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SEnDIng

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TRAINING MONITORING AND ASSESSMENT METHODOLOGY

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PROJECT SUMMARY

SEnDIng project aims to address the skills' gap of Data Scientists and Internet of Things engineers that has been identified at the ICT and other sectors (e.g. banking and energy) at which Data Science and Internet of Things have broad applications. To achieve this goal, SEnDIng will develop and deliver to the two aforementioned ICT-related occupational profiles two learning outcome-oriented modular VET programmes using innovative teaching and training delivery methodologies.

Each VET program will be provided to employed ICT professionals into three phases that include: (a) 100 hours of online asynchronous training, (b) 20 hours of face-to-face training[1] and (c) 320 hours of work-based learning. A certification mechanism will be designed and used for the certification of the skills provided to the trainees of the two vocational programs, while recommendations will be outlined for validation, certification & accreditation of provided VET programs.

Furthermore, SEnDIng will define a reference model for the vocational skills, e-competences and qualifications of the targeted occupational profiles that will be compliant with the European eCompetence Framework (eCF) and the ESCO IT occupations, ensuring transparency, comparability and transferability between European countries.

Various dissemination activities will be performed – including the organization of one workshop at Greece, Bulgaria and Cyprus and one additional conference at Greece at the last month of the project – in order to effectively disseminate project's activities and outcomes to the target groups and all stakeholders. Finally, a set of exploitation tools will be developed, giving guides to stakeholders and especially companies and VET providers, on how they can exploit the project's results.

[1] Initially the training on transversal skills was to be provided face to face. However, due to the COVID19 pandemic and the restrictions it brought, the 20h training on Soft skills had to be delivered online.

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1 Introduction

1.1 Scope

The purpose of this deliverable is to describe the monitoring and assessment methodology of SEnDIng training. Through the monitoring and assessment processes all stakeholders involved in SEnDIng training will know if the objectives of the training have been fulfilled and the intended learning outcomes have been achieved.

The objective of this document is to provide the guidelines and suggestions regarding training monitoring and assessment methodologies and tools suitable for the three phases of SEnDIng VET programs: a) on-line training, b) face to face training and c) work-based learning. The effective monitoring of the training process is crucial in order to provide effective support to learners and measure the real impact of training to them. The assessment mechanism is aligned with the intended learning outcomes. Learning outcomes tell us what learners are expected to have learnt and the assessment plan shows how they will demonstrate their learning [1].

1.2 Audience of the document

The audience of the Training Monitoring and Assessment Methodology is a) the SEnDIng project partners who shall undertake the implementation and consequently the monitoring and assessment of the project's training, b) the enterprises that employ ICT professionals which will participate in the WBL part of the provided VET programmes and thus will be responsible for the monitoring and assessment of WBL, c) other enterprises that employ ICT professionals, potential users of the SENDING training, d) other HEIs and VET providers that could provide the full SEnDIng training scheme or implement parts of the training courses, e) trainers who could use the theoretical background and practical suggestions on how to assess the SEnDIng courses in Data Science and Internet of Things technologies.

The document serves as a source of the training monitoring and assessment methodology to be undertaken by the project participants in the piloting of SEnDIng training.

1.3 Limitations

The approved project proposal had foreseen that the 20h training on transversal skills was to be provided via face to face training. However, the COVID19 pandemic brought limitations with regard the implementation of training due to the strict safety measures and social distancing that had to be taken in a worldwide scale.

For ethical and educational reasons, this guide entails details of both how the project had initially been planned and how it has been implemented, since its main goal is to constitute a product that will contribute significantly in the professional development of professionals in ICT sector, and other sectors as well. From this perspective, the elements that concern face to face training (methods, techniques, assessment and tools) are also included so as to be available for future use.

2 Monitoring and assessment of training

2.1 Monitoring of training

2.1.1 Defining Monitoring

Monitoring is as systematic reviewing on a continuous basis on the degree to which the training is completed and performance targets are being met. Monitoring focuses on tracking training inputs (participation, performance of trainees, etc), as such, is part of the operational management of the training program. Monitoring also tracks outputs, for example the percentage of trained people, the quality of learning, etc. Systematic monitoring of inputs and outputs helps the identification of potential problems and corrective actions to be taken during the implementation of the training [2].

Monitoring collaborates with assessment and uses data from formative assessment to effectively monitor the learning progress and provides the trainer or the training provider with data on the degree to which trainees have mastered the learning targets, who needs further support, who needs additional challenges, what the next learning target should be etc [3].

2.1.2 The scope of monitoring

Systematic and ongoing monitoring is essential for ensuring that training is on track, for improving performance and for achieving long term goals and results [2]. Monitoring of training intends to:

- Determine whether training activities are being carried out as planned
- Measure the achievement of learning objectives
- Identify implementation problems to initiate corrective action
- Identify and reinforce good performance
- Identify and strengthen weak performance
- Help the target of supervision towards problem areas
- Assess whether training activities have the expected effect
- Contribute to the reviewing and revising the priorities and plans of initial planning of the training

2.1.3 The principles and values of monitoring

There are many principles that should guide the development of a training monitoring process such as [4,5]:

- **Continuousness**: making progress in learning requires continuous feedback and timely use of information to adapt new strategies of training.
- **Active participation**: effective monitoring requires building high quality feedback loops to systematically collect data, act upon and share it with all involved in training. All those who are impacted should be engaged in the implementation and reflection upon monitoring.
- **Use of variety of information**: variety of information sources is also essential, including hearing from people participating in the training and those that support the implementation and assessment processes.
- **Cultivate inquiry**: building a culture of inquiry is essential to surfacing insight into successes, failures and emerging possibilities. Seeking the creation of a culture where training staff and people involved in training share diverse perspectives and challenge each others' thinking to advance the shared goals is very important.
- **Share monitoring outcomes to increase impact**: sharing of what has been learnt through monitoring creates insights to training partners to make the necessary changes. Total transparency, confidentiality and trust are also important.
- **Appropriateness of monitoring tools:** the monitoring tools must be user friendly for both the trainee and the trainer.

