

Inclusive REskilling and upSkilling Toward competitive Agrifood and veterinary sector: European agenda Strategy

D4.1 Training and delivery methodology	
Document description	This task consists in defining the pedagogical approach and the recognition scheme (following EQAVET guidelines) that will be used to develop the training programme implemented as pilots during the project and by larger networks after the project duration.
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Author(s) and date	Milena Corredig, Konstantina Ntrallou, Remigio Berruto, Patrizia Busato, Codrin Mihai Birzu, Francesca Sanna

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Deliverable's summary

Deliverable 4.1 compares several methodologies that will be considered in order to provide an inclusive and engaging training experience: Online learning, microlearning, gamification, flipped classroom, blended learning, peer learning, on-site demonstration activities, Action-based and participatory learning, work-based learning (project based). Additionally, as I-RESTART aims at developing training using the micro-credentials' structure, their approach will be analyzed too. The differentiation of the EQF level will help in this regard and will require different engaging tools.

1. Introduction

With the ultimate objective to upskill and reskill the workforce in the Food Industry, Animal Production and Veterinary sectors, a variety of methods for teaching content and processes that enhance learning of digital, technological and soft skills, and engage trainees in an inclusive process may be applied. This task consists in defining the pedagogical approach and the recognition scheme (following EQUAVET guidelines) that will be used to develop the training program implemented as pilots during the project and used by larger networks after the project duration.

Due to the pandemic, demand for various online learning opportunities has accelerated as well as demand for alternative credentials. I-RESTART will follow the DG EAC initiative on micro-credentials. A micro-credential is a qualification evidencing learning outcomes acquired through a short, transparently-assessed course or module.

According to the European Commission, the definition of micro-credentials has been designed in a way that allows Member States to adapt it according to the needs and objectives of their national qualification systems, whether in formal, non-formal or informal settings or at different education levels. In most European countries, discussions surrounding micro-credentials are at an initial stage. Given the broad definition at European level and diverse national interpretations, it is crucial to examine various purposes and functions of micro-credentials. They are seen as being fit for purposes such as upskilling and reskilling, addressing the needs of the labor market, recognising prior learning, and widening access to a greater variety of learners.

The material developed for the trainings will be used in multiple ways:

a) by workers interested in the micro-credentials modules and their upskilling and reskilling (both from Food Industry, Animal Production and Veterinary sector) and students, who will get access to personalized pattern, following only the materials they need, and

b) by students and unemployed people, willing to get European Credit system for Vocational Education Training (ECVET) certification through a completion of the whole chosen curriculum.

I-RESTART will involve industry, companies, employers, private and public to cooperate with Higher Education Institutes (HEI) and Vocational Education and Training (VET) to develop useful micro-credentials (MCs and specify their EQF level, European Credit Transfer and Accumulation System (ECTS) and program learning outcomes.

Also, the principle adopted to schedule the training (online and in-class activities, work-based periods) will be defined in this task, to maximize the engagement of the learners, and to provide a modular training schedule.

Different open-source Learning Management Systems will be compared, to pick the one to be used to implement the training material and to manage the training considering also the platforms the partners already manage. The criteria to select trainers and trainees will be decided by the partners in this task, as well as the EQUAVET

indicators to be monitored during the training.

A handbook on best practices for learning innovation will be released and made available as part of the strategy design as well as integrated in the platform for future use by VET and education providers. It will also serve as a basis for the I-RESTART pilot training content creation and conduction.

For the decision about the training platform the following points Erasmus+ were regarded:

1.1. Erasmus+ Open Access and Open License Requirement

The Erasmus+ Program Guide stipulates Open Access and Open License requirements for all outputs produced with the support of the Program:

1.1.1. Open Access Requirement

“Erasmus+ promotes the open access of project outputs to support learning, teaching, training, and youth work. This serves both to ensure that publicly funded materials provide value to the general public, to increase the value, visibility and reuse of the insights and work of a project, and to ensure long-term access to the results, even if e.g., a beneficiary consortium ceases to exist.

In particular, the Erasmus+ program commits its beneficiaries to making any educational resources produced as part of projects - documents, media, software or other materials - freely available for the public under an open license. Such materials are known as Open Educational Resources (OER). In addition, beneficiaries must ensure that these OER are shared in an editable digital form, freely accessible through the internet (without cost, registration or other restriction), and whenever possible shared on a suitable and freely accessible platform, thus not just a project or institution specific website. The open access requirement is obligatory and is without prejudice to the intellectual property rights of the grant beneficiaries.”¹

1.1.2. Open License

“An open license is a way for the copyright holder (creator or other rights holder) to grant the general public the legal permission to use their work. The applied open license is usually indicated directly on the work and wherever the work is shared. As in the case of other licenses, open licenses do not imply a transfer of copyright or other intellectual property rights. Someone granting an open license for their work still remains the copyright holder of their materials and can themselves use the materials as they wish, e.g., to commercialize their project outcomes. Specifically, an open license applied to educational resources produced with support of Erasmus+, must allow the public (i.e., any third parties) at the minimum to freely:

- Use the work;
- Adapt the work as needed (e.g., translate, shorten, modify for local contexts, etc.);
- Reproduce and share the original or adapted work with others (e.g., with students in the classroom, online, with peers, etc.).

While Erasmus+ encourages beneficiaries to apply the most open licenses² to ensure the maximum impact of

¹ Source: https://ec.europa.eu/programmes/erasmus-plus/programme-guide/part-c/important-contractual-provisions/open-access-requirement_en

² E.g., the widely used Creative Commons Attribution or Creative Commons Attribution-Share Alike licenses for creative works, the GNU Public License and GNU Lesser Public License for software, or the Open Database License for databases.

their works, beneficiaries may choose open licenses with specific conditions, in particular:

- That the creator has to be indicated whenever the work or a derivative is used or shared;
- That the work cannot be used commercially (e.g., sold by others, integrated in a commercial textbook, etc.);
- That any derivatives have to be shared under the same license or licensing terms.

While beneficiaries are free to choose any open license or even develop their own open license, to avoid duplication of work, ensure legal certainty, and ensure the possibility to combine several works, Erasmus+ beneficiaries are strongly encouraged to make use of well-known existing licenses suitable for the type of resource. The license cannot contain any conditions which limit the user group, which forces users to register, participate, or otherwise undertake any specific activity, or which specifies that the use has to be requested or reported.”³

2. Pedagogical approaches

Online learning has been broadly recognized as strategically important to address global needs of education. As early as 1998 UNESCO articulated a vision and framework for priority action for change and development in higher education (UNESCO, 1998). As information technology (IT) made access to information ubiquitous, its importance to support and enable strategic actions at national levels became evident. The US National Technology Plan (US Department of Education, 2010) proposed a technology-enabled learning model based on the assumption that advances in learning sciences and understanding how people learn, combined with rapidly evolving technological developments, create new challenges and opportunities for higher education. The European Commission (2010) stated that innovation and modernization are essential for Europe to become a competitive and inclusive economy. Similarly, EU countries and China (World Bank, 2007) have used IT into their education strategies as well as IT-enabled programs to boost research and education outcomes.

As a result, investments in education IT must not only increase learning results but also lower the cost of instruction. Previous experience has shown that with the correct investments and use of IT in education, this is possible. An assessment of 156 modified courses involving 195 institutions and 250,000 students found that learning outcomes improved in 72 % of the courses, while there were no gains in 28 %. Furthermore, the cost of instruction was decreased by 34 % on average (NCAT, 2014). Top-ranked universities' strategic plans for teaching and learning in higher education now include online delivery. This is frequently linked to better learning outcomes, lower instructional costs, and teaching/learning innovation (Williams *et al.*, 2012).

It is undeniable that online teaching and learning is effective. Higher education institutions are increasingly using online teaching/learning as a way to modernize their work and develop new channels for students to better their creative, entrepreneurial, and critical thinking skills. The remaining difficulties are around determining the most effective and efficient methods of delivering this type of teaching (Bateman & Davies, 2014). The focus of the I-RESTART project is mostly on people working and/or studying in the Agri-food (Food industry and Animal production) and veterinary sector. Partially online learning and effective skill training benefit both target groups.

2.1. Active and Passive learning

³ Source: https://ec.europa.eu/programmes/erasmus-plus/programme-guide/part-c/important-contractual-provisions/open-licence-intellectual-property-rights_en

Active learning is anything course-related that all students in a class session are called upon to do other than simply watching, listening and taking notes. When students are focused on doing, with course content and activities designed to develop and enhance their comprehension of a topic, they are said to be engaged in active learning. Online discussions/debates, group projects, idea mapping, role-playing, content-related games, and problem-solving are some examples of activities that promote active learning. Active learning entails actions that promote the application, comprehension, and discovery of new information. This could be in the form of solving an engineering challenge or designing a system in the case of engineering. Social activities are particularly suited for active learning. Students criticize, contribute, and build a deep grasp of the material they have learned. In this situation, the instructor's responsibility is to direct and support the students.

Passive learning occurs when students are engaged solely in taking in information. Examples of this include: reading materials, listening to a lecture, watching a video, and looking at the photos, diagrams or PowerPoints. Passive learning is primarily an individual activity in which students learn by assimilating the information presented.

3. Training methodologies

3.1. Online learning

Online learning (also known as remote learning, distance learning or e-learning) means the use of multimedia and internet technologies to improve the quality of learning by facilitating access to resources and services, as well as remote exchanges and remote collaboration.

The goal of e-learning is a continuing education process that involves the use of network technologies to design, deliver, select, manage and extend learning. The main elements in the design of content that can be delivered via the network, which make distance learning no longer comparable to traditional monolithic courses to be distributed indiscriminately to all students, are three:

- interactivity, i.e., the need to involve the learner, generally making use of learning by doing;
- dynamism, or the learner's need to acquire new targeted skills just in time;
- modularity, i.e., the possibility of organizing the contents of a course according to the training objectives and the needs of users.

Regarding this last element, each training block (called learning object) can be removed from a course and assembled with other learning blocks to form a new course: therefore, the learning object can be defined as any object that becomes part of the training process and that can be (re) used in different times and places. Its size varies according to the methodology adopted by the designer. The characteristics necessary to make learning objects reusable are: easy availability and portability; the ability to manage content archives; the assignment of metadata sets to individual objects.

3.2. Microlearning

Microlearning (also called bite-sized learning) is a didactic approach focused on the minutiae of learning units (or teaching units). It is a "smart" and fast methodology, such as to be shaped according to the needs of the student – who can be of any age and every cultural level, with professional skills or not: microlearning is therefore adaptable to all areas of learning. What is paid attention to is the use of multiple types of content, called "micro-content". The basic idea is in fact that, the smaller and more detailed the teaching units, the more they remain impressed in the mind of any student, who internalizes them more easily (Hug, 2010).

These are podcasts, blogs-posts, wikis, messages, photos, graphics, texts, videos, social media posts, audio and any other type of multimedia content- as long as they are short, (learning time sessions from about 5 to 10 minutes) and simple (bare concepts). In addition, micro-content must have a single focus, be self-contained (i.e., contain its own structures, sub-elements or metadata that organize them), indivisible (by breaking them down, they would lose meaning) and recoverable to a web address (they must have "addressability", that is, be indexed by a permalink associated with each of them: an example is the DOI that is used for online academic publications).

By virtue of its addressability, micro-content can be used in an "on demand" way: what makes micro-learning effective, therefore, is also the fact that the subjects can decide independently when to undertake the training process, so as not to be overwhelmed by learning, but to be able to control it. Not surprisingly, in its most recent evolution, micro-learning is widely used in e-learning and Distance Learning, in different contexts of use: from corporate training to professional updating, to the testing of skills and soft skills.

Its application in classroom teaching (but also at a distance) offers the possibility of structuring agile, innovative and multi-platform learning paths, in line with a lifelong learning perspective. In this way the canons of traditional learning – normally based on books – are overturned, which often pose long and complex contents, difficult to assimilate. Microlearning involves short-term focused strategies designed specifically for the understanding, learning and education of the learner: all based on the development of his skills and competences.

3.3. Gamification

Since 2010, gamification has become not only a word in common use, but also an educational methodology fully accepted in classrooms around the world. Gamification is understood as the use of game dynamics (e.g., points, levels, rewards) in non-game contexts, such as education, marketing, health, corporate training and politics to solicit commitment and competitiveness, to stimulate the search for solutions to a problem, etc.

Studies show that translating educational, promotional, or propaganda goals through exciting challenges, along the lines of video games, then through the awarding of progress badges and visibility of performance graphs, fulfills the need for competence and increases the perceived meaningfulness of the task (Sailer et al. 2017).

