goal not only to develop application skills but also to learn new digital tools. Additionally, students needed to understand the technological processes of grape processing and wine cooling, and they had to learn questioning techniques to effectively conduct user needs assessments.

The micro-course aimed to ensure that students acquired and developed knowledge and skills they had not learned before, and to practice collaborative thinking and work, as well as knowledge sharing, thus enhancing their individual and social competencies.

Project implementation

The project team's communication took place through personal meetings and digital tools. The latter was particularly important, as one of the goals was to develop digital skills.

The entrepreneur provided new knowledge during on-site visits, while the teachers assisted in the successful resolution of project tasks by developing and sharing micro-materials. The opportunity for experimentation was inspiring for the students, as they could develop and decide on various collaborative solutions.

The entire implementation of the project was tracked and documented in a shared digital space. The school has a Moodle system that allowed all participants (students, teachers, entrepreneurs) to work together and share the results of all activities and phases. Feedback and evaluations were also conducted within this platform.

The success of the project clearly lies in the project-based method and in the mentoring role taken on by the teachers and the entrepreneur, who supported the students. (As one student put it, “We could think freely, but if we needed help, it was always there.”)

It is also noteworthy that the students significantly improved their digital competencies as a result of learning and applying the new tools.

Project evaluation

In the evaluation of the project, the students were assessed through input, formative, and final evaluations based on learning outcomes. The aim was also to evaluate the product (the completed and documented program).

TYPE OF MEASUREMENT AND EVALUATION	SUBJECT OF MEASUREMENT AND EVALUATION	METHODS, TOOLS	EVALUATOR
Diagnostic	Knowledge and experience of the student group regarding the project method	Discussion, test	Mentor (teacher)
Diagnostic	Students' knowledge about the project topic	Test questions using digital tools after a preparatory	Business partner (company leader) and mentor teacher
Formative Evaluation 1.	Planning of application development (features, database)	Based on the uploaded summary and mind map	Mentor teacher evaluates and provides feedback

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Formative Evaluation 2. Self-assessment, peer group assessment	The functions and operation of the application	Testing the completed program	Student group, Mentor teacher, Entrepreneur
Summative Evaluation	Evaluation of the finished product and its presentation	Scoring based on criteria table	Designated "committee"
Summative Evaluation	Measurement of individual student knowledge and comparison with learning outcome requirements	Tasks prepared in advance by the mentor teacher	Mentor teacher

The final project evaluation was comprehensive, during which we gathered and summarized experiences, sharing them with the teaching staff.

Success stories, failures, risks, impact

‘We made a huge leap in our knowledge during the implementation of the project; we encountered many problems and challenges that we had not faced before, so proper adaptation and concentration were extremely important.’ **(student)**

‘I experienced it as a success that the students' creative ideas and suggestions facilitated and accelerated the achievement of the project's goals through our collaborative (project) work! The setup and customization of the development environment and framework posed challenges at the beginning of the project. To address this in the future, I would use a container as part of the micro-course. I would also highlight the positive aspect of the students' independent work and their solution to a 'real-life' problem taken from practical life. Planning and subsequently implementing the collaborative work enriched us with many new experiences. The evaluation of the project work certainly required a new evaluation method. It was necessary to consider how several students could work together in the group and what each contributed to the completed product.’ **(teacher)**

‘Participation in the VETPROFIT program as an entrepreneur brought numerous advantages. It primarily provided an opportunity for the business to connect more closely with the younger generation and to share its professional experience through practical curriculum development. The collaborative work with students in the field of winemaking uniquely contributed to the business's innovation potential, as they brought in fresh ideas and new perspectives that could be leveraged in future developments.

The collaboration not only helped the students but also allowed the business to learn about new directions, techniques, and market needs through their feedback. Such a program offers excellent networking opportunities, including collaborations with international partners. The visit to Italy was particularly significant from both a professional and cultural perspective. I would recommend that other businesses join similar projects. We did not perceive any disadvantages from the business side, and we were able to capitalize on its advantages. Participants can expand their professional networks, build relationships with international partners, and gain valuable insights into the knowledge and perspectives of the next generations.’ **(entrepreneur)**

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The modern pedagogical tools and methods applied during the program can contribute to enhancing the effectiveness of teaching; incorporating new learning methods can inspire educators, allowing them to renew themselves and apply new approaches in the classroom.

The program provides institutions with a better understanding of labor market trends and demands, enabling them to develop training content that aligns more closely with market expectations, thereby increasing students' competitiveness.

Participation in the program enhances the professional development opportunities for teachers and instructors. Acquiring new experiences and collaborating with educators and vocational training stakeholders from different countries can have a motivating effect on teachers and increase their commitment to their work.

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    - *https://www.youtube.com/watch?v=BTfbXciayNQ*
- *Tkinter: Tóth Attila*
    - *https://www.youtube.com/watch?v=f6EDJRsvlh0*
- *Arduino: Magyar Arduino Labor*
    - *https://www.youtube.com/watch?v=D2LzD3AFhhA&t=59s*

Autonomous hoeing robots

Project report

Title of the project:	Autonomous hacking robots
Target group (age, course, sector)	Trainees in agriculture and horticulture, soil cultivation and plant protection
Institution and country	DEULA Nienburg, Germany
Company(ies) involved in the project	Agrogera Agricultural company
Number of participating students	6
Teacher (name, surname)	Henrik Blöthe, Kai Helfers
Total duration of the project (weeks)	6 weeks
Duration of the microcourse (hours and lessons)	96
Duration of project work (hours)	240

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Acknowledgements

We would like to express our sincere thanks to everyone involved, especially the management of DEULA for their active support, the farmer for his excellent cooperation and the trainers for their help in developing the micro-course. Special thanks go to the vocational schools that released their students and to the trainers who welcomed new ideas and innovations with open minds.

Objectives and preparation of the project

The specific objective of the project "to introduce autonomous hoeing robots in agriculture" is to improve the efficiency of weed control whilst reducing environmental impact. Following, is a brief summary of the activities carried out as part of this project:

Needs analysis and planning

Evaluation of current weed control methods and identification of bottlenecks and opportunities for improvement. Creation of a detailed project plan with clear objectives, milestones and time frame.

Technology procurement and integration

Selection and procurement of autonomous chipping robots and the necessary technical components.
Integration of the new technology into the existing agricultural infrastructure.