2.1.4 The types of monitoring

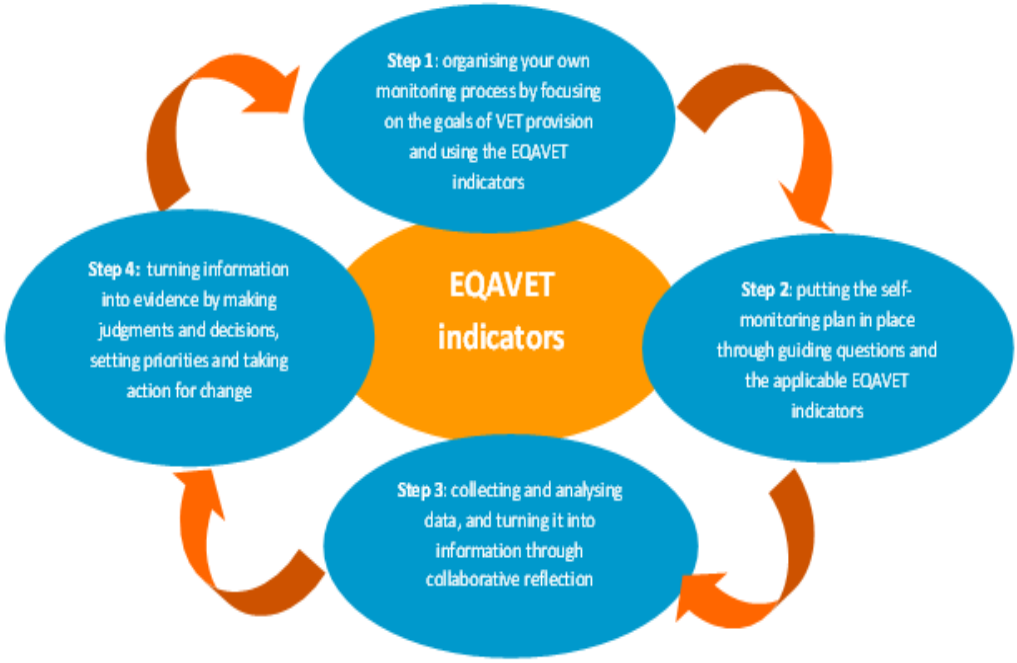
Monitoring of training is based on the use of tools that help trainers and training providers' staff to measure better the performance of training. Two main approaches are proposed in the literature: the objective and subjective approach [5].

- The **objective approach** [5] is based essentially on observation and collection of objective measurements such as training achieved, percentage of training that has been completed, statistics etc. This approach demands the access to training, the collection and analysis of data.
- The **subjective approach** [5] aims to describe qualitative perspectives from trainees on their training effort and effects using various instruments such as questionnaires, rating scales etc. This approach has been characterized as a more user-friendly approach for data entry and data analysis, since they do not interfere with the course of training sessions and they do not require more experts.

The benefits from monitoring depend on the commitment of the trainers to encourage the trainees to provide information, to analyze the information received and to ensure the following up during the training.

2.1.5 The EQAVET and its implications in SENDING monitoring

The European Quality Assurance in Vocational Education and Training (EQAVET) develops and improves the quality assurance in European VET within the context of the implementation of the European Quality Assurance Reference Framework which is designed to promote the vocational education and training by providing common tools for the management of quality [6]. The recommendations of the European Parliament and Council of 2009 [7] on the establishment of a European Quality Assurance Reference Framework for VET, recommends that a four-stage quality cycle and indicative descriptors and indicators should be used to improve the VET provision [8]. The EQAVET quality cycle can be used to monitor the implementation of VET and is illustrated in the following figure.



Source: https://www.eqavet.eu/EU-Quality-Assurance/For-VET-Providers/Monitoring-your-System

Six building blocks have also been proposed when developing a quality assurance system:

1. Ensure there is a management culture which is committed to quality assurance	Central to implementation is a providers' culture which supports and values quality assurance.
2. Develop approaches which reflect the provider's circumstances	The EQAVET Recommendation covers all aspects of VET provision. VET can be supported by building on existing quality assurance arrangements.
3. Develop a culture of self-assessment	A culture which encourages reflection and self-assessment will lead to improved quality of provision.
4.Support staff training in relation to quality assurance	VET is dependent on the knowledge, skills and competences of staff. VET can be enhanced if staff has an increased awareness of quality assurance.
5. Use data and feedback to improve VET	VET has to both meet employers' and learners' needs. Key to any quality assurance system is the way data on performance is systematically collected and used by VET providers to modify and improve provision.
6. Ensure VET is based on the involvement of external and internal stakeholders	VET is based on effective partnerships. These exist between government, social partners and national stakeholders; employers and VET providers; and learners and society. They create the foundation stone of the VET system which gives it strength, relevance and acceptability.

Source: https://www.eqavet.eu/EU-Quality-Assurance/For-VET-Providers/Building-blocks

The quality assurance cycle is supported by common quality criteria, indicative descriptors and a set of indicators. The following indicative descriptors support VET providers when implementing the quality assurance framework [7].