In the classroom, "Gamification" does not mean "making the lesson playful," rather it is applying elements specific to video games in teaching to stimulate learning in traditional subjects. Gamification allows the program to be segmented into consecutive levels and satisfies the needs for growth, activity, self-esteem, while maintaining high degrees of fulfillment and interest, thanks also to the customization of the path. This approach amplifies his motivation, allowing him to store information in a meaningful and longer-term way.

There are two different sources of motivation: one based on mastery, the other on the product (and its comparison to the achievement of others). Evidence shows that learning motivated by grade alone is only effective in the short term; instead, the desire to learn broader skills ensures long-range retention of those skills. Video games guarantee the subject wide spaces of freedom, personalization, choice, and make progress immediately visible. Error is no longer a discouraging, anxiety-inducing definition, but an impulse to try again. In place of the traditional evaluation, score-rating systems typical of video games are inserted, such as rewards that range from zero upwards, instead of the classic subtractive evaluation, calculated on the basis of errors.

In the case of gamification, the error only temporarily locks the subject to a level of the game, while the score is calculated on the actual progressions, according to one's own time. It is not important how much you make a mistake, but when the impasse is resolved, finally acquiring the competence required in the training path.

An assessment based on game scores has the advantage of giving immediate feedback on one's activities: a necessary element for maintaining high levels of "engagement". It is important to have feedback on our actions, otherwise we would not derive any satisfaction from the attempts. Trials without mistakes or successes would

simply remain empty, never happened, just as an invisible basket, placed beyond a wall, cannot be considered a goal. Learning is a continuous process of confirmations and adjustments: it is always based on the comparison between the expected output and the one actually obtained, and it is only through immediately visible feedback that the shooting parabola can be adjusted.

3.4. Flipped classroom

Advances in technology and learning theory and practice have created new directions and opportunities for pedagogy in engineering education. A pedagogy currently receiving much attention is the flipped classroom. The flipped classroom is unique in its combination of active, problem-based learning constructive ideas and direct instruction methods based on behaviorist principles (Bishop & Verleger, 2013). This pedagogical approach is enabled by technological advances that permit the transmission and duplication of information at very low cost and various means, and the trend in education to make learning student-centered.

Consensus on a flipped classroom definition is lacking (Chen et al., 2014). A simple definition of the inverted classroom is given by Lage (2000). By this definition, activities that traditionally take place in the classroom, take place outside the classroom in a flipped classroom, and vice versa. Thus, a flipped classroom is one in which learning activities not requiring human interaction take place outside the classroom (enabled by technology) and learning activities requiring human interaction take place in the classroom (virtual or physical). Figure 1 illustrates this definition of the flipped classroom. Note that by this definition of a flipped classroom activities requiring human interaction may occur face-to-face or virtually and in synchronous and asynchronous manners.

In this work, the focus of activities not requiring human interaction is for the student to understand and apply basic concepts related to the subject matter of the course in preparation for activities requiring human interaction that focus on higher levels of learning in Bloom's taxonomy (Krathwohl, 2002).

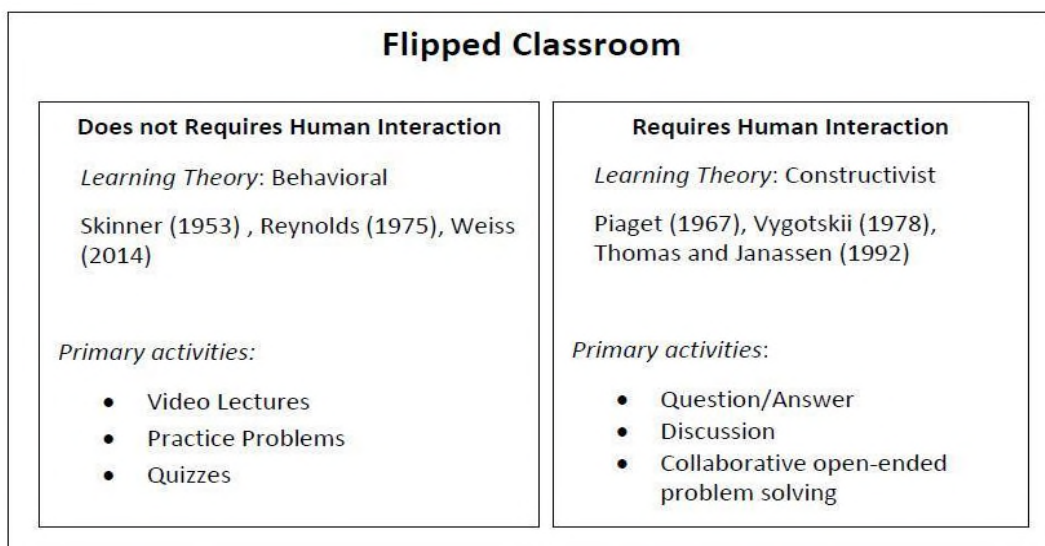


Figure 1 - Definition and theoretical framework of a flipped classroom

Some tools that do not require human interaction are video, closed-problem solving and quizzes. Early studies show that quality video lectures outperform traditional lectures (Cohen et al., 1981). Also, online homework is equally effective as paper and pencil (Bonham et al., 2003; Fynnewever, 2008). These, coupled with quizzes for self-evaluation (Stallings & Tascoine, 1996) provide a solid basis for the student to engage in activities requiring human interaction focused on higher level skills such as communicating effectively; identify, formulate and solve engineering problems; and work in teams.

Specific activities requiring human interaction include the use of face-to-face and online discussion boards used to post and answer questions (students and faculty alike) and carefully crafted open-ended problems. This approach provides an opportunity to develop activities for active learning (Michael, 2006), cooperative learning (Foot & Howe, 1998), peer-assisted- learning (Topping & Ehly, 1998), and problem-based learning (Barrows, 1996).

It is important to note that activities are not limited to those shown in Fig. 1. The number and type of activities can be diverse provided they focus on efficiently achieving a learning outcome and the learning style of the students (Zimmerman et al., 2006).

3.5. Blended learning

Blended learning, also known as hybrid learning, combines and merges the innovative tools and techniques of e-learning with traditional training and the "flipped classroom" system (Graham, 2006).

The traditional teaching of the teacher who introduces a topic and then delivers individual study materials to the students is combined with the flipped classroom, where learners study and deepen the topics independently using the materials received (videos, documents, links, interactive quizzes) and then return to confront in a synchronous manner with the teacher, who will explain any aspects that remain unclear, introduce new concepts and topics, provide new materials and so on.

Blended learning takes into account the fact that each person has their own pace of study and has different times - and even ways - of understanding and learning. It is made up of 3 different types of teaching, divided into stages:

- the first part is dedicated to the classroom meeting;
- the second refers to individual teaching to be carried out through digital content;
- the third, finally, concerns the creation of a community within which knowledge and know-how are shared (social learning).

The strength of such an approach lies in its ability to make all participants in the training session collaborative, improving internal communication thanks to the mix of models implemented. Blended learning is a complex system that embraces multiple levels of updating. In addition, blended learning allows faculty to offer resources a personalized path based on each individual's areas of improvement.

Some of the benefits of blended learning: empowerment of resources; involvement in the training activity thanks mainly to the formats used for the lessons; simplicity and immediacy; improved communication between employees and teachers; autonomy and collaboration of resources; takes full advantage of classroom and self-paced training (Dawley, 2007).

Blended learning tools and resources include: Google Classroom, YouTube, Zoom, Microsoft Teams, Skype, Moodle, Blackboard, the online platform Brainstud. An example of blended learning is students doing face-to-face group work in class then returning home to analyze that work and turning in a video as an assessment form; taking an online course, then receiving face-to-face tutoring between online classes.

3.6. Peer learning

Peer Learning, or peer education, is an educational methodology that is based on a process of transmission of knowledge and experiences among members of a peer group, within a plan that includes well-structured goals, times, ways, roles and tools.

The Peer Learning method implies, somewhat similar to the Flipped Classroom, a clear change of perspective in the learning process, which will see the students, and not the teachers, at the center of the educational system. The peer group will constitute a sort of social laboratory in which to develop awareness, test new activities, design and share together, giving students the opportunity to improve their self-esteem and social, relational and communicative skills.

According to data from a research conducted by Keith J. Topping (2005) in the area of school integration and peer learning, students who receive explanations from other students learn more than those who work alone and, even more importantly, those who take care of providing explanations to other peers assimilate even more effectively than those who receive explanations and other peers who work in a more individualistic manner because, having to go over and explain a concept to another person allows the "student tutor" to reinforce knowledge by improving their learning strategies.

The first attempts at Peer Learning date back to the late 1800s in England when two scholars, Lancaster and Bell, attempted to remedy the problem of overcrowding in the working class and the almost total absence of professional teachers. Teaching each other allows students to increase and refine their knowledge, study methods, and problem-solving skills. It should be noted that both participants will benefit from this teaching strategy because, the "student tutor" will be valued and empowered by this role and will develop, consequently, a more proactive behavior towards the school and the educational path; the other student will benefit from working in a protected environment with a person considered closer to him.

Given the ultimate goal of reinforcing students' self-esteem, as well as increasing their knowledge, the teacher must learn not to be the sole dispenser of knowledge for their students, standing aside and leaving space and time for the students. The teacher must accept that the type of communication that can be established between two peers can sometimes be more effective than that which can be established between a student and an adult. There is a real reorganization of school spaces and roles, spaces that are generally set up in rigid structures. Peer Learning makes it possible to more effectively convey the teaching of life skills, those competencies necessary for each student to achieve educational success.

3.7. On farm demonstration activities

The European Commission (2014) defines a demonstration project/activity as a: *"Practical session to illustrate a technology, the use of new or significantly improved machinery, a new crop protection method or a specific production technique. The activity can take place in a farm or in other places such as research centers, exhibition buildings, etc."*

Various farm types, such as experimental or research farms, farms owned by trusts and charitable organizations, and commercial farms, can host demonstration activities. Farmers, commercial firms, agri-food co-operatives as well as farmers' organizations, NGOs, extension services, research institutes, and/or public institutions organize demonstration actions in a variety of alliances (Sutherland and Marchand, 2021). On-farm demonstrations range from one-time "field days" organized by input suppliers to multi-year "monitor farms", where farmers, advisors, and industry members meet at regular intervals to assess farming opportunities in situ (Prager and Creaney, 2017); and permanent research farms, where researchers test and demonstrate cutting-edge technologies and approaches. As part of their business growth initiatives, farmers are increasingly opening their farms to connect with their peers and the general public. (e.g., short food supply chains, community-supported agriculture), using traditional and new virtual 'on-line' methods. On-farm demonstration is thus one activity, – amongst many – embedded in AKIS (Agricultural Knowledge and Information Systems) and mobilized by AKIS actors to facilitate farmer learning.

By inviting farmers straight onto fields and arranging meetings between farmers where both tacit and codified (scientific) information may be transferred, AKIS players (including farmers) hope to actively mobilize this culture

of 'roadside farming.' Demonstration activity has the advantage of allowing for hands-on learning and direct dialogue between peers. Uncovering the types of learning this peer-to-peer method can offer is thus central to the conceptualization of demonstration. Burton's research (2020) shows the history and challenges of actively striving to enable farmers to learn from scientific professionals and other farmers, highlighting design flaws that are still relevant today. Burton's paper highlighted those problems with effective demonstration that had existed for a long time.

The primary purposes of on-farm demonstration are to communicate explicit knowledge, and to make tacit knowledge more explicit. Farmers learn tacit knowledge mostly through experience: 'know how' gained through practice and experience. Tacit knowledge is not really associated with cognitive learning (Curry and Kirwan 2014). Farmers undertake a variety of assessments and tasks, ranging from spotting sick livestock to ploughing fields equally, without always being able to articulate how they do so. 'Scientific information,' on the other hand, is 'codified,' meaning it can be openly recorded and documented (e.g., through scientific reports).

The influence of the demonstration activity also reflects its perceived feasibility, which is best proven on a successful commercial farm. Farmers can quickly recognize the 'excellent farmers' they want to emulate (Burton et al. 2020). Unfortunately, the desire to be viewed as a "good farmer" can lead to a refusal to disclose failures, and competitiveness might limit readiness to provide precise financial accounting of commercial accomplishments. Farmers, on the other hand, are motivated to engage with demonstration farms in order to stay current with new technology and techniques that can aid them in their agricultural methods by the same desire to be viewed as a good farmer. Outsiders may find it difficult to recognize these "good farmers," yet they are critical in promoting change.