Training and qualification of employees

Training employees in the use of autonomous hoeing robots, including programming, maintenance and safety protocols. Certification and qualification of employees for the efficient operation of the new technology.

Test runs and pilot phase

Carrying out test runs and pilot trials in selected fields. Evaluation of the performance, efficiency and cost-effectiveness of autonomous hoeing robots in a practical situation.

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Optimisation and adaptation: Analysing the test results and feedback from the pilot phase. Optimisation of deployment strategies, programming and adaptation of systems to specific agricultural requirements.

Implementation and rollout: Implementation of the optimised processes and strategies on larger areas on the farm. Monitoring and continuous improvement of autonomous weed control technology.

Documentation and reporting: Documentation of all activities, training, test runs and optimisations as part of the project. Preparation of final reports with detailed results, experiences, recommendations and outlook for future developments. These activities are crucial to achieving the specific objectives of the project and ensuring that the introduction of autonomous hoeing robots in agriculture is successful and effective.

Realisation of the project

The project activities for the introduction of autonomous hoeing robots in agriculture typically take place on farms or in fields. Here are some specific environments where the project activities can be carried out:

Agricultural fields: The test runs, pilot trials and implementation activities can be carried out on agricultural fields where weed control and crop care usually take place.

Test or demonstration areas: Establishment of special test or demonstration areas within the farm to test and optimise the autonomous hoeing robots within a set of controlled environments.

Research and development facilities: Inclusion of research and development facilities or technology centres that offer a specialised infrastructure and expertise for the development and testing of autonomous agricultural technologies.

Training facilities: Specialised training facilities or training rooms equipped with computers, simulators and training materials which can be used for training and qualification activities.

Controlled environments: The setting up of controlled environments or test fields to simulate and evaluate different scenarios and deployment strategies for autonomous hoeing robots.

The exact implementation environment depends on the company's resources, available test areas, security requirements and the specific requirements of the autonomous hoeing robots. It is important to choose an environment that allows the project activities to be carried out safely and effectively whilst providing realistic conditions for the practical use of the technology.

Evaluation of the project

Pedagogical evaluation of the student project

The student project was assessed according to the learning objectives set out in the pedagogical plan, which focussed on knowledge, skills, attitudes, responsibility and autonomy.

Knowledge: The aim of the project was to give the students a deeper understanding of modern technologies such as GPS applications and the handling of autonomous hoeing robots. At the end of the project, the students had acquired comprehensive knowledge of how these technologies work. They were able to successfully apply what theory they had learnt into practical work situations.

Skills: The students made remarkable progress during the project. They learnt how to operate the hoeing robots and use GPS systems for precise agricultural work. Particularly impressive was how they applied and developed the programming and maintenance of the devices in practice. The learning objectives that had been set in the area of technical and digital skills were therefore fully achieved.

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Attitudes: By working with modern agricultural technologies, students developed a positive attitude towards innovation in agriculture. They were open to new ways of working and recognised the benefits of technological advances to increase efficiency and work in a more environmentally friendly way. This attitude change was an important learning objective that was fully achieved.

Responsibility: As the project progressed, the students took on increasing responsibility for their tasks. They were responsible for the planning and carrying out of the hoeing robot tasks in the field and documented the results independently. As a result, they developed a strong sense of responsibility, just as envisaged in the educational plan.

Independence: The learning objectives in the area of independence were mostly met. The students worked independently on the tasks assigned to them and showed initiative, especially when analysing errors and solving problems during the practical exercises.

Results compared to the objectives: The learning objectives set out in the pedagogical plan were fully achieved in all areas - knowledge, skills, attitudes, responsibility and autonomy. The practical work in the project enabled the students to apply and further develop their theoretical knowledge. As a result, they achieved objectively measurable learning outcomes. Particularly noteworthy is the development of their technical and social skills, which were strengthened through the interplay of theory and practice.

Methods and measurability of the results: The methods used, which involved a combination of theoretical introduction and practical application, were successful. The pupils showed measurable progress in their technical skills and in their assumption of responsibility. Evaluation methods, such as questionnaires before and after the project, showed a clear increase in knowledge and an improvement in practical skills.

Summary: The student project fully met the objectives set out in the pedagogical plan and delivered measurable results confirming the students' learning success in the areas of technology application, problem solving and teamwork.

Success stories, shortcomings, risks, effects

The feedback from students, teachers and company representatives was consistently positive. The students were enthusiastic about the practical approach, which enabled them to apply their theoretical knowledge in a real working environment. Many appreciated the teamwork and the opportunity to take on tasks independently. However, some students found working with the autonomous hoeing robots more challenging than expected, which led to occasional frustration, especially with technical problems. Nevertheless, this was seen as a valuable learning experience as it enhanced their ability to solve problems independently.

Teachers particularly emphasised the positive group dynamics and noted that students were much more motivated by the combination of theory and practice. However, some teachers reported unexpected challenges, such as time pressure and technical difficulties, which they were able to overcome through flexible schedules and additional technical support.

The company representatives were also satisfied with the results of the project. They emphasised that the collaboration with the students and teachers not only helped the students to improve their practical skills, but also gave the companies new perspectives on the use of modern technologies in agriculture. However, some companies expressed concerns about the amount of time they had had to invest in order to provide the students with the necessary support. Ultimately, however, they saw this as a worthwhile investment.

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For DEULA as an educational institute, it was a particular challenge to recruit pupils for the project. As DEULA does not have a fixed student base but instead offers weekly courses for vocational schools from all over Lower Saxony, it was more difficult to retain students in the project in the long term and get them interested in participating. This structure made it more difficult to ensure the continuous commitment of the participants.

The key success factors of the project included the close cooperation between all those involved, the practical orientation and the flexibility in solving any problems that arose. Another success factor was the careful planning and organisation, which ensured that everyone involved had clear goals in mind.

The greatest risks and shortcomings came in the form of technical difficulties, particularly in the programming and maintenance of the autonomous hoeing robots. External factors such as soil conditions also posed a significant risk. If the ground was too wet, it was not possible to use the hoeing robots, which led to delays in the project. To overcome these challenges, alternative schedules for dry weather conditions were considered alongside the use of external experts. The students received additional training to prepare them for these conditions. Another risk was the timing between the companies and the school, but this was successfully resolved through regular meetings and flexible time management.