Quality criteria	**Indicative descriptors at VET provider level**
Planning reflects a strategic vision shared by the relevant stakeholders and includes explicit goals/objectives, actions and indicators	– European, national and regional VET policy goals/objectives are reflected in the local targets set by the VET providers – Explicit goals/objectives and targets are set and monitored Ongoing consultation with relevant stakeholders takes place to identify specific local/ individual needs

	– Responsibilities in quality management and development have been explicitly allocated – There is an early involvement of staff in planning, including with regard to quality development – Providers plan cooperative initiatives with other VET providers – The relevant stakeholders participate in the process of analysing local needs – VET providers have an explicit and transparent quality assurance system in place
Implementation plans are devised in consultation with stakeholders and include explicit principles	– Resources are appropriately internally aligned/ assigned with a view to achieving the targets set in the implementation plans – Relevant and inclusive partnerships are explicitly supported to implement the actions planned – The strategic plan for staff competence development specifies the need for training for teachers and trainers – Staff undertake regular training and develop cooperation with relevant external stakeholders to support capacity building and quality improvement, and to enhance performance
Evaluation of outcomes and processes is regularly carried out and supported by measurement	– Self-assessment/self-evaluation is periodically carried out under national and regional regulations/frameworks or at the initiative of VET providers – Evaluation and review covers processes and results/outcomes of education including the assessment of learner satisfaction as well as staff performance and satisfaction – Evaluation and review includes adequate and effective mechanisms to involve internal and external stakeholders – Early warning systems are implemented
Review	– Learners' feedback is gathered on their individual learning experience and on the learning and teaching environment. Together with teachers' feedback this is used to inform further actions – Information on the outcomes of the review is widely and

	publicly available – Procedures of feedback and review are part of a strategic learning process in the organisation – Results/outcomes of the evaluation process are discussed with relevant stakeholders and appropriate action plans are put in place

The recommendations of the European Parliament [7] set out 10 indicators which can be used to support the quality assurance of VET and monitoring. They can be selected by VET providers to meet the circumstances and requirements of the use. The indicators per phase of the cycle are:

Indicators Description
Indicator no 1: Relevance of quality assurance systems for VET providers: (a) share of VET providers applying internal quality assurance systems defined by law/at own initiative; (b) share of accredited VET providers.
Indicator no 2: Investment in training of teachers and trainers: (a) share of teachers and trainers participating in further training; (b) amount of funds invested.
Indicator no 3: Participation rate in VET programmes: Number of participants in VET programmes (1), according to the type of programme and the individual criteria (2) (1) For VET: a period of 6 weeks of training is needed before a learner is counted as a participant. For lifelong learning: percentage of population admitted to formal VET programmes. (2) Besides basic information on gender and age, other social criteria might be applied, e.g. early school leavers, highest educational achievement, migrants, persons with disabilities, length of unemployment.
Indicator no 4: Completion rate in VET programmes: Number of persons having successfully completed/abandoned VET programmes, according to the type of programme and the individual criteria
Indicator no 5: Placement rate in VET programmes: (a) destination of VET learners at a designated point in time after completion of training, according to the type of programme and the individual criteria (3); (b) share of employed learners at a designated point in time after completion of training, according to the type of programme and the individual criteria;

(3) for IVT: including information on the destination of learners who have dropped out.
Indicator no 6: Utilization of acquired skills at the workplace: (a) information on occupation obtained by individuals after completion of training, according to type of training and individual criteria; (b) satisfaction rate of individuals and employers with acquired skills/competences.
Indicator no 7: Unemployment rate according to individual criteria
Indicator no 8: Prevalence of vulnerable groups: (a) percentage of participants in VET classified as disadvantaged groups (in a defined region or catchment area) according to age and gender; (b) success rate of disadvantaged groups according to age and gender.
Indicator no 9: Mechanisms to identify training needs in the labour market: (a) information on mechanisms set up to identify changing demands at different levels; (b) evidence of their effectiveness.
Indicator no 10: Schemes used to promote better access to VET: (a) information on existing schemes at different levels; (b) evidence of their effectiveness

The EQAVET working group [9] has also identified a set of further building blocks which could support work based learning. These building blocks provide a set of simple actions that could support the quality of work based learning and could help VET providers to develop and implement quality assurance approaches for WBL that are in line with EQAVET framework. The WBL building blocks are presented in the following table.

Building blocks	Building blocks meaning	Call to Action
Design WBL	Work with partner organisations to ensure the relevance of learners' training during periods of work based learning	○ Which organizations to work with in order to provide high quality training? ○ Which courses/qualifications should learners follow?
Improve the quality	Agree with partner organisations when the quality of training will be monitored and how improvements will be made	○ How organization(s) should take responsibility for monitoring quality? ○ When and how improvements will be made?
Respond to learners' needs	Continue to be aware of the specific needs of learners throughout their work based	○ How to respond to learners' on-going or emerging training needs? ○ How to fix any problem experienced

	learning	by a learner?
Communicate	Ensure learners and partner organisations are kept well informed and receive frequent updates on all aspects of training	○ Which are the ways in which organizations involved in the training will communicate? ○ How each partner involved in the training keeps in touch with each other and the learners?
Train the staff	Ensure staff are well prepared for their training role which includes quality assurance	○ How all staff will be made aware of how quality is assured? ○ Which staff will need training in relation to quality assurance?
Assess the learners	Work with partner organisations to review the work based training programme, assess and certify individual learner's achievement, where appropriate	○ What type of assessment will be completed by the learner? ○ Who will assess each learner – and has the learner been informed? ○ What a learner has to demonstrate to "pass" or complete the training?

2.1.6 The overall structure of SENDING monitoring

In SEnDIng monitoring methodology a combination of the objective and subjective approach will be followed. Data from the implementation of training will be collected and analyzed. Qualitative data will be also collected using relevant questionnaires.

SEnDIng monitoring will be ongoing and will also use the findings from formative assessment and self-evaluation as described in the following section of the present report.