For making tacit information explicit, Nonaka and Toyama (2003) suggested four steps: socialization, externalization, combination, and internalization. Each of these phases builds on the previous one. The aided experience of hands-on learning known as "socialization" occurs when a learner is purposely exposed to a setting that promotes personal experiences. When tacit information is articulated (for example, as concepts or principles), it is referred to as 'externalization.' 'Combination' actions combine this and other people's knowledge, systematizing and integrating it. The new knowledge is then internalized, integrated in agricultural techniques, when it is practically used in a new environment - such as the learning farmer's farm.

3.8. Action-based and participatory learning

Participatory Learning and Action (PLA) is a qualitative research method that can be utilized to have a comprehensive understanding of a community or issue. It is commonly utilized in community-based activities. PLA is a participatory methodology, which means it should always be carried out with the full and active participation of the community. PLA's major goal is to help people in communities analyze their own situations rather than relying on outsiders to provide it, and to ensure that any learning is put into action (Gosling and Edwards 2003).

PLA can be characterized in two ways, both of which are complementary. To begin with, it is an ideology and way of thought that emphasizes power imbalances between communities and outsiders (such as researchers, evaluators or programme planners). Second, it provides a variety of participatory tools and approaches that can be used to collaborate with and alongside communities to plan, work, and reflect.

PLA is intended to be a fully participatory approach in which communities have a considerable say in how work is done. This suggests that providing a standardized approach or process is not possible (or desired). The following steps, however, are generally included. To begin, the PLA's goals and objectives are clarified and agreed upon with the communities. If you have several or competing ambitions, then issues are resolved before proceeding. The aims and objectives should represent both the requirements of the community and the needs of outsiders. Following that, a collection of suitable tools and techniques is chosen. PLA is made up of a variety of tools and methodologies. The tools and approaches should be used in a collaborative way. This usually entails a series of

activities that are carried out in the field. Normally, these activities are carried out with the assistance of a skilled facilitator.

The community double-checks and validates any information obtained using the tools and processes. In PLA, data analysis is done in the field by community members and facilitators in a cumulative manner. PLA does not specify any analysis methodologies, but it is critical that any analytic methods utilized be accessible to community members.

Analysis typically includes the identification of connections, relationships, gaps, contradictions and new areas of inquiry. Often this is based around:

- interpreting descriptions, stories, statements, pictures, maps, diagrams and other visual data;
- identifying themes and patterns emerging out of the data collection;
- assessing the frequency with which particular ideas or themes are mentioned;
- testing the strength of feeling about specific issues;
- identifying points of convergence or divergence between different sets of data, collected through different sources, methods and perspectives;
- identifying gaps in the data where further information needs to be collected, or where more probing of existing data is needed.

Optimal ignorance and acceptable imprecision are two key principles in PLA (Chambers, 1983). This means that PLA participants should only gather and analyze information that is required, to the level of precision required to inform community decision-making and action. Many monitoring, evaluation, and research approaches, on the other hand, are intended towards establishing findings to extremely high degrees of precision in order to fulfill the needs of academic audiences. The next phase is to design a community action plan, or for the community to take particular action based on the analysis once optimal ignorance has been attained. This frequently entails presenting work to a variety of audiences, including community leaders, community-based organizations, local government agencies, and other possible collaborators. This includes presenting work to various audiences, such as community leaders, community-based organizations, local government agencies, and other possible service providers, in a variety of ways.

Within the PLA, there is a vast variety of tools and procedures that can be used. Many of these are common data collection tools. Direct or participant observation, semi-structured interviews, focus group discussions, photography, video, case studies, and secondary data sources are some of the methods used. There is, however, a large number of tools and procedures built expressly for PLA. Many of these rely on visual aids like photographs, diagrams, charts, and maps, which are frequently created with local resources. These tools and strategies are especially useful for people who are illiterate or have never read or written before.

4. Micro-credentials' recognition scheme

On 16 June 2022, the Council of the European Union (EU) adopted a [Recommendation on a European approach to micro-credentials for lifelong learning and employability](#). The Recommendation seeks to support the development, implementation and recognition of micro-credentials across institutions, businesses and borders.

An effective culture of lifelong learning is key to ensuring that everyone has the knowledge, skills and competences they need to thrive in their personal and professional lives.

Micro-credentials certify the learning outcomes of short-term learning experiences, for example a short course or training. They offer flexible, targeted ways to help people develop the knowledge, skills and competences they need for their personal and professional development.

Shorter forms of learning opportunities than traditional qualifications, such as micro-credentials, are being developed rapidly across Europe and around the world. These opportunities are made available by a wide variety

of public and private providers in response to the demand for more flexible, learner-centered forms of education and training opportunities to a wider range of learners. (European Commission, 2022).

As highlighted by the Council Recommendation, microcredentials do not seek to replace traditional qualifications, but rather complement existing ones by providing added value to end users, to the labour market and to society in general. The Recommendation also touches on the fact that microcredentials may be designed and issued by a variety of providers in different learning settings, including formal, non-formal and informal (Council of the European Union, 2022). (CEDEFOP, 2023)

The Recommendation provides building blocks including a definition, standard elements for describing micro-credentials, and principles for designing and issuing micro-credentials. As a result, micro-credentials can be developed, used and compared in a coherent way among Member States, stakeholders and different providers across different sectors, fields and borders. It will support the building of trust in micro-credentials across Europe.

4.1. Micro-credentials' definition

The European approach to micro-credentials offers a common definition that is valid across sectors of education and the world of work and mirrors the societal mission of education and training institutes, including higher and vocational education and training (VET) institutions, and non-formal providers as well as employers and labour market actors.

“A micro-credential is the record of the learning outcomes that a learner has acquired following a small volume of learning. These learning outcomes have been assessed against transparent and clearly defined standards. Courses leading to micro-credentials are designed to provide the learner with specific knowledge, skills and competences that respond to societal, personal and cultural or labour market needs. Micro-credentials are owned by the learner, can be shared and are portable. They may be standalone or combined into larger credentials. They are underpinned by quality assurance following agreed standards in the relevant sector or area of activity”.

4.2 Micro-credentials' elements

The basis for trust in micro-credentials is transparency. Micro-credentials should be clearly identified as such with elements that make it possible for learners, education and training institutions, quality assurance agencies, and employers to understand the value and content of micro-credentials and compare them.

The European approach to micro-credentials suggests a list of critical elements that any micro-credential should provide:

Mandatory elements	Mandatory elements
● Identification of the learner	● Prerequisites needed to enroll in the learning activity
● Title of the micro-credential	● Supervision and identity verification during assessment (unsupervised with no identity verification, supervised with no identity verification, supervised online or onsite with identity verification)
● Country/Region of the issuer	● Graded achieved
● Awarding body	● Integration/stackability options (standalone, independent micro-credential/ integrated, stackable towards another credential)
● Date of issuing	● Further information
● Learning outcomes	

● Notional workload needed to achieve the learning outcomes (in ECTS credits, wherever possible)
● Level (and cycle, if applicable) of the learning experience leading to the micro-credential (EQF, QF-EHEA), if applicable
● Type of assessment
● Form of participation in the learning activity
● Type of quality assurance used to underpin the micro-credential

Table1: The European standard mandatory and optional elements to describe a micro-credential (European Commission, 2022)

These standard elements will be included in a Union data model⁴ that specifies a common format for describing micro-credentials. The data model will be available as an open standard to be used by providers of micro-credentials and will support interoperability and easier exchange of data on micro-credentials.

4.3 Micro-credentials' principles

The 10 principles highlight the key characteristics of the European approach to micro-credentials. They are universal and may be applied in any area or sector.

4.3.1 Quality

Micro-credentials are subject to **internal and external quality assurance** by the system producing them (e.g., the education, training or labour market context in which the micro-credential is developed and delivered). Quality assurance processes must be **fit-for-purpose, be clearly documented, accessible, and meet the needs** of learners and stakeholders.

External quality assurance is based primarily on the **assessment of providers** (rather than individual courses) and the effectiveness of their internal quality assurance procedures.

External quality assurance is conducted in line with:

- **Annex IV of the European qualifications' framework Recommendation**, where applicable;
- **The Standards and Guidelines for Quality Assurance in the European Education Area**, where applicable;
- **The European quality assurance reference framework (the EQUAVET Framework) in the field of vocational education and training**, where applicable;
- **Other quality assurance instruments**, including registries and labels, to build public trust in micro-credentials, where applicable.

Providers should make sure that **internal quality assurance** covers all the following elements:

- The **overall quality of the micro-credential itself**, based on the standards referred below
- The **quality of the course**, where applicable, leading to the micro-credential
- **Learner's feedback** on the learning experience leading to the micro-credential
- **Peers feedback**, including other providers and stakeholders, on the learning experience leading to the micro-credential (European Commission, 2022)

4.3.1.1 Implement External Quality Assurance of micro-credential providers

⁴ Data models are graphical and/or lexical presentations of data, specifying their properties, structure, and inter-relationships. They are used as open standards, free to use, transparent, and built based on consensus.

While quality assurance (QA) approaches may differ per country, the EU Council Recommendation indicates that, as a minimum, “external QA is based primarily on the assessment of providers (rather than individual courses) and the effectiveness of their internal QA procedures.”

A provider may choose (or be required) to become externally quality assured via several pathways including:

- Accreditation or licensing procedures, whereby an external quality assurance procedure must be undergone as part of a regulatory requirement, for a micro-credential to be allowed to be offered within a jurisdiction.
- Professional and Employer certifications – business membership organizations, business membership organizations, groups of employers or large employers will create lists of ‘approved’ providers or courses for professional development.
- External Quality Assurance certification schemes by standardization bodies such as ISO 21001 – Educational Organisation Management Systems or ISO 17024 – Conformity assessment – General requirements for bodies operating certification of persons or ISO 17024 – General requirements for bodies operating certification of persons.
- Platform certification schemes – whereby a massive open online course (MOOC) platform (or other online platform) conducts its own quality assessment of courses before allowing them to be offered via the platform.

A comprehensive external quality approach combines self-assessment, external review and processes for improvement. Standards which external QA reviews should consider, based on the Council of the EU Recommendation (2017), include:

- the **design** of micro-credentials and application of the **learning outcomes** approach.
- the **process of certification** and whether **learner assessment** is valid and reliable, according to agreed and transparent learning outcomes-based standards.
- quality assurance processes (for e.g., internal quality assurance) consist of **feedback mechanisms** and procedures for continuous improvement of micro-credentials and are based on clear and measurable objectives, standards and guidelines.
- **involvement of all relevant stakeholders** at all stages of assuring and improving quality of micro-credentials.
- the **regularity of evaluations** associating self-assessment and external review.
- whether QA is **integral** to internal management and supported by the appropriate resources.
- the **electronic accessibility** of evaluation results.

The essential principle is that micro-credential providers’ internal QA system needs to be evaluated externally, ideally by an entity independent from the organization running the QA system. (ETF, 2022)

4.3.1.2 Implement Internal quality assurance of micro-credentials

A risk-based approach to quality assurance of micro-credentials recognizes that the stakes and potential consequences of participating in a smaller, more focused learning experience are different from those associated with a full 3-year university program. As such, the quality assurance methods for micro-credentials should be tailored to the unique characteristics and risks associated with these smaller credentials.

Micro-credentials require significantly less time to complete than a full 3-year university program. Consequently, the opportunity cost and potential lost time for a student participating in a micro-credential are lower. Similarly, since they are less expensive (for individuals or governments) than traditional degree programs, the financial risk is also lower. Micro-credentials are also often pursued alongside other educational or professional commitments, minimizing disruptions to a student's life and reducing the risk of having to leave a job or relocate.

Given these factors, **quality assurance methods for micro-credentials should be adapted to reflect the lower**

risk profile and unique characteristics of these programs. Quality assurance methods may emphasize the direct relevance and applicability of the program to the specific skills or competencies being targeted. This might include a more targeted assessment of course content, instructional methods, and learning outcomes. As micro-credentials often cater to specific industry needs, quality assurance should prioritize ensuring that these programs align with current industry standards and practices.

On the other hand, practices such as using large multi-disciplinary programme committees to evaluate quality, doing extensive and lengthy consultations for years before launching a programme or running internal programme level reviews by evaluation teams may not be necessary given the specificities of micro-credentials. A risk-based approach to quality assurance for micro-credentials acknowledges the unique characteristics and lower risk profile of these programs compared to traditional degree programs. **Adapting quality assurance methods to account for these differences can help ensure that micro-credentials remain relevant, effective, and responsive to the needs of both learners and industry stakeholders.**

According to the EU Council Recommendation (2022), providers should ensure that their internal QA procedures review:

- The **overall quality** of the micro-credential itself, based on the quality standards referred to in Chapter 3.1. including Annexe IV of the EQF, the European Standards and Guidelines for Higher Education, and the European Quality Assurance Framework for VET.
- The **quality of the course**, where applicable, leading to the micro-credential.
- **Learners' feedback** on the learning experience leading to the micro-credential.
- **Peers' feedback**, including other providers and stakeholders, on the learning experience leading to the micro-credential.