Valuable lessons were learnt from the project, which will be incorporated into future projects. Firstly, it has been shown that the combination of theory and practice is an extremely effective learning method that increases the commitment and motivation of the students. This method will therefore be used more frequently in future courses and projects. Secondly, it became clear that the close co-operation with external companies offers considerable added value not only to the students, but also to the teachers and companies themselves. The tools and evaluation methods developed as part of the project will therefore be further utilised and refined in future projects.

Many of the tools used in the VETProfit project work, in particular the practice-orientated approaches and close cooperation with external partners, can easily be transferred to future courses. However, it will be more difficult to implement the technical aspects of working with autonomous hoeing robots in all courses, as this requires specialist technical equipment and expertise.

Conclusions and recommendations

The findings and experiences from the student project has led to several important suggestions. One key suggestion is to further intensify cooperation between vocational education teachers and companies in order to strengthen the practical relevance of training. Joint workshops and regular practical projects could enable an even closer integration of theory and practice. Another suggestion is to expand the technical support provided by companies in order to better overcome potential difficulties within the conditions of the technical framework. More flexible schedules could also help to minimise risks such as delays due to technical problems or unfavourable ground conditions. The use of the responsive project method does harbour risks, but overall it shows excellent potential to promote student engagement and strengthen independence.

In conclusion, the project provided valuable learning experiences for pupils, teachers and companies and can serve as a blueprint for future projects. Due to the positive results, DEULA Nienburg has now incorporated this course into its programme and offers it on a regular basis.

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    - https://www.*nachhaltigkeit*.info/artikel/nachhaltige_landwirtschaft_1753.htm
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    - https://www.naio-*technologies*.com/en/home/

Beneficial insect application with multicopters

Project report

Project title	Beneficial insect application with multicopters
Target group (age, course, sector)	EQF level: 3-5, farmer, arable farming, specialisation: organic farming
Institution and country	DEULA Nienburg, Germany
Company/ies involved in the project	Agrogera Agriculture
No. of participating students	6
Teachers (name, last name)	Henrik Blöthe, Kai Helfers
Overall project duration (weeks)	3 weeks (15 days)
Duration of the micro-course (hrs and lessons)	48 hours
Duration of the project work (hrs)	10 hours practice, 5 hours preparation and follow-up by the company

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Acknowledgments

Special thanks go to **Agrogera Landwirtschaft** for providing expertise and support, in particular to **Rolf Sieling** for planning and coordinating the field trials. Many thanks also go to **DEULA Nienburg** for the logistical support and provision of the training rooms, and to **Henrik Blöthe** and **Kai Helfers** for the educational support and technical instruction. Finally, we would like to thank the participating trainees for their commitment and constructive co-operation.

Goals and preparation of the project

The aim of *the beneficial insect application with multicopters* project was to increase the efficiency of agricultural pest control and reduce the use of chemical pesticides. The use of multicopters should enable the precise application of beneficial insects, which should not only save costs and time, but also promote more environmentally friendly agricultural practices. The participants in the project, mainly trainees from vocational schools, learnt how to use modern technologies such as GPS-supported multicopters and how to apply them in real farm environments.

Learning objectives: The main objective of the educational planning was to provide participants with the ability to programme and control multicopters safely and effectively for the application of beneficial insects. In addition, they should be able to record and evaluate data in order to continuously optimise the efficiency of the operations.

Learning areas involved: The project covered the learning areas of agricultural technologies, ecological pest control and the use of GPS-based systems.

Prior knowledge and skills required: As the participants already had prior knowledge of working with GPS-based systems, the project could be organised over three weeks. This prior knowledge made it easier to start working with the multicopters. If this knowledge had not been available, the project would have had to be extended to include an additional micro-course on GPS applications in order to lay the foundations for the efficient use of the multicopters.

Areas with skills gaps: Participants needed to further develop their skills in programming and controlling multicopters and in using digital technology in order to fully achieve the project objectives.

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Organisation of the student project: The project lasted three weeks, during which the participants worked from a theoretical introduction to practical training, test runs and the optimisation of deployments. The planned results included fully documented training and test runs, a final report and recommendations for action for future missions. The efficiency of the multicopter operations and the reduction in the use of pesticides served as key indicators for measuring the success of the project.

Participant structure and distribution of roles: The participants in the project took on various roles, including project organisation, time management, technical implementation, data evaluation and safety monitoring. Clear responsibilities ensured efficient collaboration and coordinated implementation of the project activities.

Method and timing of the microcourse: The project was divided into three specific micro-courses, which were integrated into the schedule in order to divide the learning process into phases:

Basics of beneficial insect application in maize cultivation: The first microcourse taught the principles and importance of beneficial insect application, particularly in maize cultivation. Participants learnt about the ecological and economic benefits of the targeted use of beneficial insects.

Technical aspects and practical application of multicopters: The second micro course focussed on the technical aspects of multicopter technology. Participants learnt how the multicopters work, how they are programmed and controlled and the specific requirements for agricultural use. Practical exercises in the field with GPS-supported multicopters were at the centre of this course.

Practical implementation under labour market conditions: In the third micro-course, the knowledge acquired was applied under real-life labour market conditions. The participants worked on agricultural scenarios, optimised their deployment strategies and gained practical experience of how multicopter technology can be integrated into everyday operations.

The micro-courses combined theoretical units with practical exercises. They were supported by developed training materials, including videos, manuals and digital tools for programming and control. This structured approach enabled participants to gradually build up skills and apply them directly in practice.

Project implementation

The main aim of the project on the application of beneficial insects using multicopters was to increase the efficiency of agricultural pest control and minimise the environmental impact by reducing the use of pesticides. To achieve this, the project team was clearly structured, with defined roles for everyone involved. The trainees took on various tasks, including organisation, scheduling, technical implementation and safety monitoring. Everyone contributed to achieving the project objectives through their specific responsibilities, which enabled the activities to be carried out in an efficient and coordinated manner.

It is particularly important to emphasise that the participants already had prior knowledge of GPS-guided tools and systems. These skills enabled them to quickly familiarise themselves with multicopter technology, which also relies heavily on GPS-based navigation and control. The trainees were able to seamlessly transfer their previous experience with GPS-guided systems to the new technology, ensuring smooth and effective use of the multicopters in the field.

The team communicated regularly via meetings, which took place both in person and virtually. The participants used digital tools such as email, chat platforms and project management software to coordinate and share information. This ensured that everyone was up to date and able to react quickly to challenges. The clear allocation of tasks and communication channels ensured that the project ran smoothly.