Furthermore the indicators 4 "Completion rate in VET programmes" and 6 "Utilization of acquired skills at the workplace" from EQAVET are going to be incorporated into the development of the monitoring process. The proposed building blocks for developing quality assurance systems in VET and the alignment of WBL quality assurance to EQAVET are also going to be exploited for the development of SEnDIng monitoring methodology of training. SEnDIng monitoring approach will target on the following aspects of training:

- The active participation of trainees in face to face training
- The active participation of trainees in e-learning
- The active participation of trainees in WBL
- The performance of trainees in face to face training

- The performance of trainees in e-learning
- The performance of trainees in WBL
- The achievement of learning outcomes on behalf of trainees
- The satisfaction of learners from the each phase of training
- The individual learning experience of trainees

Furthermore a set of indicators will also be developed and monitored such as:

- The rate of successful completion of the training
- The attendance rate in training
- The rate of trainees that abandon training

2.2 Assessment

2.2.1 Defining assessment

When discussing about assessment it is customary to consider a number of different concepts such as assessment, evaluation, test and so on. Each of these terms has different meaning and emphasises different aspects. Assessment and evaluation are not the same.

Assessment is the process of objectively understanding the state or condition of a thing by observation and measurement. In the case of training, assessment means taking a measure of its effectiveness [10], focusing on learning, teaching and outcomes and providing information for improving learning and teaching. In other words assessment is the use of a range of methods to determine the attainment of trainees. Evaluation is something wider, is about the determination of how a particular course or programme has performed. An effective evaluation of training must evaluate more levels (i.e. reaction, learning, behaviour, results) in order the training provider to understand the full effects of the training programme [27].

According to Harlen [11] assessment in the context of education involves deciding, collecting, and making judgments about evidence relevant to the goals of learning. In other words assessment is the systematic process of documenting and using empirical data on the level of knowledge, skills, attitudes, and competences, achieved by learners. Assessment may be part of an evaluating process of a course or a training project or institution, since evaluation focuses on other components of training than course content or mastery level of outcomes.

2.2.2 Assessment in constructivist approaches

In the constructivist approach, learning is an open-ended process through which outcomes are constructed in the learners' minds according to their individuality [12]. Constructivism supports the active engagement of learners, and considers learning as determined by what goes on in peoples' minds. The focus is on how people construct meaning, while their prior knowledge is a significant determinant of their capacity to learn new things. Achievement is attained when the learner improves understanding of conceptual structures and competences in processing strategies [13].

Learners' assessment in constructivism should be more subjective and focus on the process [12]. Since prior learning influences the new learning, formative assessment is a crucial element from pedagogical point of view. In constructivism, teaching and assessment are blended in order the goals of training to be achieved. Assessment should be more performance-based and include portfolios or projects rather than use traditional methods [12]. Furthermore assessment seeks to close the gap between current and new understandings and metacognition is also considered as an important dimension of learning [14]. So learner assessment should also focus on self-evaluation of the learner [12].

2.2.3 The scope of assessment

The scope of assessment in constructivism is to gain deeper understanding of individual learners in their specific learning context and is seen as a social, contextually specific and interpretive activity [13]. Assessment is not seen as an "objective" measurement process; rather, it is a human interaction involving the human as the primary assessment instrument. The focus is on why we do what we do in terms of assessment. Assessment tools are the vehicles for promoting self-reflection, self-evaluation and goal setting. Through assessment an improved understanding of the needs, values, interests and abilities of learners is accomplished, thus assessment is part of the learning process and not separate from it.

2.2.4 The principles and values of assessment

There are many principles and values that should guide the development and implementation of training assessment. The most important from them are presented below.

Assessment should be valid: Validity refers to the accuracy of assessment. An assessment can be considered as valid when it is appropriate for its purpose, it assesses what is wanted to be measured. It allows the interpretation and inferences which can be

drawn from the assessment outcomes to be meaningful and justifiable [15]. There are three kinds of validity [15]. Content validity refers to the extent to which the content of assessment is representative of the domain that the assessment seeks to measure. Face validity refers to the extent that the assessment tool makes sense as a reasonable way to assess what it is intended to assess. Construct validity concerns the extent to which an assessment actually measures what is indented to measure. All types of validity are achieved choosing the appropriate assessment methods and tools.

Assessment should be authentic: Authenticity refers to ensuring that the assessed achievements belong to the learner. Achievement of desired learning outcomes is to be measured as close as possible to the intentions behind the outcomes [16].

Assessment should be reliable: Reliability refers to the extent to which the results can be said to be of acceptable consistency and precision. It refers to the extent to which the assessment if repeated would give the same results [15].

Assessment should be sufficient: Sufficiency relates to the requirement that enough evidence should be provided as specified in evidence requirements and assessment methodology [13].

Assessment should be fair and equitable: This means that all learners have equivalence of opportunity to succeed even their experiences are not identical. This is particularly important in work based learning [16]. Assessment practices should never discriminate between learners. Assessment tools should not put anyone in an unfair situation [13].

Assessment should be transparent: Transparency refers to the fact that assessment needs to be in line with the desired learning outcomes and the scope of learning. Learners should have a clear understanding of assessment criteria [16].

Assessment should motivate learners to learn: Assessment should support the structure of learning and motivate the learners to make choices about their learning through self-assessment and monitoring activities [13].

Assessment should promote deep learning: Learners should not be driven to surface learning because of the ways their learning is going to be assessed [16].

Assessment should be timely and incremental: An assessment that occurs at the end of learning is not much used in providing feedback; earlier opportunities should be provided for rehearsal and feedback [16]. Feedback to learners should be continuous.

Assessment should be efficient and manageable: The burden of resources should not be excessive, nor should be the demands on learners when undertaking assessment tasks [16].