When gathering learners' feedback on the learning experience, providers should enable **learners to be involved as equal partners in the internal QA process**. Taking the responsibility to co-own the improvement of the learning experience is essential for learners to develop collaborative skills and competencies which are necessary both in the labour market and society in general.

Beyond giving feedback only through surveys, learners may take on more meaningful roles when they participate in internal governing and quality assurance structures (Klemenčič, 2018). Their involvement e.g., in designing, communicating, administering and improving quality improvement processes further legitimizes the quality claims made by the micro-credential provider. The meaningful and non-tokenistic participation of learners in such structures should be actively endorsed from the view that learners are not only there to listen and succeed in their assessments, but that they are key players to improving micro-credentials. (ETF, 2022)

4.3.2 Transparency

Micro-credentials are measurable, comparable, and understandable with **clear information on learning outcomes, workload, content, level, and the learning offer**, as relevant.

Workload:

- Higher education institutions should use the **European Credit Transfer and Accumulation System (ECTS)** and comply with the principles in **Annex V to the EQF Recommendation**, wherever possible, to demonstrate the notional workload needed to achieve the learning outcomes of the micro-credential.
- Providers that do not use the ECTS may use other systems or types of information that can effectively describe learning outcomes and workload, in compliance with the principles in Annex V to the EQF Recommendation.

Qualifications framework/systems:

Micro-credentials may be included in national qualifications frameworks/systems, where relevant and in line with national priorities and decisions. National qualifications frameworks/systems are referenced to the European

qualifications framework and, for higher education qualifications, self-certified to the qualifications framework of the European Higher Education Area, which can further support the transparency, and trust in, micro-credentials.

Information on the offer of micro-credentials:

Systems for micro-credentials should provide transparent and clear information, to underpin guidance systems for learners, in line with national practices and stakeholders needs:

- **Information on providers** of micro-credentials should be published in **registers**, or incorporated into existing registers. Higher-education providers (and other relevant providers) should be included, where possible, in the **Database of External Quality Assurance Results (DEQAR)**, based on quality assurance in line with the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG);
- **Information on learning opportunities** leading to micro-credentials should be accessible and easily exchanged through relevant platforms, including **Europass**. (European Commission, 2022)

4.3.3 Relevance

Micro-credentials should be designed as distinct, targeted learning achievements, and learning opportunities leading to them are updated as necessary, to meet identified learning needs.

Cooperation between education and training organizations, employers, social partners, other providers, and users of micro-credentials is encouraged to **increase the relevance** of the micro- credentials for the labour market.

4.3.4 Valid assessment

Micro-credentials learning outcomes are **assessed** against transparent standards. (European Commission, 2022)

Where short periods of learning such as a MOOC, merely offer a non-assessed credential such as a certificate of attendance, they are not considered to be micro-credentials as per the EU definition.

To avoid cumbersome recognition procedures and increase trust in micro-credentials for their recognition it is necessary for all micro-credential providers to ensure assessment criteria and methods are quality assured and documented. Their **relevance (suitability) for assessment of learning outcomes defined in the micro-credential should be assessed in consultation with stakeholders, persons who conduct training or carry out assessment, and tested to evaluate their effectiveness and practicality**. The quality of assessment and the way how the assessment methods and criteria are designed are critically important for ensuring reliability, objectivity and validity of assessment and credibility of its results.

Based on the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG, 2015), a quality assessment should ensure that:

- The criteria for and method of assessment as well as criteria for marking are published in advance.
- The assessment allows students to demonstrate the extent to which the intended learning outcomes have been achieved.
- Students are given feedback, which, if necessary, is linked to advice on the learning process.
- Assessors or assessment designers are familiar with existing testing and examination methods and receive support in developing their own skills in this field.
- Assessment is consistent, fairly applied to all students and carried out in accordance with stated procedures.

Organizing fit for purpose assessment and quality assurance of assessment for micro- credentials provided in non-formal or informal learning contexts is also expected for the credentials to be recognised for further education and training purposes.

Micro-credential designers and issuers should formulate the criteria, forms and procedures of assessment most appropriate to evaluate the tasks with which learners can best demonstrate attaining the agreed learning outcomes. While multiple-choice tests and other easily automatable assessment techniques can offer scale at low cost, they are not always the best choice for proving a given unit of learning. Project or problem-based learning assessment methods are commonly used in micro-credentials provided by two European University Alliances: The Arqus Alliance's 'Engaged Citizens' Program and the European Consortium of Innovative Universities (ECIU) Alliance's Micro-Modules. **A combination of assessment methods such as a written questioning or exam combined with a practical simulation, or the presentation of a project followed by answers to oral questions tend to offer higher predictive validity of learner performance.** (ETF, 2022)

Table 2 gives a breakdown of different assessment options:

Form of assessment: type of tasks assessed	Levels of grading	Place of assessment and authentication required
Quiz: test recall	Self-graded	Online with ID verification
Numerical exercises: test analytical skills	Peer-graded	Online without ID verification
Self-assessment learning diaries or portfolios: test reflection skills	Externally graded (automatically or manually by instructor)	Onsite with ID verification
Written or oral exams: test knowledge and application of knowledge to theoretical scenarios		Onsite without ID verification
Peer reviews: test synthesizing and presentation skills		
Project or problem-based learning: test practical problem-solving skills		

Table 2: Source: Adapted from Sood et al. (2018) and Mitroi (2012) (ETF, 2022)

4.3.5 Learning pathways

Micro credentials are designed to support **flexible learning pathways**, including the possibility to **stack, validate** and **recognize** micro-credentials from across different systems.

Stackability:

Micro-credentials are designed to be **modular** so that other micro-credentials may be added to create larger credentials. Decisions to stack or combine credentials **lie with the receiving organization** (e.g., education and training institutions, employers, etc.) in line with their practices and should support the **goals and needs of the learner**.

Validation of non-formal⁵ and informal⁶ learning:

Obtaining micro-credentials is possible following assessment of learning outcomes, obtained either through a specific course leading to a micro-credential, or on the basis of assessment of learning outcomes resulting from **non-formal and informal learning**.

“Non-formal learning” means learning which takes place outside formal education and training through planned activities in terms of learning objectives and learning time and where some form of learning support is present.

“Informal learning” means learning resulting from daily activities and experiences which is not organized or

⁵ Definition taken from Regulation of 20 May 2021 establishing Erasmus+: the Union Program for education and training, youth and sport OJ L 189 28.05.2021

⁶ Definition taken from Regulation of 20 May 2021 establishing Erasmus+: the Union Program for education and training, youth and sport OJ L 189 28.05.2021

structured in terms of objectives, time or learning support; it may be unintentional from the learner's perspective. **"Formal Learning"**⁷ means learning which takes place in an organized and structured environment, specifically dedicated to learning, and typically leads to the award of a qualification, usually in the form of a certificate or a diploma; it includes systems of general education, initial and tertiary vocational training and higher education. (European Commission, 2022)

4.3.6 Recognition

Recognition has a clear **signaling value** of learning outcomes and paves the way for a wider offer of such small learning experiences in a **comparable way across the EU**.

Micro-credentials are recognised for academic or employment purposes based on standard recognition procedures used in recognising foreign qualifications and learning periods abroad, when dealing with micro-credentials issued by formal education providers.

The recognition is distinguished between:

Recognition of micro-credentials for education and training purposes: the formal acknowledgement of. Micro-credentials by a competent recognition entity for providing an applicant with the right to apply for admission to an education or training program, to transfer credit within it, or to exempt part or all of it.

Recognition of micro-credentials for employment purposes: the acknowledgement of micro-credentials by an employer for providing an applicant with the possibility of employment or job progression.

Micro-credentials can be considered as doorways to utilize recognition processes in two ways. (ETF, 2022)

4.3.6.1 Recognition of micro-credentials for education and training

This form of recognition takes place anytime prior learning is recognised for formal education and training purposes. This can include for admission into an E&T organization, exemption from part of a programme, as well as stacking or combining credentials for the purposes of progression through an education and training programme or for certification of learning outcomes.

Such recognition can take place via various routes depending on the existence of credit sharing and recognition agreements or on regional or global recognition frameworks, as well as validation arrangements. This chapter recommends micro-credential providers to **ensure the necessary pre- conditions for recognition to take place through different recognition routes**.

In Europe, the recognition of qualifications is mainly the prerogative of the education and training institution to which an applicant applies for recognition. Given that there is a lack of harmonization of definitions, processes, and evaluation criteria for micro-credentials, E&T organizations are expected to tailor criteria for recognition.

The project 'Evaluating e-learning for academic recognition' - e-Valuate led by [Nuffic](#) demonstrated how stand-alone e-learning (including micro-credentials) can be recognised for access into Higher Education. The project suggested seven criteria for the evaluation of a micro-credential, based on recognition procedures of foreign qualifications:

- **quality** - internal or external quality assurance procedures applied to the micro-credential or accreditation of the micro-credential provider;

⁷ Definition taken from Council Recommendation of 20 December 2012 on the validation of non-formal and informal learning OJ C 398, 22.12.2012

- **online verification** - the authenticity of a credential may be determined by checking the provider's website for the programme or by checking the digital signature on a verifiable credential;
- **level** - should be indicated with reference to established (national or regional) qualification frameworks, rather than to a platform specific classification;
- **learning outcomes** - should be listed in as much detail as possible, preferably with reference to a skill or competence framework;
- **workload** - should be indicated in terms of theoretical workload, as well as actual workload undertaken by the learner;
- **testing** - the existence of standardized testing rubrics against which to assess learner performance;
- **online identification** - the processes for ensuring that the credential-holder is the same person who followed the learning experience and participated in the assessment. (ETF, 2022)

4.3.6.2 Recognition of micro-credentials for employment purposes

Employers tend to identify skill-based hiring as one of the most important current trends in human resource management (Fuller, Langer and Sigelman, 2022). This describes a set of practices that focus on identifying the skills needed to be successful in a given role and then matching potential employees to the opportunity. This matching is based on their skills and competencies, or the aptitude they have shown for acquiring the necessary skills quickly (DeMark, et al., 2022).

As a mixture of both industry-specific and professional competencies are expected of most jobs, employers typically look for self-reporting of skills via a CV, rather than a list of achieved micro-credentials. By using a mixture of experience, credentials, interviews and tests to assess a candidate, employers would be able to evaluate an applicant's skills more directly and with efficiency. In this context, it is not the micro-credentials that are recognized but rather the skills and competencies contained within those micro-credentials. As such, in hiring, micro-credential recognition may be limited to being used as evidence of 'willingness to learn', or of acquisition of certain niche skills that may not be covered by a main learning program. This always assumes that either the employer has a willingness to accept micro-credentials, and/or that the applicant tracking software in use by the employer has the ability to read and process micro-credentials. It is not unusual for these assumptions to fail (SHRM Foundation, 2021).

Recognition of micro-credentials becomes more attractive to employers with respect to continuing professional development (CPD). Compared to other options for CPD, such as mentorship, part-time or full-time degrees, micro-credentials offer a more flexible, cheaper pathway that is more easily integrated with the requirements for promotion or change of responsibilities. This considerably increases the incentive of employers to recognize micro-credentials in this context. (ETF, 2022)

4.3.7 Portability

Micro-credentials are **owned** by the credential-holder (the learner) and may be **stored** and **shared** easily by the credential-holder, including through secure **digital wallets** (e.g. Europass), in line with the General Data Protection Regulation. The infrastructure for storing data is based on **open standards** and **data models**. This ensures interoperability and seamless exchange of data, and allows for smooth checks of data authenticity.

4.3.8 Learner-centered

Micro-credentials are designed to **meet the needs of the target group of learners**. Learners are involved in the

internal and external quality assurance processes and their feedback is taken into account as part of the continuous improvement of the micro-credential.

4.3.9 Authentic

Micro-credentials contain sufficient information to **check the identity** of the credential-holder (learner), the **legal identity** of the issuer, and the **date** and **location** of issuance of the micro-credential.

4.3.10 Information and guidance

Information and advice on micro-credentials should be incorporated in **lifelong learning guidance services** and should reach the **broadest possible learner groups**, in an inclusive way, supporting education, training, and career choices.