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The company, an agricultural business, played a central role in the realisation of the project. It was not only involved in the planning, but also provided the necessary resources and the practical environment. The multicopter technology was procured and prepared by the company before it was used in test runs in the fields. The participants evaluated the efficiency of the beneficial insect application and optimised the application strategies based on the data collected.

The participants' training included an introduction to the operation of the multicopters, practical exercises on programming and navigation and a final certification. Thanks to their previous knowledge of GPS-supported work, they were able to use the multicopter technology quickly and optimise navigation and the precise application of the beneficial insects. Various test runs were carried out during the pilot phase, which were then documented in detail. The entire project documentation, from the training courses to the test runs and their evaluation, was standardised and resulted in a final report with recommendations for future operations.

Overall, the project showed that the close collaboration between the trainees, the vocational school and the farm, supported by digital tools and clear communication structures, led to the successful and practical realisation of the project objectives. The participants' prior knowledge of GPS systems contributed significantly to the rapid implementation and successful application of the multicopter technology.

Project evaluation

Pedagogical evaluation of the student project in comparison to the objectives: The pedagogical evaluation of the project was carried out by comparing the learning objectives defined in the pedagogical plan with the learning outcomes measured at the end of the project (knowledge, skills, attitudes, responsibility and autonomy). All participants completed evaluation forms before and after the project, documenting progress in their knowledge, skills and sense of responsibility.

Knowledge: The evaluation forms showed recognisable progress in the area of knowledge for all participants. Before the project, most of them only had basic knowledge of multicopter technology and GPS applications. After completing the project, they were able to demonstrate in-depth knowledge in these areas. This increase in knowledge was clearly evident in the results of the "before" and "after" questionnaires and demonstrates the successful development of knowledge during the project.

Skills: All participants also made significant progress in the area of practical skills. They learnt how to programme and control multicopters safely and used the technology effectively in the application of beneficial insects. The improvement in these skills was also clearly reflected in the evaluation forms.

Attitudes: The participants developed a positive attitude towards the use of new technologies in agriculture. They gained confidence in their ability to successfully use innovative tools such as multicopters in practice, which also became clear in the "after" evaluation forms.

Responsibility and independence: All participants made progress in terms of responsibility and independence. While they were dependent on support at the beginning of the project, by the end they were carrying out many tasks independently. This development was also documented in the evaluation forms.

Overall, the participants made recognisable progress in all areas, which shows that the methodology used in the project successfully achieved the intended learning objectives. The participants are now well equipped to apply their newly acquired knowledge and skills in agricultural practice.

Success stories, failures, risks, impact

Feedback from the participants: The feedback from the trainees from the vocational schools, the teachers and the participating farmer was consistently positive. The trainees reported that they were able to gain

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valuable experience through the practical work with the multicopter technology. In particular, the direct use of the technology on the fields of the farm enabled them to apply theoretical knowledge in practice and expand their skills in the field of modern agriculture.

The teachers emphasised that the project not only imparted technical knowledge, but also promoted the trainees' personal responsibility and teamwork. The co-operation with the farmer, who acted as a certified trainer and training company, was also seen as a great advantage. Thanks to his practical guidance and experience in everyday farming, the trainees were able to learn directly from practice.

The farmer, who was already involved in the development of the project plan, was very satisfied with the results. The multicopter missions carried out met his expectations and were implemented efficiently. He emphasised that the technology is a promising addition for pest control and other agricultural tasks.

Success factors of the project: A key success factor of the project was the close connection to practice and the cooperation between the vocational schools and the agricultural training company. The farmer, who acted as the trainer, was heavily involved in the project planning and ensured that the content learnt was applied directly in the fields. This close integration of theory and practice enabled the trainees to put what they had learnt into practice immediately.

Another success factor was the versatility of multicopter technology. Although the course focussed on the application of beneficial insects, the potential of multicopters for numerous other applications in agriculture was demonstrated. This emphasises the relevance of the project as a basic course that provides trainees with the fundamental skills to implement more complex projects such as fawn monitoring or smart farming in the future.

Risks and failures: As with every project, there were also some challenges here. Technical problems, such as GPS signal interference or weather-related delays during flights, posed challenges, but these were successfully overcome through flexible adjustments to the project plan and technical maintenance. Thanks to the guidance of the farmer and the teaching staff, these problems were managed well.

Another risk was the trainees' initial uncertainty in handling the multicopter technology. However, these uncertainties were quickly overcome through additional training and practical exercises. Ultimately, all trainees were able to acquire the necessary knowledge and skills.

Insights and lessons for the future: The project has made it clear that the application of multicopters in agriculture is extremely versatile. Although the focus of this course was on the application of beneficial insects, it shows that the technology can be used for many other projects. Future projects could include fawn monitoring or smart farming, where multicopters are used to collect data and monitor fields.

This course therefore served as a basic course to teach trainees the fundamentals of working with multicopters. The skills acquired provide a solid foundation for more advanced courses and projects focussing on more complex applications of the technology. Students are now able to transfer their knowledge to new areas of application and use the technology flexibly in various agricultural scenarios.

Transferability of the tools to future courses: The technologies used in the project, in particular the multicopters and GPS systems, have proven to be extremely versatile and easily transferable to future courses. These technologies have numerous applications in modern agriculture and can be utilised in various areas such as fawn monitoring or automated field monitoring. The course has provided the trainees with the basics required for these more advanced projects.

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The use of specialised applications to identify plant pests also proved useful and could play an important role in future pest monitoring and plant care projects. The close co-operation with an agricultural training company and a certified trainer proved to be a valuable addition and could serve as a model for future projects.

Conclusions and recommendations

Several new approaches and recommendations can be derived based on the experiences and results of the project "Beneficial insect application with multicopters". Vocational schools, which have a fixed student base thanks to the dual training system in Germany, have an advantage when it comes to integrating labour market-related technologies such as the use of multicopters. Although the integration of such practical technologies in German vocational schools is not completely new territory, the project shows that curricula need to be regularly adapted to keep pace with technological developments. In order to further strengthen cooperation between teachers and companies, a closer exchange during project planning and implementation is beneficial. This enables the teaching content to be adapted even more specifically to the current requirements of the labour market. The responsive project methodology offers valuable opportunities for practical training, but also harbours risks, for example in the event of technical problems or unforeseeable external factors. Overall, the project experience was extremely positive and made it clear that the close integration of school and company promotes sustainable and future-orientated training.