2.2.5 The types of assessment

There are different types of assessment that serve different purposes as described below.

Summative assessment: It is a more formal type of assessment and often happens at the end of a course. Summative assessment allows learners, trainers and training providers to establish whether the desired learning outcomes have been achieved through the training course and to what extent. It provides the final profile of the learner [17]. According to Sadler [16] summative assessment is geared towards reporting at the end of the training for purposes of certification. It is essentially passive and does not have immediate impact on learning.

Formative assessment has a monitoring function, enabling trainers and trainees to track progress, estimate the effectiveness of the training methods and make adaptations where necessary [17]. In other words formative assessment serves three key purposes a) where learners are in their learning, b) where they need to go, and c) how to get there [13]. Formative assessment involves a continuing cycle of activities which includes the following key elements: a) the provision of clear goals which are shared with the learners, b) learners are in the centre of the process. c) learners take part in gathering and interpreting evidence regarding the accomplishment of goals, d) trainers (if available) and learners make decisions together related to the next steps, e) feedback is provided to learners which is used to adjust training. Formative assessment is therefore the process that leads to the enhancement of learning during learning and feed forward rather than provide feedback after learning [16].

Diagnostic assessment: is used to evaluate the learners' status related to knowledge, skills attitudes and competences, possible learning challenges when training starts. This helps the identification of specific learning needs of the learners and adaptation of training [17].

Self-assessment: Adult learners are more self-directed and need to be responsible for their learning. Self-assessment is essential to learning because learners can achieve a learning goal if they understand it and can assess what they can do to reach it. The desired learning outcomes and what is required to complete the tasks successfully need to be made clear in the case of self-assessment [13]. Self-assessment is beneficial for several reasons [18]: a) promotes learning, providing judgment which benefit the

learning process, b) gives a raised level of awareness of perceived levels of abilities, c) motivates goal orientation, d) the range of assessment techniques is expanded, e) learners participate in their own evaluation and f) leads to beneficial post course effects. Since ownership of learning is transferred to the learners via self-assessment, the engagement of learners is improved. Self-assessment consolidates learning, opens up new levels of understanding and drives away misconceptions [19].

2.2.6 Finding the right assessment methods

To select the right assessment methods many factors should be taken into account, such as the learning activities that learners are engaged in, the learning outcomes and other factors to be assessed [13]. The deferent types of cognitive demand are also important when designing an assessment. Depending on the ability that assessment seeks to measure, the levels of cognition (i.e. knowledge, manipulation, application, analysis, synthesis, evaluation based on Bloom's taxonomy of educational objectives) and the right method of assessment should be found [20].

There are many decisions that should be taken when developing an assessment strategy; some useful guiding questions in designing assessments are listed below [20, 13]:

- Who will collect the data?
- How will the data be collected and interpreted?
- How will the data be recorded and communicated?
- Is the method of assessment chosen consonant with the learning outcomes?
- Is the method relatively efficient to the learners and staff time?
- What alternatives are there, what are their advantages and disadvantages?
- Do the assessment tasks match the outcomes?
- Are the adopted schemes and criteria appropriate?

2.2.7 The overall structure of SENDING training assessment

In SEnDIng assessment methodology we follow the argument that "the emphasis should shift from summative to continual, diagnostic and formative assessment throughout the learning process" [17] which is in line with the constructivist approach which is also employed in SEnDIng. Constructivism is in favor of evaluation for learning (formative and self-assessment) rather than evaluation of learning (summative assessment). Such shift takes into account the application of learning instead of standardizing learners and allows the individual differences to surface [17].

SEnDIng assessment methodology also takes into consideration the argument [21] that assessment should reflect the practice of the profession or practice being assessed, while

at the same time giving learners the opportunity to demonstrate their knowledge and skills and connect them to their own previous experience. This argument is also considered an essential aspect of adult learning.

At the same time, we take into consideration the fact that constructivist assessment techniques have been surrounded by controversy [17]. Most trainers acknowledge the significance of using formative assessment and self-assessment but at the same time they are advocating the validity and reliability of standardized testing which are supported by summative assessment. They argue that through assessment the performance of learners, i.e. their knowledge, know-how, skills and competences need to be measured using predefined criteria, namely the learning outcomes [17].

Thus, the assessment methodology suggested for SEnDIng training courses is drawn upon a combination of constructivism assessment principles as well as more traditional ones. In SEnDIng assessment methodology, formative and summative assessment as well as self-assessment are followed.

A combination of formative assessment and self-assessment is applicable throughout the learning procedure and to all phases of training (face to face, e-learning and work based learning) and has a cumulative use. It is guided by the principles of the constructivism approach. The methods and tools used are described in the following sections.

Summative assessment will be carried out in two ways. First, the results of ongoing (formative) assessment are collected in the personal files of each learner, so that the individual learner profile is constructed (this is not applicable for e-learning phase of training). Second, after the completion of each of the training phases (face to face, e-learning and work based learning) of the courses the learners will be asked to demonstrate how they will be able to combine and integrate multiple aspects of training in complex situations. The methods and tools used are described in the respective section.

The combination of cumulative assessment and final tasks compiles the final assessment of each learner. The details of the monitoring and assessment methodology applied to each phase of training are presented in the following sections.

3 Monitoring and Assessment methodology for face to face training

3.1 Description

Given the general objectives and structure of SEnDIng assessment presented above, during face-to-face training formative and summative assessment as well as self-assessment will be implemented. Self-assessment is a particularly useful method for adults when assessing transversal competences. The tools to be used for assessment are in line with the teaching methodologies presented in D2.4. Monitoring will be ongoing and it will be implemented throughout the duration of face-to-face training using specific tools and exploiting data provided by assessment. The assessment tools that are described in detail in the following paragraph are recommended for each type of assessment (formative, summative, self-assessment). Formative and self-assessment takes place throughout the phase of face-to-face training, while summative assessment takes place at the end of face-to-face training.