4.4 Micro-credentials in current strategies and policies

Developments in microcredentials and their incorporation into national qualification systems vary substantially between European countries. In most countries, discussions about microcredentials are at an initial stage, with a focus on better defining and standardizing their role within national qualifications systems. In cases where discussions are more advanced, these are stimulated by current or completed reforms that aim to allow wider opportunities in terms of learning pathways. In a few countries, like Estonia, and Spain, microcredentials or alternative credentials are referenced explicitly in legal documents, though the term microcredential is rarely included per se in strategic, legal or official documents.

Microcredentials are seen to be fit for purposes such as addressing the needs of the labour market, lifelong learning, upskilling and reskilling, recognising prior learning, and widening access to a greater variety of learners.

Stakeholders tend to position microcredentials on a continuum of qualifications/credentials, serving a supplementary and complementary function to other forms of qualifications. Microcredentials are gaining space within qualification systems on the basis that they offer certain advantages over traditional qualifications, principally their greater flexibility and their suitability for building sector- or occupation-specific skills (reskilling/upskilling) in order to respond to the changing needs of industry. The definition boundaries between microcredentials and sectoral or professional skills certificates are fairly blurred; quality-assured and industry-recognised certificates may be considered a subcategory of microcredentials that enjoy higher visibility, recognition and trust. (CEDEFOP, 2023)

4.5 Linking micro-credentials and qualifications systems

In many countries, understanding of microcredentials is uneven, and the lack of nationally agreed definitions and approaches has led to questions: can existing qualifications and programmes within qualifications frameworks may be considered microcredentials and, if so, which types?

Modularisation is one of two key developments that pave the way for the incorporation of microcredentials into national qualification systems: the other is the development of mechanisms to validate non-formal or informal learning. All European countries engage in some kind of modularisation which, while most common within adult education, is becoming increasingly prevalent in VET and HE. In some countries, the modularised offer shares the

same characteristics as microcredentials, as defined by the European Commission. However, some stakeholders remain unsure whether existing modules or partial qualifications that share similar characteristics and functions to microcredentials can be, or should be considered to be, microcredentials.

Most European countries are working towards comprehensive national qualifications frameworks (NQFs), which include all levels and types of qualifications from formal education and training; some countries are opening their frameworks to qualifications from outside the formal domain. In parallel, the vast and rapid proliferation of microcredentials on a national and international scale has largely taken place outside the formal education sector. Among those countries that have opened up their systems in this way, there is an equal split between those in which it is unclear if non-formal qualifications can be considered microcredentials (because they have not yet been officially defined) and those, such as Poland and Slovenia, where some qualifications that are awarded outside the formal education and training system but are now incorporated into the NQF, may be considered microcredentials.

The use of credit systems as part of the modularisation of VET has the potential to enable the accumulation and combining of microcredentials, which is possible in 22 EU countries. However, the use of credit systems varies considerably across education institutions, countries and sectors, and labor market credentials are often non-credit bearing, which prevents learners from using them to progress educationally. The accumulation and combining of microcredentials with credentials and qualifications from other institutions and sectors, although not frequent, is possible in few national contexts. High levels of trust are central to the success of accumulation and combining practices. This, in turn, depends on having in place respected and transparent processes: quality assurance; the definition of learning outcomes and assessment; the recognition of prior learning practices; and credit transfer systems. For this reason, accredited and quality-assured microcredentials are more likely to be accepted across institutions and sectors, which points to a need to establish a common terminology to describe micro-credentials (e.g., learning outcomes, level, volume).

Due to their characteristics, microcredentials are well positioned to be an important tool in practices relating to the recognition of prior learning (RPL): they can be both tools to facilitate RPL and can be obtained through RPL. As a result of their (potential) role in RPL, microcredentials are seen by some stakeholders as functioning as partial qualifications, counting towards full qualifications and also enabling progression towards further education in VET and HE. Lack of adequate quality assurance mechanisms is one of the main factors hindering the proper utilization of microcredentials in RPL.

In terms of the opportunities and challenges presented to qualification systems by microcredentials, it may be helpful to view them in relation to two sets of tensions inherent in qualifications: between flexibility and stability on the one hand, and between supply-led and demand-driven qualifications on the other. Microcredentials tend to be a flexible, demand-driven response to the need for skills in the labor market, but they can lack the same trust and recognition enjoyed by full qualifications. In terms of whether and how they might be accommodated within qualification systems, they can pose important questions about how to guarantee their value and currency without undermining both their own flexibility and the stability and dependability of established qualifications. Microcredentials are better able to reflect and respond to the changing needs of the labor market by providing short, quick, tailored skills development. However, these benefits can come at the expense of quality control and transparency regarding the trustworthiness of both the credential and the provider.

The relationship between VET and employment systems, which shapes the overall functions of qualifications, has an effect on the status of microcredentials: countries with strong connections between VET and employment, deep involvement of social partners and collective agreements, tend to perceive microcredentials more as challenges to established qualification systems. In contrast, countries with weaker connections between VET and employment and more flexible and modularised qualifications systems, regard microcredentials as opportunities. (CEDEFOP, 2023)

4.6 Characteristics of micro-credentials and links to other qualifications

4.6.1 Micro-credentials compared with traditional and formal qualifications

Formal qualifications, which have existed for a long time, are the cornerstones of national qualifications systems, and continue to signal value to both learners and employers. However, they can have certain limitations, which have been highlighted by the emergence of microcredentials. They may be too supply-driven, and do not always correspond to the needs of learners and employers. For instance, during the hiring process, traditional qualifications are usually complemented with certificates and other forms of qualifications/credentials obtained outside the formal education system, better signaling job-relevant technical and soft skills. The role of qualifications also varies between countries and sectors. In rapidly changing sectors such as ICT, traditional qualifications are losing value and are increasingly being replaced by smaller, more specialized ones that are better tailored to the specific needs of the job and can be acquired much more quickly to meet rapid developments in the sector.

Traditional qualifications do not always accurately identify and recognise individuals' existing skills and knowledge, and do not respond in a timely manner to the needs of the labor market. In this respect, microcredentials are considered to have a comparative advantage over traditional qualifications and certificates by better signaling individuals' skills and competences and responding quickly to the changing needs of the labor market. To address this deficiency of traditional qualifications, some countries are experimenting with alternative credentials, including microcredentials, while collaborating closely with the private sector. For instance, in Czechia, the Ministry of Education has established a partnership with IBM to pilot microcredentials aimed at improving IT and mathematical skills. The programme is jointly designed by IBM and schools and targets adult learners as well as those in upper-secondary and tertiary education.

Near-consensus existed among interview programme respondents that microcredentials will not diminish the labor market value of recognised qualifications soon. Interviewees from different stakeholder groups tended to agree that formal qualifications are still the most widely known and valued in the European labor market, while microcredentials are less so. Microcredentials can complement full qualifications/degrees and be recognised within traditional educational pathways; such views position them as one element in a broader system of qualifications and credentials. In this sense, microcredentials do not stand in opposition to traditional qualifications but are positioned on a continuum of qualifications/credentials, serving a supplementary and complementary function to other forms of qualifications. Further, microcredentials can push the national qualifications systems towards change. Since such systems – especially formal systems – are too rigid and slow to change, microcredentials can help to make them more flexible and better able to respond to the needs of the labor market. The modularisation of existing qualifications and programs into stand-alone certificates (which could qualify as microcredentials) is one of the strategies used to enhance the flexibility and relevance of existing education programmes and qualifications, without having to change them entirely.

One of the potential drawbacks of micro-credentials, is the fragmentation of knowledge. There is a potential risk that learners may simply pick and choose courses here and there, rather than pursuing a full degree. While individuals can obtain specific and job-relevant skills through microcredentials, they should also acquire a broader perspective on their respective occupational fields, as well as general knowledge, which can be obtained through a formal degree programme.

CEDEFOP conducted an interview program which included representatives of employers' organizations, employee organizations, VET providers and national authorities. The interviews covered the following countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Slovenia and Sweden.

Most respondents from national authorities and VET providers, as well as employer and employee organizations, agreed that micro-credentials offer advantages over traditional forms of qualification (table 3). However, between 22% and 30% of survey respondents did not know or could not say whether micro-credentials offered any advantages over traditional qualifications. This finding indicates that knowledge of micro-credentials and their characteristics is not yet widespread among relevant stakeholders, especially VET providers.

The survey's applied question was: Do microcredentials have any advantages over traditional forms of qualifications and other forms of competence recognition?

Stakeholder group	Yes	No	Do not know/cannot answer
National Authorities (n=74)	63%	15%	22%
VET providers (n=187)	54%	16%	30%
Employer organizations (n=37)	59%	14%	27%
Employee organizations (n=66)	50%	24%	26%

Table 3: Source: Survey of Stakeholders (n=364) (CEDEFOP, 2023)

Research revealed potential advantages that microcredentials offer over traditional qualifications and degrees. The most prominent is the fact that they are flexible and provide a format well suited to upskilling and reskilling, enabling a speedier response to the needs of the labor market. In terms of their content, they were also seen as being more relevant to labor market needs. They were considered better suited to lifelong learning and to facilitating the recognition of employees' knowledge, skills and competences.

At present, discussions in many European countries regarding the place of microcredentials within the VET sector are at an early stage. However – and as evidenced in the interview programme and in the mapping of microcredentials in manufacturing and retail sectors – it is widely acknowledged that microcredentials are increasing in number. There are increasing demands on the VET system to better adapt and respond more quickly to changes in the labor market, and to provide learners with the right skill sets. This has also been emphasized in the Bruges communiqué (European Commission, 2010), which called for the VET sector to respond better to changing labor market needs and continuously update VET content to keep up with these changes. The Osnabrück Declaration of 2020 also highlighted an increase in labor market demand for a different mix of skills and qualifications. Labor market and skills intelligence, along with research, were mentioned as the basis for informing the relevant VET stakeholders how to adapt VET offers to the changing needs of the labor market. In alignment with this, the European Economic and Social Committee (EESC, 2021) encouraged Member States to link microcredentials to employment policies as an important and complementary tool for the reskilling/upskilling of the workforce and to reduce skills mismatches in the labor market. (CEDEFOP, 2023)

4.6.2 Purposes and roles of micro-credentials

In alignment with the factors driving the emergence and uptake of microcredentials, the previous analysis in manufacturing and retail sectors highlights some of their most common purposes referred to in descriptions, either explicitly or implicitly. The two most common purposes of microcredentials are: (a) enhancing or building sector/occupation-specific skills (reskilling/upskilling); (b) responding to the changing and emerging needs of the labor market and industry.

These two objectives were mentioned in almost all the microcredentials identified; other purposes/functions were also repeatedly indicated in the descriptions. It is apparent that they play an important role in preparing the

workforce to meet industry standards in managing systems and operating equipment. Related to this is the role that they play as a certifying tool to validate and confirm the professional competences needed to carry out certain professional activities regulated by industry bodies or professional associations. Microcredentials may also be a prerequisite for membership of a professional/industrial association.

In addition to highly targeted/specialized types of training, microcredentials can also provide learners and professionals with the introductory knowledge they need to become acquainted with new sectors and occupations and to aid their entry into the labor market. This relates to yet another important function, which is to help professionals to switch careers and improve their professional profiles in new and emerging occupational fields. Employers can also use microcredentials in the form of in-company training to build or hone employee skills.

Microcredentials are also a tool for the validation and recognition of prior learning. They can be used within the framework of RPL to support obtaining a full formal qualification.

While microcredentials are expected to support professionals in navigating the labor market and combating unemployment, they also appear to contribute to the strengthening of the labor market at local level by offering targeted training to fill vacancies and skills gaps.

Analysis of the purposes highlighted by the mapped microcredentials (as well as the stakeholder group survey and interview programme) indicates three main areas in which they play an important role. These are lifelong learning, the recognition of prior learning, and employability/career development. (CEDEFOP, 2023)

4.6.3 Lifelong learning

Microcredentials offer an effective way to upskill workers throughout the course of their lives; they compare favorably with traditional qualifications, which fail to meet the lifelong learning needs of diverse learners (Oliver, 2021). Microcredentials could also help to advance equity in education by making learning accessible and affordable to vulnerable communities, supporting the United Nations sustainable development goal 4 on quality education (Oliver, 2021). Microcredentials have a social inclusion function for those who have had bad schooling experiences, enabling them to have a second chance to engage in reskilling/upskilling activities.