Links

https://vetprofit.itstudy.hu/hu/results/r3-labour-market-oriented-projects-students
https://mlc.itstudy.hu/en
https://www.ima-agrar.de/produkte/lehrermagazin
https://www.passpunkt.de/wie-koennen-drohnen-in-der-landwirtschaft-eingesetzt-werden

PLC project and innovation management

Target group (age, course, sector)	18+, EQF 5 course on Mechatronics
Institution and country	Fondazione ITS Jobsacademy, Italy
Company/ies involved in the project	Schneider Electric S.p.A. (Salvino Zocco)
No. of participating students	20
Teachers (name, last name)	Manuel Gazzaniga, Valeria Moliterno
Overall project duration (weeks)	20
Duration of the micro-course (hrs and lessons)	20 (5 lessons)
Duration of the project work (hrs)	32

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Project report

Acknowledgments

We would like to express our gratitude to Schneider Electric S.p.A., to the teachers and tutors Valeria Moliterno and Manuel Gazzaniga, and to the students who dedicated their time, effort, and expertise to ensure the success of this project. Their commitment and teamwork have not only enhanced the learning experience but also reinforced important partnerships between industry and education.

Goals and preparation of the project

The project titled "PLC Project and Innovation Management" focused on developing competencies in PLC programming and Industry 4.0 within the field of mechatronics. Its core objective was to enable students to design and manage automation systems, enhancing their understanding of real-world industrial applications through both digital simulations (digital twins) and hands-on experience. This initiative aimed to empower students to optimize energy efficiency in industrial settings, which was recognized as an essential skill for Schneider Electric, the partner company involved.

The project aimed to equip students with a blend of practical and theoretical knowledge across several key areas. These included an understanding of PLC programming, skills in Human-Machine Interface (HMI) design, and competence in industrial automation systems, which were achieved through simulations and real hardware applications.

Key areas of focus encompassed mechatronics and automation, with particular emphasis on PLC programming and HMI development, as well as the design of energy-efficient systems. Project management in industrial contexts was also a significant component, employing tools such as EcoStruxure Machine Expert.

To effectively engage with the project, students were expected to possess foundational knowledge in basic PLC systems and the principles of mechatronics, as well as fundamental project management skills. Familiarity with design software such as CAD and programming environments like CoDeSys was also necessary.

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Recognizing certain skill shortages, the project included a microcourse designed to bridge these gaps. This microcourse addressed advanced PLC operations and programming techniques, the fundamentals of HMI and electronic drives, and the usage of specific PLC types, HMI configurations, and electronic actuators.

The project unfolded over a span of 20 weeks, with key outputs that included demonstrated PLC logic through software and compressed archive files, properly configured HMI panel designs for PLC-HMI interaction, and a presentation slide deck summarizing the entire project. The final deliverable consisted of working project files that had been tested on real equipment.

Students organized themselves into teams of three or more, assigning roles that mirrored real-world corporate structures, including time managers, organizers, and technical experts. Each student had specific responsibilities and contributed to both the final presentation and project documentation.

The microcourse comprised 20 hours of preparatory training designed specifically to address the identified skill gaps in students. The modules covered advanced PLC and HMI configuration, as well as electronic drive controls. This training was delivered through a combination of hands-on practice and guided tutorials, with communication and documentation facilitated via Microsoft Teams.

Project implementation

In the project, students were organized into groups of at least three, each assuming specific roles that mirrored real-world technical responsibilities. These roles included programming PLCs, designing HMI interfaces, and conducting simulations. Collaboration and communication played important roles throughout the process, facilitated by tools such as Microsoft Teams. This platform allowed students to share files, exchange ideas, and provide regular updates on their progress, ensuring that all team members stayed aligned with the project's goals.

The project was grounded in a real-world context, closely aligned with the needs of the partner company, Schneider Electric S.p.A. This company provided essential resources, including proprietary software and access to digital twins for simulating behavior. This connection to industry enriched the students' learning experience and helped them understand the practical applications of their work. To further enhance their skills, a micro-course conducted by the teacher supplemented the students’ existing knowledge, ensuring they were well-equipped to tackle their tasks effectively.

Over the course of 32 hours of project work and 20 hours of micro-course instruction, students engaged in hands-on activities using their personal laptops, which were loaded with software supplied by the partner company, Schneider Electric S.p.A. Throughout the project, students meticulously documented their progress, establishing clear milestones that reflected their achievements. For instance, programming teams developed interim software versions, while design teams provided incremental revisions of their work, fostering a structured approach to project development.

The teacher played an important role in guiding the students, offering ongoing support and feedback throughout the project. This mentorship helped students refine their projects, encouraging them to adopt an iterative approach to problem-solving. Ultimately, the project concluded with a comprehensive documentation process that included the students' experiences and learnings.

Project evaluation

The pedagogical evaluation of the student project was conducted by comparing the learning objectives outlined in the pedagogical plan with the learning outcomes assessed at the conclusion of the project. The evaluation focused on various dimensions, including knowledge, skills, attitudes, responsibility, and

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autonomy. Utilizing a combination of in-class exercises and group tests submitted via the Teams platform, the methodology aimed to foster a comprehensive learning experience. Performance thresholds were established, categorizing results into three levels: non-passing (0-60%), passing (60-80%), and excellent (80-100%). The outcomes indicated that the methodology was largely successful in achieving the expected learning objectives. A significant number of students demonstrated proficiency in PLC programming, HMI design, and project management, reflecting both an understanding of theoretical concepts and practical applications. Moreover, the emphasis on group collaboration and responsibility fostered a sense of autonomy among students, aligning with the project's broader educational goals.

Success stories, failures, risks, impact

The feedback from students, teachers, and representatives of Schneider Electric, the partner company, was mostly positive regarding the "PLC Project and Innovation Management." Students shared that they enjoyed the hands-on elements of the project and felt that the microcourse helped them understand PLC programming and HMI design much better. Many students expressed a strong sense of achievement after completing the project. Although some students faced challenges in understanding more complex topics at first, they appreciated the support from their peers. Overall, they valued both their individual learning experiences and the sense of community that developed during the project.