3.2 Assessment types, structure and tools

The assessment structure and tools proposed for SEnDIng face to face training are presented in the following table. **The training providers and trainers can select the appropriate tools** according to the characteristics of the trainees and the purposes of assessment.

Tools	Assessment Type			
	Diagnostic	Formative	Self-assessment	Summative
Case study		x	x	x
Group/team work		x		
Portfolio		x	x	x
Presentation		x		x
Peer evaluation		x		
Role playing		x		x
Mid Test				x
Final test				x
Checklist	x		x	
Rating scale			x	

The assessment tools have been selected on the basis of their compatibility with the principles of constructivism and adult learning and are presented briefly as follows.

Case study: Case studies are popular tools used for both formative and summative assessment as well as self-assessment. They depict real life situations in which problems need to be solved. Trainees are introduced to a real or fictional case study, either as individuals or in groups, and they are asked to identify a set of problems, and subsequently apply their knowledge of the subject to the case [17]. Case studies are a powerful learning tool for developing cognitive skills of students; when conducted in groups they can enhance oral communication and team building [22].

Group/team work: allows for the employment of different skills, knowledge and experiences that individuals have. It can be approached both as a skill to be learned and as a means of carrying forward curriculum concerns and of enriching classroom experience [23].

Portfolio: Portfolios are a collection of student work that allows assessment by providing evidence of effort and accomplishments in relation to specific instructional goals [17]. They can be used both as a record of students' development in a number of areas, as well as a means of summative assessment. Portfolios can contain evidence reflecting a wide range of skills and attitudes and can reflect development [16].

Presentation: It is often used to assess students' learning in individual or group projects. It is the process of showing and explaining a topic to an audience. Presentation assessment usually consists of a topic for the student to research, discuss and present. Questions and answers are usually following the presentation.

Peer evaluation: It helps to create a learning community within a classroom. Students are exposed to the thinking of their peers and their alternative feedback as peers' observation may differ from each other. With peer evaluation, students see each other as resources for understanding and checking for quality work against previously established criteria [24].

Role playing: it is considered as a form of experiential learning. Students learn through their exploration as they are provided with opportunities for learning situated in a real-life context through simulating the activities of their profession. Role playing significantly contributes to learning and assessment as it provides opportunities to reflect on learning, to show how tacit knowledge works etc. At a culminating academic moment (such as the end of a module) a role play can take the form of an exhibition or demonstration and can serve as a summative assessment tool.

Tests: depending on the knowledge, skills and competences that need to be assessed, mid-term tests are types of summative assessment [17]. They can be oral or written. In the case of oral exams the presentations skills become an essential aspect of what is evaluated. Written tests can be composed by multiple choice questions, cloze questions, short answers, matching questions, and structured questions [13].

Final test: it can be oral or written, depending on the knowledge, skills and competences that need to be assessed, and is a type of summative assessment. In the case of oral exams the presentations skills become an essential aspect of what is evaluated. Oral exams can take the form of an one-to-one interview as a means to explore what students have learned by using a more personalized oral interaction. An important element here is that the trainer can influence how the interview proceeds in order to test certain skills [17]. Written final tests can be composed by multiple choice questions, cloze questions, short answers, matching questions, and structured questions [13].

3.3 Monitoring structure and tools

Monitoring of face-to-face learning will be based on objective and subjective approaches. Monitoring will be done through observations, checklists, analysis of attendance and complementary data and answering in questionnaires.

Through observation, learners will be monitored on how they participate in face-to-face learning activities, if they need more clarifications and on their performance. Trainers' guidance and encouragement can also be used as feedback for students' learning [25]. Attendance in face-to-face training is considered as an important element of the students' learning process. Complementary data that may refer to attendance sheets, comments etc. can be used for the measurement of indicators and the monitoring of several aspects of training.

Furthermore, checklists are going to be employed to monitor learning implementation and trainees' performance serving the identification of areas that need more work and reflection. The outcomes of formative evaluation will also be used for monitoring purposes. Questionnaires are going to be used in order to measure the perspectives of trainees regarding their participation, performance and satisfaction.

4 Monitoring and Assessment methodology for e-learning

4.1 Description

Formative, summative and self-assessment will be used during the e-learning phase of SEnDIng training. After the completion of each educational module, a combination of formative/self-assessment will be applied aiming to assess trainees' progress and enable trainers to estimate the effectiveness of the e-learning phase. When the trainees will complete all the modules of the VET curriculum, a combination of summative/self-assessment will be applied aiming to assess whether the desired learning outcomes of the online educational modules have been achieved and to what extent.
Monitoring will be active during the whole phase of the online training enabling trainees to monitor their progress. The assessment and monitoring tools that will be used during the e-learning phase are presented below.

4.2 Assessment types structure and tools

As e-learning will be self-regulated, the assessment tools that will be used are mid quizzes during the phase of combined formative/self-assessment (end of each educational module) and final quizzes during the phase of combined summative/self-assessment (end of all educational modules). The quizzes will be completed online at each phase of assessment and will be composed by multiple choice questions and matching questions providing direct feedback to trainees about the results of the assessment.

Tools	Assessment Type	
	Combined formative/self-assessment	Combined summative/self-assessment
Mid quiz	X	X
Final quiz	X	X

4.3 Monitoring structure and tools

As in the case of face to face training, the monitoring of e-learning will be based both on objectives and subjective approaches.