Microcredentials have also emerged in alignment with the evolution of qualifications and credentials systems in Europe towards being more flexible and open to diverse learning experiences. European countries are increasingly improving their policies, regulations and practices in areas such as learning outcomes, qualifications frameworks, the modularisation and accumulation of qualifications, and the validation and recognition of non-formal and informal learning. However, practices still vary between different national contexts. There is also greater emphasis on flexible and personalized learning in which learners can pursue their interests and needs and undertake learning at any place and time (Cedefop, 2010). These socioeconomic pressures and changes in the education and employment landscape have created the need for flexible and responsive short learning experiences such as those offered by microcredentials. The insights from the interview programme align with this notion, while affirming that microcredentials would allow more flexible and personalized learning pathways depending on individuals' needs and career aspirations. Further, they offer greater effectiveness and efficiency of learning by giving learners the opportunity to save time by choosing those courses and modules that are most applicable to them, instead of enrolling in a full degree program.

When looking at the value microcredentials offer in supporting lifelong learning, there are two main aspects to consider. First, they can be developed and offered as a learning tool that aims to deepen the individual's knowledge, skills and competences in a certain occupational area. This is especially the case when awarded based

on, or associated with, a structured/organized learning activity followed by an assessment/examination process (e.g. when they include classroom-based or remote training modules). This is already the case in countries such as Latvia, where upskilling courses (*profesionālās pilnveides programmas*) are offered. These are certified short-term training courses or units of learning outcomes that form part of a qualification (but do not lead to one). Another example is special-purpose qualifications offered in Greece. A special-purpose qualification represents a coherent set of learning outcomes that are part of a larger group of learning outcomes that define a qualification level. The providers of such microcredentials include the lifelong learning centers of HEIs. In Cyprus, the Centre for Lifelong Learning, Assessment and Development at the University of Cyprus offers microcredentials to professionals that align with the needs of employers and/or professional unions.

Microcredentials can be seen as a tool that “certifies or attests to” learning outcomes that have already been achieved and acquired, without engagement in any structured/organized learning (e.g., based on work experience). This relates to the role that they play in the validation and recognition of non-formal and informal learning. An example is the recognition of skills certificate (EVC) awarded in Belgium. In Czechia, the vocational qualification certificates of the National Register of Qualifications also attest to the competences that an individual may have acquired following a short learning experience. These can be awarded based on standardized examinations within the context of CVET. (CEDEFOP, 2023)

4.6.4 Opening up qualifications’ framework to micro-credentials

National qualification systems encompass all activities in a country’s education and training system that lead to the recognition of knowledge, skills and competences through the issuing of a qualification. Qualifications frameworks in European countries are heterogeneous, differing in terms of their integration, coherence and openness. In recent years, NQFs have begun to capture qualifications awarded outside formal education and training, and those helping to validate non-formal and informal learning. They are becoming genuine maps for lifelong and life-wide learning and guidance (Cedefop, 2019a; Cedefop, 2020d). These developments impact the way in which microcredentials link to qualification systems and frameworks; data indicate that, in many countries, stakeholders perceive some of the existing offer as microcredentials, for instance modules that are already part of formal education and training, and credentials offered outside of it.

Countries that have opened up their frameworks to qualifications from outside the formal education and training system include Austria, Belgium, Czechia, Denmark, France, Netherlands, Poland, Slovenia, Sweden and the UK (Scotland).

Some established frameworks, for example in France and the UK, have already had in place procedures allowing ‘non-formal’ qualifications to be included in the frameworks. Even though qualifications from outside the formal education and training system are being introduced into NQFs and linked to levels, it is not always clear whether these qualifications can be considered microcredentials. Still, there are interesting examples of microcredentials from the retail and manufacturing sectors, which appear to be linked to NQFs.

The inclusion of qualifications awarded outside the formal education and training system (including microcredentials) is important, as it can provide such qualifications with a quality label and make them trustworthy in the eyes of stakeholders, especially in systems where social partners are familiar with the purpose and functioning of the qualifications framework. Most employer representatives (55%) who participated in the survey confirmed that it is important to them that microcredentials are referenced to and/or integrated into the national qualification system or framework.

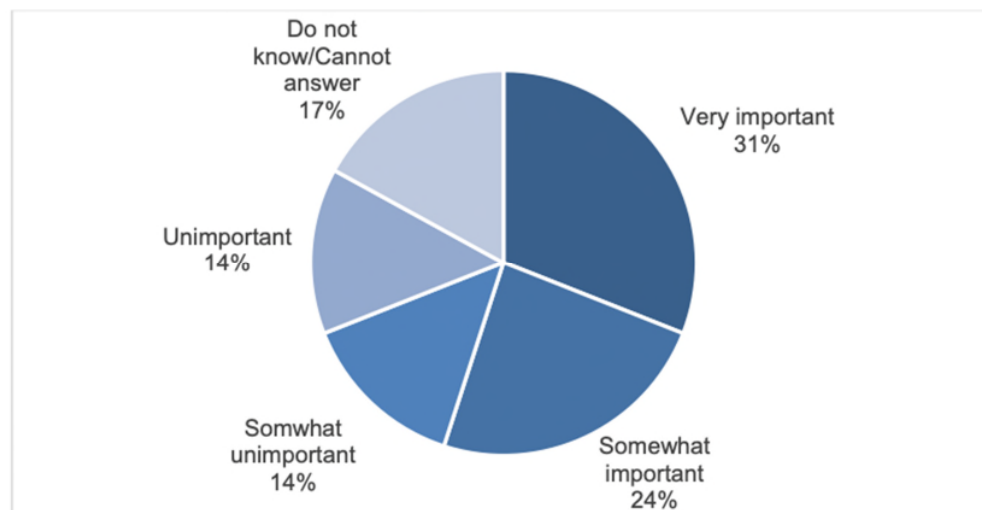


Figure 2: Survey of stakeholders representing employers (n=29) (CEDEFOP, 2023)

Survey's question: 'To the best of your knowledge, how important is it to employers in your sector that microcredentials are references to and/or integrated into the national qualifications system or framework?'

Since many of the stakeholders considered microcredentials to be equivalent to modules or partial qualifications due to their shared characteristics, the overview of national contexts and mapping exercise shows that microcredentials can be included into qualification systems and frameworks as modules or partial qualifications. (CEDEFOP, 2023)

4.6.5 Accumulating and combining micro-credentials

Traditional qualifications are increasingly being complemented by other supplementary qualifications and credentials, including microcredentials (OECD, 2020). Given the rapid changes in knowledge and technology and increasing economic and societal demands, individuals need to acquire new skills and upgrade their competences continuously. One way to address this challenge is through the accumulation and combining of different types of learning throughout life, especially through certified learning.

First, accumulating and combining microcredentials provides learners with flexible learning pathways. They can obtain new knowledge, acquire new skills, and upgrade their competences at any time, anywhere, at any length, from any provider, using both paid or free options, and engage in any form of learning that best suits their needs. The accumulation and combination of microcredentials refers to individuals' ability to assemble or stack several traditional and non- traditional qualifications and credentials to build up a larger credential or full qualification, as well as to recognise their existing achievements and obtain an accurate assessment of their knowledge, skills and competences (Williamson and Pittinsky, 2016). The more credentials' learners accumulate, the more they increase the labor market employability and access to better jobs and higher salaries.

Second, combining micro-credentials promotes a culture of lifelong learning in which individuals can combine learning obtained from different parts of their life (professional, personal, social), from different points in their life (student, young professional or expert), and from different institutions and sectors (VET, HE and the labor market). The ability to assemble, verify and recognise these learning outcomes can enable individuals to upgrade their skills, obtain new competences, pursue further education, and advance in their career paths.

Third, accumulation and combination of microcredentials fosters continuous upskilling and reskilling in the labour market. This enables learners and employees to adapt and respond to changes in the labour market and in society in general: this includes rapid shifts in technology, digitalisation and greening. It helps adults and the working-age

population to improve their qualifications and professional skills throughout their careers.

Williamson and Pittinsky (2016) suggest three ways of accumulating and combining credentials that are seen as most useful. These include vertical, horizontal, and value added.

Vertical accumulation and combination:

Vertical accumulation refers to a traditional way of stacking credentials in a hierarchy in which credentials are built on top of each other, enabling learners to progress towards a higher qualification; an example is a student progressing from secondary to post-secondary and on to a tertiary education. Here, the emphasis is on level, with the learner progressing from a lower level of qualification. This type of accumulation and combining is largely driven by the credentials gap: the difference between the educational level of the workers currently employed compared with the level employers demand of their new hires. According to Burning Glass (2014), hiring practices and requirements have changed, given that an increasing number of jobs that were historically filled by non-degree holders now require a degree. (Source: Williamson, J. and Pittinsky, M. (2016) [Making credentials matter. Inside higher Ed.](#))

Horizontal accumulation and combination:

Horizontal accumulation concentrates less on the level of the credential, and more on the learner's expertise in the subject matter. This enables learners to broaden their topic-specific expertise by earning micro-credentials in related fields that jointly prepare them for a specific type of job. Unlike in vertical accumulation and combination, there is no explicit ranking or prerequisites, although credentials can still build on each other. Horizontal accumulation and combination are particularly visible in the IT sector, where individuals earn non-degree certificates and certifications horizontally across professional fields. For instance, IT professionals can obtain CompTIA, Microsoft and Cisco certificates with the aim of broadening their skills across the field. (Source: Williamson, J. and Pittinsky, M. (2016) [Making credentials matter. Inside higher Ed.](#))

Value added accumulation and combination:

Value added accumulation. Involves both. Vertical and horizontal concepts of accumulation and combination. It occurs when an individual adds an area of expertise to an existing qualification, preparing for a specific type of job. For example, a business professional with an associate or bachelor degree may obtain the Project management professional certification. This is an industry-recognized certification for project managers, aimed at those who wish to be more effective at managing both people and projects. (Source: Williamson, J. and Pittinsky, M. (2016) [Making credentials matter. Inside higher Ed.](#))

4.6.6 Role of credit-based systems for accumulating and combining micro-credentials

Credit systems play a crucial role in accumulating and combining microcredentials. They promote transparency by making content comparable across institutions and sectors, and contribute to mutual trust.

The use of units of learning outcomes provides a strong basis for developing microcredentials, individual learning accounts and European vocational core profiles. The last of these initiatives can facilitate the mobility of learners and workers, the automatic recognition of qualifications, and the development of joint VET curricula, qualifications and microcredentials (Cedefop, 2021a). Therefore, having a common and/or widely accepted credit system for VET makes it easier to accumulate and transfer microcredentials and to combine them with qualifications and credentials from other providers and sectors.

The European credit system for VET (ECVET) contributed significantly to implementing learning outcomes and improving the quality of mobility experiences in some countries. However, it achieved only limited success in promoting the use of credit points to transfer assessed learning outcomes. The major challenges to this were due to the different approaches taken by Member States in implementing ECVET, and the differences in

qualifications/VET systems, regulations, the existence of credit systems and different national priorities. There has also been a lack of synergy and consistency with other EU instruments such as the EQF, Europass, and VNIL (European Commission, 2021a). While ECVET is no longer applied, its main objectives and principles (e.g., units of learning outcomes) have been enshrined in the new Council Recommendation, and will continue to be a priority in European VET policy (European Commission, 2021a).

The use of credits in VET is not uniform and consistent across Europe. To illustrate this, out of the 30 analyzed countries:

- (a) 20 use a credit system that is compatible with the principles of ECVET;
- (b) five countries use a national credit system;
- (c) two countries use ECTS;
- (d) three countries do not use any credit system in VET, or a system is currently under development. (CEDEFOP, 2023)

4.6.7 Prerequisites for the effective accumulation and combining of micro-credentials

For microcredentials to be effectively accumulated and combined, there needs to be trust in them as well as in their providers. Educational qualifications gain public trust through strong quality assurance. However, microcredentials are often unaccredited (Ralston, 2021), excluded from formal quality assurance mechanisms (Duklas, 2020), or lack transparency regarding standards (Resei, Friedl et al., 2019). Trusted providers and increased transparency are important for ensuring trust in the value of microcredentials and promoting their accumulation and widespread uptake. One possible solution is to create a common register of trusted issuers and mutual recognition at a European level, to ensure that microcredentials do not exist in silos or become *ad-hoc* badges (Brown, Nic Giolla Mhichil et al., 2021), but instead become building blocks for lifelong learning. According to DigitalEurope (2021), to drive the successful uptake of microcredentials and allow effective accumulation, it is essential to have:

- (a) clear definition that elaborates the content and quality of learning, options for storing (digital or physical) and usage modalities;
- (b) clear differentiation between traditional degrees and microcredentials obtained upon completion of a learning programme;
- (c) quality assurance, which can be achieved by having an EU register of trusted issuers, open to non-formal education providers such as industry;
- (d) cross-platform portability of microcredentials;
- (e) financial support to leverage content from various microcredential providers;
- (f) European digital credentials infrastructure (EDCI) to store, validate and share digital credentials;
- (g) minimum standards, in order not to limit innovation and flexibility in microcredentials;
- (h) trust and confidence in the quality of the credential and its provider;
- (i) openness to diverse issuers outside the formal sector, including private sector and international providers.