Teachers and tutors reported encouraging results, noting that the project achieved its educational goals. They saw increased student engagement and motivation, largely due to the real-world applications presented in the project. However, some teachers encountered challenges, especially with managing time and pacing the curriculum. Certain topics took longer to teach than expected, which left some students feeling overwhelmed. In hindsight, teachers recognized the need for better timelines and check-ins throughout the project. Nevertheless, they praised the innovative evaluation methods used, such as group tests on Teams, which encouraged teamwork and responsibility among students.

At the institutional level, the head of the institution described the project's impact as transformative. It led to more collaboration among teachers from different departments than usual. This teamwork enriched the learning experience and sparked discussions about combining different subjects in teaching. The partnership with Schneider Electric was particularly valuable, as it exposed students to industry standards and practices. The head of the institution emphasized that these types of partnerships are crucial for connecting education with industry needs, making the curriculum more relevant.

From the company’s perspective, representatives expressed satisfaction with their involvement in the project. They noted that the partnership helped them gain insight into the skills and knowledge of future employees. This experience allowed the company to better understand the education system and identify areas where they could help improve the curriculum.

Despite the successes, the project faced some risks and challenges. One major issue was that many students were not familiar with certain advanced PLC programming concepts, which could have slowed their progress. To address this, the teaching team organized extra sessions and encouraged peer mentoring, allowing stronger students to assist those who were struggling. This approach not only helped prevent failures but also built a supportive learning environment.

Several lessons were learned from the project, especially regarding the sustainability and future use of the methods developed. The combination of microlearning and hands-on projects worked well and could be adapted for future courses. Using platforms like Teams for communication and assessment showed great potential for managing collaborative projects in various educational settings.

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In terms of tools used during the VETProfit project, the structure of the microcourse and the new evaluation methods were seen as highly transferable to other courses. These methods can be applied in various subjects, especially those focused on practical skills and teamwork. However, the specific technical tools used for PLC programming may need specialized training to be effectively implemented in other educational environments, which limits their immediate transferability. Overall, the project not only met its educational goals but also set the stage for future improvements in teaching methods, highlighting the importance of collaboration between schools and industry

Conclusions and recommendations

In conclusion, the "PLC Project and Innovation Management" experience has led to several new proposals for improving higher education VET. One key recommendation is to create better communication pathways between teachers and companies to ensure that the curriculum meets industry needs. While the responsive projects methodology provides great opportunities for hands-on learning, it also carries risks, such as students struggling with complex topics without proper support. Overall, this project highlighted the benefits of combining real-world experiences with education, showing that strong partnerships between schools and companies can enhance student learning and support teacher development.

Links

- *Students project:*
  - *https://mlc.itstudy.hu/en/mlc-browser/progetto-didattico-plc-project-and-innovation-management*
  - *https://mlc.itstudy.hu/en/mlc-browser/presentation-responsive-project-plc-applications-mechatronics-start-ups*
- *Students' project work:*
  - *https://mlc.itstudy.hu/it/mlc-browser/project-work-sistema-automatizzato-di-erogazione-mangime-cavalli-da-corsa*
  - *https://mlc.itstudy.hu/it/mlc-browser/project-work-replastitech*
  - *https://mlc.itstudy.hu/it/mlc-browser/project-work-rainvest*
- *Company's website:*
  - *https://www.se.com/it/it/*

Plant treatment based on meteorological

Project report

Project title	Planning plant treatment based on meteorological data
Target group (age, course, sector)	11th grade Horticultural technician students, Horticultural technician, Agricultural engineer, Horticultural engineer, Agriculture
Institution and country	KMASZC Márton Varga Horticultural and Land Surveying Technical College, Hungary
Company/ies involved in the project	Szuvandzsiev Ornamental Gardening, AgriDron Ltd.

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No. of participating students	6
Teachers (name, last name)	Brigitta Boda (group leader), Katalin Sinka, Zsolt Jescheta, Cecilla Barta Dombóvári, Sára Ekert (project manager)
Overall project duration (weeks)	6
Duration of the micro-course (hrs and lessons)	30 weeks
Duration of the project work (hrs)	10 hours of theory, 5 hours of practice

Acknowledgments

We would like to express our gratitude to all those who contributed to the success of the project. Thank you to the teacher members of our team and the students for their tireless efforts in achieving our common goal. We especially thank Szuvandzsiev Ornamental Horticulture and Krizantém Ltd. for enriching the project with their valuable experience and knowledge. We appreciate everyone's cooperation, teamwork, and support! Through our collective efforts, we have gained valuable experiences that will serve as a foundation for future successes.

Goals and preparation of the project

The project's goal is for students to organize their knowledge of plant physiology and meteorology while refreshing their understanding of meteorological data collection tools. They will get to know the measuring instruments used in practice and learn to interpret and analyze the collected data, which can be applied in ornamental plant cultivation to produce more marketable products. The main objective of the project is to develop students' digital competencies, familiarize them with new tools and methods, improve their cooperation and communication skills, and master independent work organization.

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To successfully achieve these goals, it is essential to assess the students' prior knowledge and skills. For this purpose, the students participated in a preliminary survey, which clarified the skills and competencies, as well as the knowledge areas that need development.

In addition to precisely defining the project objectives, an important planning step is to prepare the necessary materials, curricula, books, digital tools, and other resources that will support the learning process and the students' work.

The Gantt chart created within the project plan helped establish the project's timeline, where various milestones were placed in chronological order.

The project team consists of students from the 11.B class of the KMASZC Varga Márton Horticultural and Surveying Technical School, specializing in horticulture.

Project implementation

Communication among project members takes place through personal and digital tools (email, phone, messenger). Documentation related to activities is shared on the VetProfit platform, learning materials are created using digital applications, and practical implementation is documented with photos. The final project report is prepared based on a template, with mentorship support.

The project is carried out in a school environment as well as at the partner companies' sites (Szuvandzsiev Ornamental Horticulture; Kővári Krizantém Ltd.). Necessary tools include modern meteorological measuring instruments used by the partner company, a layered film cultivation system, and a digital environment for data processing. The partner company has provided continuous support throughout both the planning and implementation processes.

Project evaluation

Before the project implementation, a pedagogical plan was developed that outlined the intended outcomes and products of the project. Based on the preliminary survey, the necessary knowledge, skills, attitudes, as well as responsibility and autonomy for each activity were detailed. It was essential that these competencies be measurable and assessable from the very beginning of the development process.

The learning outcomes specified in the pedagogical plan covered both professional and project management knowledge, as well as transversal and digital skills, including various work forms, methods, and tools.