Integrated tools of the online courses platform will be utilized for e-learning objective-based monitoring. Such common tools that well-known online courses platforms provide are learner progress dashboards, grading charts, activity completion, course completion,

course reports, etc. The data collected by such tools will be utilized for the observation and collection of objective measurements, like the e-learning attendance, completion rate of online modules, etc.

Furthermore, electronic questionnaires will be used at the end of the educational modules aiming to measure the perspectives of trainees regarding their participation in the online courses, performance and satisfaction. The data collected by these questionnaires, will be used for subjective-based monitoring. Furthermore, the outcomes of combined formative/self-assessment and summative/self-assessment will be used for monitoring purposes.

5 Monitoring and assessment methodology for work based learning

5.1 Description

Assessment and monitoring in WBL is an important part of the learning process, serves several functions [26] and includes the diagnosis of success or failure, the provision of valid and meaningful outcomes of what has been achieved and the maintaining of the learners progress in order to assist them in planning their own learning [26].

The assessment process focuses on both the implementation of work based learning activities and the achievement of the desired learning outcomes. Given that learning takes place in different learning environment and different forms, the assessment in WBL often involves several approaches [26]. It has been argued that reliability of assessment in WBL context is difficult to achieve, since placements are highly individual and learners' opportunities vary [16]. Some learners might have better opportunities than others to demonstrate their potentials.

Assessment in SEnDIng WBL will be formative and summative, based on data collected from multiple sources such as the trainees themselves, the staff of enterprises, trainers, supervisors. Monitoring will be ongoing, while self-assessment and self-monitoring will be also employed.

The proposed assessment methodology refers to the following aspects:

- The extent to which the learning outcomes in terms of skills and competences have been achieved.
- The application of the knowledge acquired in the previous phases of training (online and face to face).

- Further aspects of job performance related to transversal competences and active participation in WBL

In order to balance reliability issues, the following suggestions [16] will be taken into consideration and relative actions will be implemented in WBL assessment and monitoring:

- Involvement of employers, supervisors and other colleagues.
- Clarification of the purposes of assessment to all people involved.
- Careful consideration of the in-company people that will be asked to assess the trainees.
- Ask trainees to produce a personal kind of document that might include hopes, fears, feelings, actions, achievements.
- Using a portfolio to demonstrate work achievements as well as anonymous testimonials from clients and other staff.

The supervisors and in-company trainers assigned by the companies involved in WBL will be the main responsible for collecting the necessary information.

5.2 Assessment structure and tools

The methods for the assessment of the WBL part of the training are the following [17]:

Discussion allows the cooperation between the trainee and the evaluator. Discussions will be done using open-end questions that will allow the identification of the trainee's opinions and attitudes concerning the implementation of practical training and execution of tasks during WBL. In addition, task, incident and skills analysis regularly performed during supervision sessions will provide further data that is indicative of the trainee's development. During such analysis trainees will be asked to describe real incidents, what and how services/products were provided, what problems emerged, and the solutions found.

Task performance assessment: By this procedure changes in the trainee's performance are measured as a result of the implementation of on-the-job training. Learning outcomes in terms of skills and competences are assessed in a more direct way. Efficiency assessment can take place in a variety of ways, including performance checklists, , and action plans. In the action plans trainees are asked to describe how they applied or how they intend to apply what they have learned so far, allowing the in-firm trainer to assess problem-solving skills, critical thinking, autonomy, flexibility etc. It should be noted that to a great extent task performance assessment takes place through observation; however the timing and tools used differ somehow.

Assessment from third persons. For assessment to be complete the opinion of other persons working directly with the trainees should be taken into account. Staff from the companies as well as the supervisors will be consulted to offer their perspective on the trainee's performance and progress. Through specific questionnaires they will be asked to provide information on specific aspects of attitude, performance and behavior they can directly observe and evaluate.

Self-assessment. Trainees will be asked to assess their own progress, as well as perceived strengths, weaknesses and challenges. Self-perceived competence and efficiency, as well as the detection of persisting difficulties will help the in-company trainers design more effectively WBL activities. The questionnaires to be used should be in line with the task complexity and the specific objectives of the training.

The tools to be used are questionnaires, task performance checklists, portfolios, incident analysis, and action plans. They can be used as shown in the following table.

Method	Tools	Reporting
Discussion	Incidents analysis	At the end of WBL
Task performance assessment	Task performance checklists Action plans Portfolios	At the end of WBL
Assessment from third persons	Questionnaires	At the end of WBL
Self-assessment	Questionnaires	At the end of WBL

5.3 Monitoring structure and tools

Monitoring of WBL will be based on objective and subjective approaches and will be ongoing.

Through observation learners will be monitored on their participation in WBL activities and on their performance. Observation will be carried out by both the learners (self-observation) and by others (hetero-observation). In the latter case observation will be conducted by in-company trainers during the supervision sessions. Recording may take place in real time or retrospectively. In the case of self-observation trainees will record

behaviors, actions, tasks, problem-solving steps etc. using diaries completed at a weekly basis. Through this procedure, notes will be taken by the training providers in a systematic way for the production of safe conclusions.

Complementary data such as attendance sheets, internal procedures of the hosting companies, service-user questionnaires, comments etc. will be also used. Such data is particularly useful for the monitoring of further aspects of job performance. Data will be gathered at a weekly basis and will be reported in the middle and the end of WBL.

Upon completion of WBL the supervisors and in-company trainers draft a final report for each trainee, drawing from all the aforementioned sources. Questionnaires are also going to be used measuring the perspectives of trainees and third persons in companies regarding trainees' participation, performance and satisfaction in WBL procedures.