To accumulate and combine microcredentials effectively, it is important to address issues such as quality assurance, credits and recognition. In particular, microcredentials issued by providers other than education institutions should be quality-assured and recognised, and possibly included in the national qualifications' framework (Cedefop, 2021a). If microcredentials are developed in accordance with quality-assured procedures, this would ensure transferability between education institutions and the labour market, as well as the mobility of the workforce between countries (Cedefop, 2021a). One of the reasons that countries do not currently include microcredentials in their national qualifications frameworks is the issue of quality assurance, as underlined by stakeholders from Denmark, Norway, Poland, Spain and Sweden.

To enable stackability and increase in exchange value, microcredentials should be comparable with each other, have the same parameters, and include the same information (e.g., duration, credits, learning outcomes). This makes it easier for education providers or employers to interpret and understand what a specific microcredential

represents in terms of what the learner has learned and is able to do, to count toward further education or employment. Another issue is related to the credibility, validation and recognition of this kind of learning (Cedefop, 2021a). To accumulate microcredentials across institutions and sectors it is important to decide how to link them to levels, and at what level they will be accepted, accumulated and stacked.

The stacking of microcredentials can promote international mobility. This would require the safe and certified digitalisation of microcredentials, as well as the use of learning outcomes. It will also require the development of an appropriate IT infrastructure (e.g., using blockchain) and the introduction of a unified quality assurance system. The portability of microcredentials could be ensured if legal harmonization in relation to microcredentials is carried out at national and EU levels and adapted to the European Commission's initiatives relating to the digital learning certificate and individual learning accounts. This will allow the unification of labour market processes at EU level; increase participation in adult learning; enable the comparison, recognition and portability of training at EU level; and allow the validation of previously acquired knowledge (Cedefop, 2021a).

Learning outcomes that are clear, verified and assessed allow for the effective accumulation of microcredentials. This view was shared by various stakeholders in the interview programme and in the ReferNet questionnaires (Cedefop, 2021a). The learning outcomes of microcredentials should accurately describe what a learner can do (Cedefop, 2021a). If different sectors used the same definitions for learning outcomes, it would be easier to communicate these outcomes across sectors and organizations. In the retail sector in Sweden, for example, working tasks are defined, and are then accumulated to define vocational roles. It is considered important to indicate the volume or workload (e.g. using credits for learning outcomes). Such microcredentials could be also linked to NQF levels, which further enables their effective accumulation (Cedefop, 2021a).

There is growing interest and need for accumulation of learning acquired via formal initial and continuing vocational education and training, as well as non- formal or informal learning. However, this requires institutional and technical conditions for effective accumulation to be addressed, as well as tackling barriers that inhibit the accumulation of microcredentials across institutions, sectors and countries. The major challenge relates to the issue of trust and transparency. Addressing this requires robust quality assurance systems, the use of common terminology to describe microcredentials, and common credit systems that can make microcredentials comparable regardless of their providers. Developing a pathway to recognise non-credit bearing microcredentials and credentials issued by industry stakeholders would help to address the issues of trust and transparency. (CEDEFOP, 2023)

4.6.8 Use of micro-credentials for validating and recognising prior learning

Recognition of prior learning (RPL) helps individuals to acquire formal qualifications based on their knowledge and competences. The advantages of this are manifold, and include improved employability, mobility and social inclusion. The analysis of RPL practices and policies in various EU Member States shows that most allow individuals to obtain partial (e.g. Germany, Spain and Cyprus) and/or full qualifications (e.g. Luxembourg and Norway). This is most specifically the case within the context of IVET and CVET, following an assessment process that is usually based on standards like those used in formal education. In addition, most of these validation arrangements are linked to NQFs (e.g. in Belgium-fl, Ireland and Latvia). In this context, the characteristics of microcredentials position them as an important tool for enhanced prior learning assessment practices.

Where microcredentials are based on clearly defined learning outcomes, this makes it possible to align them with the other forms of qualifications including formal qualifications awarded through RPL. In such systems, the completion of individual modules that fit the broad understanding of micro-credentials is followed by the issue of a certificate proving the learning outcomes achieved (e.g., in Estonia, Lithuania and Sweden). From the learner's perspective, this means that an individual may complete one module without having to be enrolled in a full programme. If, however, the learner later decides to complete the whole programme, the institution can give an exemption for the module that has already been completed. Since some courses offered in adult education

follow the same curriculum as modules within formal VET programmes, if a decision is made to enroll in a formal VET programme, the individual can be given exemptions for those modules completed outside the formal setting, given that the learning outcomes are similar. For example, countries such as Spain, Denmark, and Belgium-fl grant admission to and exemptions from (parts of) educational programmes based on prior learning. This highlights the important social function played by microcredentials, which allow early school leavers to return to school to complete full qualifications as intended.

Microcredentials can be seen as outcomes of the RPL process. The receipt/award of a partial qualification or stand-alone skills certificate based on recognition of prior learning can be conceived as the award of a microcredential using the learning outcome-based validation of a small volume of learning. Examples exist of microcredentials (even if the term microcredentials itself is not used by the service provider or the awarding body) that are awarded following assessment/examination, without the need to engage in any structured/organized classroom-based or remote learning activity. Passing the assessment process or exam using knowledge, skills and competences acquired in non-formal and informal settings can result in the individual receiving a micro-credential that relates to specific learning outcomes (i.e., a microcredential as an outcome of RPL).

The other approach is to look at microcredentials as a tool in the RPL process. In order to recognise and validate a prior learning achievement, an individual is subject to an assessment/examination process to ensure that the relevant learning outcomes have been achieved and/or the occupational standards have been met. When the desired qualification is larger than a micro-credential (e.g., a full formal VET qualification), and when part (or all) of the prior learning achieved is documented and certified by microcredential(s), then microcredentials have the potential to support and/or shorten the validation towards the desired qualification. Various scenarios exist for the use of microcredentials within the context of RPL under this approach:

- (a) micro-credentials can be used to obtain a partial qualification;
- (b) microcredentials can be used to obtain a full formal qualification: this also relates to whether it would be possible to accumulate/stack a number of microcredentials towards a larger qualification or not
- (c) microcredentials can be used to gain access to an education programme. In such cases, the use of RPL for the purpose of meeting the preconditions for the education programme can be supported through the submission of relevant micro-credential(s);
- (d) microcredentials can be used to gain exemption from part(s) of an education programme and/or shorten the duration of study, by offering proof, through the relevant microcredential(s), that some of the intended learning outcomes have already been achieved through prior learning;
- (e) microcredentials can be used to gain exemption from part(s) of a professional qualification, where some of the intended learning outcomes (or occupational standards) have already been achieved/met through prior learning.

Even though there is a general agreement that microcredentials would help to simplify the recognition and validation of prior learning, the lack of adequate quality assurance mechanisms was highlighted as a hindering factor by several national authority representatives (from Belgium, Denmark, Estonia, Greece, France, Latvia and Slovenia) and VET providers (from Germany and the Netherlands). If short learning experiences leading to microcredentials are accredited and quality-assured, this would allow for the smooth, or even automatic, recognition of prior learning. However, some individuals may present certificates from providers that are little known to the relevant validation bodies. In such cases, even if a rigorous assessment of the competences acquired has taken place before the issue of the microcredential, the individual's knowledge, skills and competences will still need to be assessed again, simply because the provider of the microcredential is unknown or not accredited. In alignment with the mapping of microcredentials in RPL, there are two ways to increase their quality assurance. This could be tackled either at the level of the learning activity and/or its assessment process, or at the level of the awarding body. The relevant quality assurance agency can take the necessary measures towards ensuring that specific microcredentials awarded in the market are accredited and/or quality-assured, which would make it easier for both individuals and RPL bodies to use them with confidence in the RPL process. The second possible

approach is to accredit providers, so that microcredentials awarded by a specific accredited and quality-assured education and training provider would automatically signal value to the relevant RPL stakeholders. In relation to this discussion, the European Commission has highlighted that the development of microcredentials can build on the existing EU and European Higher Education Area (EHEA) transparency and quality assurance tools, one of which is the recognition of prior learning and validation of non-formal and informal learning (European Commission, 2020b). (CEDEFOP, 2023)

5. Learning objectives classification- Bloom's framework for learning outcomes

Bloom's revised taxonomy is a two-dimensional framework for identifying, categorizing, and scaffolding learning outcomes with a cognitive emphasis. The taxonomy table helps to recognize learning outcomes by level of cognitive complexity (y-axis) and level of conceptual knowledge (x-axis).

Using bloom's framework to identify the learning outcomes will allow to think of learning outcomes as two-fold:

Cognitive Process + Knowledge

The verb, or the cognitive process, clarifies the expected action to occur in learning. The object, or the knowledge phrase, identifies the targeted information learners will attain and the meaning learners will construct.

The cognitive process dimension contains six categories of thinking skills. The categories are on a continuum of increasing cognitive complexity, from lower order thinking skills to higher order thinking skills. A learner who is able to achieve a higher-level thinking skill is understood to have already mastered the lower-level thinking skills. For example, a learner who is able to apply a procedure will have already attained lower-thinking skills of knowledge (*recall*) and comprehension (*understand*).

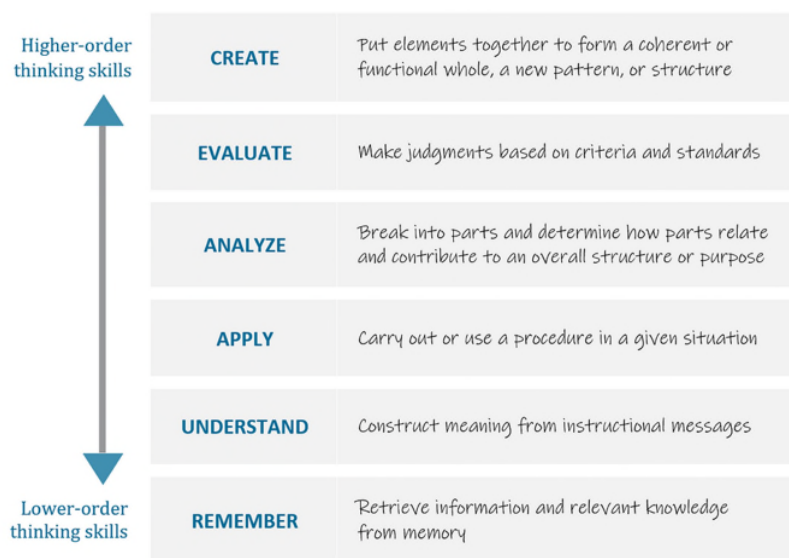


Figure 3: Revised Bloom's Taxonomy in the Cognitive domain

The knowledge dimension contains four categories on a continuum of concrete knowledge to abstract knowledge. The revised taxonomy includes a fourth category called metacognitive knowledge, which encompasses students'

awareness, control, and regulation of their own cognition. The inclusion of metacognition reflects research that shows how knowledge of one's own cognition and the ability to strategically control one's own cognition plays an important role in learning (Anderson & Krathwohl, 2001).

These four types of knowledge help determine what to teach and how to teach it, or instructional content and instructional methods and activities.

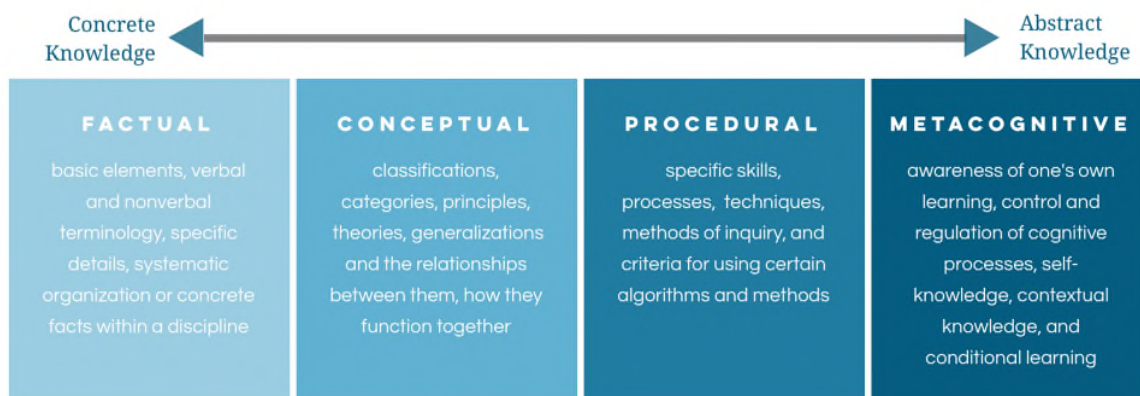


Figure 4: Cognitive Processes and Knowledge Level Matrix

5.1 Writing measurable Learning Outcomes

Using Bloom's revised framework, it'll be possible to form measurable learning outcomes. Course Learning Outcomes are specific and measurable statements that define the knowledge, skills, and attitude learners will demonstrate by the completion of a course.