With the input information and the pedagogical plan, it was relatively easy to evaluate the results and developmental indicators achieved by the end of the project. Students assessed the project task and their work both individually and in groups, employing self-assessment and peer assessment. This process allowed observation of how they applied their acquired knowledge and provided them with an opportunity to express how prepared they felt to use the learned skills. The joint presentation helped gather experiences and lessons learned, while the presentation itself offered a chance to showcase and evaluate their skills and results.

In addition to the students' evaluations, assessments conducted by teachers and partner companies were also significant, as they provided different perspectives on the students' development and performance.

Regarding digital skills, it can be said that students faced no significant difficulties in joining online discussions during the work process or creating digital work plans on a shared platform. They were able to search for credible digital resources (on topics such as plant physiology, meteorological factors, and mathematical statistics) and prepare presentations, which were also uploaded to the shared platform. During the fieldwork, they documented the information recorded on-site (photos, videos) and logged meteorological data on the

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platform according to group assignments. The final presentation was prepared in digital format, and the group members followed a pre-agreed format. Students effectively applied digital presentation techniques at a skill level.

As part of the monitoring, evaluation, and feedback process, assessments occurred throughout every activity, including at the beginning and end of each task, as well as regarding the transversal skills gained during the project work. At the beginning of each activity (at the end of the previous activity), a short digital test (Redmenta) was administered to assess previously acquired knowledge. At the end of each activity, a digital test (Quizlet) covering both old and new content facilitated evaluation. Based on the completed tests, it was determined whether there were areas that still needed refreshing or mastering to reach the desired level. During the project work, each individual presentation was evaluated by team members, who also provided developmental suggestions. Students corrected and supplemented their presentations based on this feedback.

Success stories, failures, risks, impact

Participating as a partner company in the project offers numerous advantages, as it allows for direct contact with high school teachers and students. Through such collaboration, the company can better understand the skills needed in the job market and adjust its training programs accordingly. On the other hand, students can become familiar with the company culture at a young age, potentially leading to motivated and committed employees in the future. It's also important to note that the ideas and opinions of young people can provide new perspectives on company processes and innovations. Finally, keeping track of students' needs and interests can help the company better adapt to the changing expectations of the labor market.

Conclusions and recommendations

First, the methodology of educational institutions needs to be reconsidered. Based on the experiences and outcomes of student projects, it is advisable to explore new proposals that contribute to improving collaboration between vocational schools and companies. To strengthen this cooperation, teachers can organize regular workshops with industry professionals, allowing students to gain practical experience and work on real projects. A thorough analysis of the methodology for optional projects can help identify opportunities and risks, ensuring that students acquire relevant and applicable knowledge. Additionally, the overall experiences from the project indicate that involving companies not only supports students' professional development but also enhances their readiness for the job market.

Links

https://vetprofit.itstudy.hu/hu/results/r3-labour-market-oriented-projects-students

https://mlc.itstudy.hu/en

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Drone technology in precision agriculture

Project report

Project title	Drone technology in precision agriculture
Target group (age, course, sector)	9th grade Horticultural Technician students, Plant Growing/Horticulture, Agriculture
Institution and country	Central Hungarian Centre for Agricultural Vocational Training Magyar Gyula Horticultural Technical and Vocational School
Company/ies involved in the project	AgriDron Ltd.
No. of participating students	7
Teachers (name, last name)	Péter Wimmer (group leader), Ildikó Polák, Anna Füvesi, János Molnár, Krisztina Stump, Sára Ekert (project manager)
Overall project duration (weeks)	10 weeks
Duration of the micro-course (hrs and lessons)	20 hours
Duration of the project work (hrs)	15 hours of theory, 5 hours of practice, 5-8 hours of individual work

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Acknowledgments

We would like to thank our teacher colleagues for being open to the topic and wholeheartedly working to ensure that students gain as much valuable knowledge as possible during the project. We also appreciate the hard work of the participating students; their active involvement and creative ideas have been an inspiration to all of us. We are grateful to Agridron Ltd. for their continuous presence and expertise, which supported the team's efforts. Special thanks go to AgroMark Ltd., who guided us around the fieldwork site and introduced us to the practical aspects of the project. Finally, thank you to all participants who contributed to our collaborative work!

Goals and preparation of the project

The project's goal is for students to become familiar with essential data collection methods for modern agriculture. Within the project framework, we aim to expand students' knowledge by providing them with the opportunity to learn about remote sensing tools, process and visualize the data they collect using various mapping techniques, and ultimately apply this data in practice, highlighting its economic and environmental significance. After mapping the necessary prior knowledge and skills for the successful completion of the project, it became clear which areas lacked skills and should be the focus of the project.

The theoretical education takes place at the Hungarian Gyula Horticultural Technical School of the Central Hungarian Agricultural Vocational Training Center, while practical sessions occur in designated fields provided by the collaborating company. Necessary tools for project implementation include an RTK-capable drone with a specialized camera, as well as GIS applications for processing and visualizing the collected data.

The project team consists of students from the 9th-grade Horticultural Technician class and six teacher colleagues. The project work is supported by AgriDron Ltd. on the corporate side.

Project implementation

The project team's communication takes place through in-person meetings and digital tools such as Google Chat and Google Meet. The documentation of completed activities is conducted on Google Drive, where students can collaboratively edit shared documents. The evaluation process begins with an initial diagnostic assessment, followed by self-assessment and peer assessment according to criteria set by the teacher. Documentation is managed through files uploaded to the Drive folders, where students receive different permissions for collaborative work.

The partner company provides supporting materials for the educational processes and is responsible for organizing the fieldwork, which is part of the student course.

Success stories, failures, risks, impact

The subject area was relatively new for the teachers, which posed challenges during its implementation. Initially, students had difficulty grasping the concepts of remote sensing and GPS positioning, mainly because they had studied relatively little physics and geometry so far, necessitating coverage of these topics.

However, after overcoming these initial difficulties, they began to enjoy the subject more and more, especially when it came to showcasing the possibilities offered by modern machinery, such as robotic steering. Thought-provoking questions posed in class were discussed collectively, allowing for brainstorming with guidance from the teacher.

Our greatest joy was witnessing the students' progress as they discovered the potential of precision agriculture and began to think from a broader perspective. At first, they approached the topic with complete

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confusion, seemingly resistant due to its complexity. Yet, as they began to think systematically and explore connections, they increasingly enjoyed the material.