6 Final Assessment for certification

After the completion of face-to-face, e-learning and WBL training, a final assessment test will take place. This final assessment is a summative one, applied for purposes of **certification.** The final assessment test will be designed by a set of multiple choice questions aiming to assess in a combined way the learning outcomes that the trainees got during the SEnDIng training (online, face to face and work based learning). This final assessment test will be in alliance with the requirements of the certification scheme.

The trainee will have to apply theoretical and practical knowledge acquired through all training modules and WBL in an integrative, critically reflective manner. Trainees should be able to demonstrate through final assessment test that they are able to perform tasks in an adequate, efficient and professional way.

UPATRAS, UOC and OTC as the training material providers will be responsible for the production of the final assessment tests, in consultation with UNICERT as the certification provider and companies hosting work based learning. More details on the certification procedure will be provided at Deliverables "D4.2: Data Science VET program certification" and "D4.3: Internet of Things VET program certification".

References

[1] UNSW (nd), Aligning Assessment with Outcomes. Available at: https://teaching.unsw.edu.au/aligning-assessment-learning-outcomes

[2] Management Sciences for Health (2012).MDS-3: Managing Access to Medicines and Health Technologies. Arlington, VA: Management Sciences for Health. Available at: http://apps.who.int/medicinedocs/documents/s19577en/s19577en.pdf

[3] Formative Assessment & Monitoring Student Progress. Available at: https://schools.archmil.org/CentersofExcellence/DOCsPDFs/Learning-Support-Teams/2015-16/October-8-2015/Formative-Assessments/FormativeAssessmentandMonitoringStudentProgress.pdf

[4] David Lucile & Packard Foundation (nd). Guiding Principles and Practices for Monitoring, Evaluation and learning. Available at: https://www.packard.org/wp-content/uploads/2019/01/MELGuidingPrinciples.pdf

[5] Roy, M., Roy, X, Chevrier, J and Cardinal, C. (2018). Planning and monitoring of sports training: what is it and how to teach it?. LASE Journal of Sport Science. Vol 9, No1, p:91-123. Available at: http://journal.lspa.lv/files/2018/1/LASE_Journal_2018_9_1_92-124.pdf

[6] https://www.eqavet.eu/What-We-Do/European-Quality-Assurance-Reference-Framework

[7] Official Journal of the European Union (2009). Recommendation of the European Parliament and of the Council. Available at: https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:155:0001:0010:EN:PDF

[8] https://www.eqavet.eu/EU-Quality-Assurance/For-VET-Providers/Building-your-System

[9] https://www.eqavet.eu/Aligning-with-EQAVET/Work-based-learning/Guidelines

[10] Academia Edu (nd). Difference between "Assessment" and "Evaluation". Available at: https://www.academia.edu/28852459/DIFFERENCE_BETWEEN_ASSESSMENT_AND_EVALUATION_

[11] Harlen W (2004) A systematic review of the evidence of the impact on students, teachers and the curriculum of the process of using assessment by teachers for summative purposes. In *Research Evidence in Education Library.* London: EPPI-Centre, Social Science Research Unit, Institute of Education.

[12] Cedefop (2010). Learning outcomes approaches in VET curricula. A comparative analysis of nine European countries.

[13] Parents4all (2018). O3.A1 Theoretical foundation of assessment methodology.

[14] James, M. (2006) 'Assessment, Teaching and Theories of Learning' in J. Gardner (ed.) *Assessment and Learning*. London: Sage. p.55

[15] Scottish Qualification Authority, (2019). https://www.sqa.org.uk/files_ccc/Guide_To_Assessment.pdf

[16] Race, P. (2014) The Lecturer's Toolkit. A practical Guide to Assessment, learning and teaching. 3d edition. Routledge: New York

[17] TIME, (2016). Training course for Intercultural Mediators for Immigrants. Part V. Assessment methodology. Available at: www.mediation-time.eu

[18] Coombe, C. and Canning, C. (n.d.) 'Using self-assessment in the classroom: Rationale and suggested techniques'. Available at: http://www.seasite.niu.edu/tagalog/teachers_page/language_learning_articles/using_self.htm [Accessed 7/8/2018].

[19] University of Reading (n.d.) 'Engage in Self-Assessment'. Available at: https://www.reading.ac.uk/engageinassessment/peer-and-self-assessment/self-assessment/eia-self-assessment.aspx

[20] Brown, G. (2001). Assessment: A guide for lecturers. The Generic Centre learning and Teaching Support Network. Assessment Series No.3. Available at: http://www.flinders.edu.au/Teaching_and_Learning_Files/Documents/Assessment%20-%20A%20guide%20for%20lecturers.pdf

[21] Scholtz, A. (2007). An analysis of the impact of an authentic assessment strategy on student performance in a technology-mediated constructivist classroom: A study revisited. *International Journal of Education and Development Using Information and Communication Technology*, 3(4), 42-53. Available at: http://ijedict.dec.uwi.edu/viewarticle.php?id=422

[22] UNSW (nd). Assessment by Case Studies and Scenarios. Available at: https://teaching.unsw.edu.au/assessment-case-studies-and-scenarios

[23] Infed (nd), What is Groupwork? Available at: http://infed.org/mobi/what-is-groupwork/

[24]Garisson & Ehringhaus, n.d. Available at: https://www.amle.org/BrowsebyTopic/WhatsNew/WNDet/TabId/270/ArtMID/888/ArticleID/286/Formative-and-Summative-Assessments-in-the-Classroom.aspx

[25] https://classroom.synonym.com/types-formative-assessment-5419008.html

[26] European Commission (2013). Work – Based Learning in Europe. Practices and Policy Pointers. Available at: https://www.skillsforemployment.org/KSP/en/Details/?dn=WCMSTEST4_057845

[27] Kirkpatrick, D. (1998). Evaluating training programs. The four levels. 2nd edition. Berett- Koehler: San Francisco