Writing an effective learning outcome that is measurable involves the structuring of two parts, a verb and an object. The verb phrase describes the intended cognitive process and the noun describes the knowledge students are expected to acquire or construct (Anderson & Krathwohl, 2001).



Note that not all actions or processes are measurable. For example, "understand" is a category label for lower-level thinking skill of comprehension; however, the verb *understand* itself is difficult to observe and cannot be easily measured. Learners can demonstrate understanding by their ability to **define**, **describe** or **explain**. These kinds of observable action words have to be used in place of *understand*. It is often helpful to consider the evidence of learning will be assessed and how the levels of mastery will be measured in order the expected learning outcome to be determined.

5.2 Reinforce a common taxonomy of skills and competencies in credentials

Aside from encouraging awarding bodies to produce better credentials, policy and decision-makers should incentivise credential issuers to make skills in micro-credentials visible using a common taxonomy developed by actors across the credential supply and demand sides.

A promising technological approach is the use of Artificial Intelligence to extract skills data from natural text, and to use this to better understand a person's learning accomplishments. Such tools are being increasingly integrated into applicant tracking software as well as common CV builders and platforms. Another approach is for recognising authorities to create mappings between employment opportunities, desired skills and micro-credentials that teach those skills.

One example of this in action is the European Skills, Competences, Qualifications and Occupations (ESCO). ESCO represents a European classification of skills, competences, qualifications and occupations available in 28 languages (besides official EU languages, Icelandic, Norwegian, Arabic and Ukrainian). It encompasses 3008 occupations (including hierarchical relationships between them and mappings to International Standard Classification of Occupations – ISCO and 13,890 skills) as of January 2023.

Another example is the Rich Skill Descriptors developed by the Open Skills Network. Using this system, an employer can publish a job vacancy that lists not only the skills required, but also link it to a list of courses that impart those skills. This can be used to screen potential candidates by skills or by learning background, increasing the potential pathways to an interview.

Finally, employers as well as education and training organizations can develop application templates which encourage users to describe the skills they possess, rather than solely relying on descriptions of work experience and credentials earned. This allows a person to describe their learning outcomes to a recognising body, even where the body has no prior knowledge of the micro-credential.

6. E-learning platform Access Modality

The success of the Micro-credentials approach relies heavily on the availability of a secure, versatile, and efficient platform for storing, modifying, updating, and visualizing these educational resources.

Our approach to selecting the Learning Management System was guided by a series of comprehensive methodologies:

1. **Needs Analysis:** We initiated the process by conducting a thorough needs analysis. This phase focused on identifying the specific project requirements, encompassing content storage, ease of modification, updating capabilities, secure access, and the ability to visually present educational materials.
2. **Stakeholder Consultation:** We actively engaged with a diverse range of stakeholders, including educators, trainers, agricultural experts to ensure their input was integrated into our selection criteria.
3. **Comparative Evaluation:** A comparative evaluation was conducted, encompassing various LMS options available in the market. We assessed key factors such as feature sets, customization capabilities, user-friendliness, scalability, support and maintenance, and adherence to European data protection regulations.
4. **Previous Experience:** Several partners from the consortium brought valuable prior experience with Moodle, having successfully utilized it in the FIELDS project. This familiarity with Moodle's capabilities and its positive impact on learning outcomes was a significant consideration in our decision-making process.

Despite the stipulated requirements in the Erasmus+ Programme Guide, practical experience has revealed that

Erasmus+ Project outputs are often subject to registration barriers. The European Commission has acknowledged this practice, provided that certain essential information about the outputs is made publicly accessible, without any cost or registration requirements. In simpler terms, elements such as training structure, content descriptions, and video teasers should be freely available online, while access to the full training materials may necessitate registration.

For the I-RESTART project, a general overview of the training content will be accessible on the project website and the Moodle platform. Registration is vital for identifying trainees, tracking their knowledge growth (including pre-test and final test results), and grading their performance. Without this registration, it would be impossible to measure or achieve the training program's objectives. For trainer registration, administrative capabilities will be facilitated by UNITO, while trainer-led registration of learners (trainees) will be supported by UNITO, if required. This approach ensures compliance with the General Data Protection Regulations (GDPR) in managing personal data.

Practical experience has also revealed that some Erasmus+ outputs are commercialized after the project's conclusion. This is largely due to the fact that completely free outputs, even if they remain accessible post-project, tend to be neglected once the project consortium disbands. Such outputs often become outdated, feature broken links, and lack customer support for registered users, among other issues. In contrast, charging for outputs provides a stronger incentive to maintain their quality and availability.

Consequently, we recommend applying the [CC BY-NC 4.0](https://creativecommons.org/licenses/by-nc/4.0/) Creative Commons license (Attribution Non-Commercial 4.0 International) during the project's active period and for up to four years following its completion.

I-RESTART'S project approach encompasses an educational program offered in English, Italian, French, German, Portuguese, Danish, Dutch, and Spanish. Therefore, the selected training platform should provide a user-friendly multilingual capability to accommodate these languages seamlessly.

6.1 E-Learning Platform Segments and User-Friendly Navigation

To ensure a user-friendly experience, the e-learning platform must boast a straightforward structure and easily navigable menus. To achieve this, it is imperative that the platform provides icons that are intuitively understandable, making it evident to users what they represent and what to expect. Consequently, icons and file/video previews should be of a noticeable size.

With this in mind, the following content icons are essential components of the e-learning platform:

- Video Icon or Video Preview
- Documents Icon
- Documents with Notes (pertaining to PowerPoint presentations accompanied by notes within the training course)
- External Link Icon

Additionally, in order to accommodate the diverse content and varying user requirements for both trainers and trainees, the training platform must have the capability to support two distinct sections, each offering unique content and user options.

6.2 Available IT Platforms and Tools

To implement the training methodology effectively, a Learning Management System (LMS) is a fundamental requirement. A LMS is a software environment designed to create, deliver, and manage educational content, monitor trainee progress, collect performance statistics, facilitate social interaction, and issue certificates. In essence, it serves as a software application for the administration, documentation, tracking, reporting, and delivery of educational courses or training programs.

LMSs can be described as a collection of software platforms that instructors deliver to users over the internet using various hardware tools. Their primary purpose is to expedite the delivery of comprehensive knowledge within a specific domain, while simultaneously enabling the complete management of the entire educational cycle, including data and information (Berking & Gallagher, 2013).

According to a study conducted by Dobre (2015), Learning Management Systems (LMSs) can be categorized into the following main groups:

2. **Proprietary LMSs:** These systems are considered proprietary because their developers hold exclusive legal rights to the copyrights. Proprietary LMSs typically require well-established infrastructure (including physical facilities like buildings with labs, networks, and computers) and often involve the installation of the platforms on servers and computers within the Higher Education Institution. Among the well-known and widely used proprietary LMSs are Blackboard Learn, along with other notable options like Design2Learn, Canvas, and ANGEL.
3. **Open-Source LMSs:** Open-Source LMSs are learning management platforms that release their source code under a public, free license, granting users the rights to use, modify, study, create, and distribute the results freely, to anyone, for any purpose. At present, the most prominent and frequently used open-source LMS is Moodle. Other noteworthy open-source LMSs include Sakai, Open edX, and front.

In line with current trends, open-source LMSs appear to be gaining greater prominence. For instance, a study by Aljaloud, Uliyan, Alkhalil (2022) shows that Learning Management Systems (LMSs) are increasingly utilized for the administration, tracking, and reporting of educational activities.

6.3 Comparative Analysis of Available Tools

Learning Management Systems (LMSs) are meticulously designed systems that facilitate online education, serving as network-enabled transfer applications for web-based learning. LMSs are tailored for use by educational institutions and corporations aiming to provide training for large, decentralized teams. They offer a range of features, including the delivery of training and workshop courses, assessment metrics, and skill gap analytics.

As per the task description, the comparison will focus exclusively on platforms that are compatible with online access via smartphones, tablets, and personal computers.

After conducting an in-depth analysis of over 70 articles and user reviews sourced from industry-leading forums such as E-learning Industry, Capterra, Quora, Trust radius, Class Central, and others, we present a comparison of five prominent LMS vendors currently available in the market: Moodle, Sakai, Canvas, Open edX, and Blackboard.

Subsequently having considered the basic aspects, the comparison was made focusing following these advanced parameters:

- Popularity and use,

- assessments/Assignments/Grade Book availability,
- subscription and maintenance fees,
- calendar tool, discussion forum,
- multilingual capabilities,
- possibility of customization,
- ability to deliver content on mobile devices,
- synchronous and asynchronous conference tool,
- integration of applications of other companies, like MS office Package, communication tools
- data security and user privacy.

After evaluation based on the methodologies outlined above, **Moodle** was chosen as the preferred Learning Management System for I-RESTART. The following factors were instrumental in our decision:

1. **Proven Success:** Our past experience with Moodle in the FIELDS project demonstrated its effectiveness in facilitating collaborative learning and knowledge dissemination. This prior success provided strong reassurance.
2. **Open-Source Nature:** Moodle's open-source nature aligns with our commitment to cost-effectiveness and adaptability. It grants us the flexibility to customize the platform to meet the unique needs of our project.
3. **Granular Permissions:** Moodle allows administrators to define precise user roles and permissions, giving project owners control over who can modify or delete materials within the platform. This feature addresses past challenges, mitigating the risk of errors that led to the loss of valuable work hours.
4. **Data Tracking and Dissemination:** Moodle's analytics capabilities enable project owners to track how often educational materials are accessed. This feature is invaluable for data tracking and dissemination purposes, helping us measure the impact of our educational content and adapt our strategies accordingly.
5. **Scalability:** Moodle's architecture is inherently scalable, accommodating the anticipated growth of our project and potential future expansions.
6. **Data Privacy Compliance:** Moodle has a robust track record of compliance with European data protection regulations, ensuring the security and confidentiality of user data, a critical requirement for our European partners.
7. **User-Friendly Interface:** Moodle's intuitive and user-friendly interface makes it accessible to a diverse group of educators and learners, aligning with our commitment to inclusivity.

In conclusion, after a thorough and meticulous evaluation process, Moodle emerged as the ideal Learning Management System for the I-RESTART Project. The decision to select Moodle is grounded in its proven track record, adaptability, and robust feature set, all of which align seamlessly with the project's objectives.

7. Conclusion

Qualification systems are changing rapidly across Europe and beyond, with the aim of increasing their flexibility and allowing learners to accumulate learning taking place in different settings. The shift to learning outcomes, the introduction of qualifications frameworks, the emergence of arrangements for validating non- formal and informal learning, and the movement towards more demand-driven qualifications systems are all about creating more flexibility by opening to a wider range of individual learning outcomes and experiences. In this context, alternative credentials and microcredentials have come under the spotlight; their main feature is flexibility in delivery and pace that allows individuals to build their skills portfolio by adding different types of credentials.

Regarding investment costs, running costs and the personnel needed to run the platform the proprietary LMSs are not anymore a viable and cost effective solution. The open-source LMSs are a better solution from financial

point of view, involving less costs related to software licenses and maintenance/upgrades, requiring not a well-developed infrastructure and, most important, offering the liberty to develop own LMS, based on own goals, own requirements and adapted to own necessities. Moreover, only web standard platforms (meaning technologies that don't require any special software) will be used in order to ensure the sustainability of the project.

It is also considered that I-RESTART project will complement and build the work done in FIELDS, several main outputs of FIELDS will be used and not developed again in I-RESTART (Platform, some skills gap analysis in agriculture, VET maps has effectively utilized Moodle in past projects and has consequently acquired the necessary skills to properly manage the full setup of the platform and its maintenance).

The deliverable 4.1 will contribute to the following WPs and tasks:

1. The development of the training content for trainees (Task 4.4) will be based on the selected methodological approach defined in this deliverable.
2. WP5: The training methodologies that have been analyzed in this deliverable, will be implemented in WP5: Training program delivery and curricula implementation.
3. Task 5.2: Training pilots. For the training, the open source platform - Learning Management System (LMS) - selected in T4.1 will be used to host and monitor the training.
4. Task 5.5: The training material for trainers will be uploaded on the open access Learning management system defined in T4.1.

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