The project is evidently important for both students and teachers. Such micro-courses allow us to flexibly follow technological advancements and labor market demands.

Conclusions and recommendations

From the partner company's perspective, participating in the project was definitely worthwhile. In the process of creating supporting materials, the company gained numerous new ideas and opportunities. Working with students is always exciting and challenging, providing valuable insights from their fresh perspectives and the interactions we share. The project also offers the chance to connect with other companies, educational institutions, and professional organizations, opening up new collaboration opportunities. The development of precision agriculture plays a key role in sustainable farming, and we hope that this can contribute to future solutions.

Links

https://vetprofit.itstudy.hu/hu/results/r3-labour-market-oriented-projects-students
https://mlc.itstudy.hu/en

Viola as a model plant - Complete cultivation technology

Project report

Project title	Complete cultivation technology of Viola as a model plant
Target group (age, course, sector)	13th grade Horticultural Technician students, Plant Growing, Horticulture, Agriculture
Institution and country	Magyar Gyula Kertészeti Technical and Vocational School
Company/ies involved in the project	Szuvandzsiev Ornamental Gardening
No. of participating students	11
Teachers (name, last name)	Borbála Veress (team leader), Ildikó Orosz, Zsolt Dorogi, Sára Ekert (project manager)
Overall project duration (weeks)	10 weeks
Duration of the micro-course (hrs and lessons)	20 hours
Duration of the project work (hrs)	15 hours of theory, 5 hours of practice, 5-8 hours of individual work

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Szuvandzsiev Ornamental Gardening

Acknowledgments

We would like to express our gratitude to everyone who contributed to the realization of the project. Without the combined efforts of students, teachers, and companies, this initiative would not have been possible. Thank you to the students, whose commitment, diligence, and enthusiasm significantly contributed to the project's success. The role of the teachers was essential in guiding the project and imparting knowledge. We appreciate their patience, support, and guidance, which helped in the students' development and in achieving our goals. We are also thankful to the companies that provided students with the opportunity to gain practical experience.

Goals and preparation of the project

The project's goal is to explore the processes involved in ornamental plant cultivation through the complete cultivation technology of two model plants, from variety selection to the sale of marketable plants. This topic is important as it addresses the challenges of sustainable ornamental horticulture, aiming to preserve environmental resources and maintain a harmonious environment. After clearly defining the learning objectives, we mapped the skills to be developed and the areas that needed improvement. Accordingly, special attention was given to enhancing students' practical knowledge during the planning of the student project. Through this project, students will gain insight into the operations of a stable business, where they can learn essential knowledge about greenhouse climate control, sustainable water use, variety selection, and plant protection.

The project team consists of students from the 13th-grade Horticultural Technician class and four participating teachers. The team's work is further supported by two agriculture-oriented companies: Szuvandzsiev Ornamental Horticulture, which engages in intensive plant cultivation, and AgriDron Ltd., which provides precision agricultural services, among others.

Project implementation

Communication among the project team members takes place through personal meetings and digital tools (Google Drive, Google Chat, Google Meet). Project documentation is conducted on Google Drive, where files are collaboratively edited. The evaluation of the learning process includes initial diagnostic tests, self-assessment, and peer assessment based on criteria set by the teacher.

The theoretical instruction occurs at the Hungarian Gyula Horticultural Technical School of the Central Hungarian Agricultural Vocational Training Center, while practical sessions take place at the Szuvandzsiev Ornamental Horticulture site. The necessary tools for implementation include modern meteorological measuring instruments used by the partner company, a multi-layered film cultivation system, and a digital environment for data processing. The partner company provides continuous support throughout both the planning and implementation processes.

Success stories, failures, risks, impact

The participating companies have clearly benefited and can continue to benefit from the collaboration. Working together with students brings new ideas and perspectives that can assist the company in its innovation processes. The connection between students, teachers, and the company can open up new business opportunities and lay the foundation for long-term partnerships. By participating in the project, companies can practically apply teaching and mentoring processes, which can aid in employee development and the organization of existing information, as well as the creation of new work-related educational materials.

Additionally, the collaboration strengthens the company's social responsibility, positively impacting both its reputation and society at large. Last but not least, through the project, companies can discover young talents who may become potential employees in the future.

Conclusions and recommendations

In the future, it would be beneficial to develop a collaborative relationship where the partner company participates in the students' education—especially in practical training—throughout the entire program. This would allow for continuous presence and communication among students, teachers, and business professionals, as well as an ongoing exploration of the practical and business aspects of current topics.

Links

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Project basics

- ***Title:*** *Multidisciplinary, Project-based Digital Learning Content for VET*
- ***Acronym:*** *VETPROFIT*
- ***Project ID:*** *2021-1-HU01-KA220-VET-000025350*
- ***Partner countries:*** *Germany, Italy, Hungary*
- ***Coordinator:*** *iTStudy Hungary Ltd.*
- ***Duration:*** *01 November 2021 – 31 October 2024.*
- ***Target groups:***
    - *VET- chers/trainers*
    - *Companies (Agriculture and IT sectors)*
- ***Beneficiaries:***
    - *VET students*
    - *Employers*

Aim of the project

The aim of the project is to reflect the needs of the labour market in vocational education and training, to prepare teachers to work with companies to develop project tasks for students and future employees to solve real problems proposed by them. To achieve this objective, the partnership:

Objectives

- *review the curriculum, learning materials and teaching methods used in the initial training of IT and Agricultural sectors in the partner countries;*
- *train VET teachers of these sectors about the project method, related digital tools, innovative assessment practices and digital content creation;*
- *assign real-life project tasks for VET students, in close collaboration of teachers and labor market representatives;*
- *create a repository of project-based, re-usable, high-quality, motivating digital learning contents with an interdisciplinary approach;*
- *prepare students for successful project implementation by designing and delivering microi-courses for them;*
- *create a model to be published as a guide for teachers of other VET institutes.*

Partners

- *iTStudy Hungary IT Education and Research Centre. Hungary*
- *DEULA - Nienburg GmbH, Germany*
- *Fondazione ITS – JobsAcademy, Italy*
- *Association of Hungarian Horticultural Vocational Training Institutions, Hungary*
- *Premontre Vocational High School, Technical School and College, Hungary*
- *Discovery Center Nonprofit Ltd., Hungary*

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