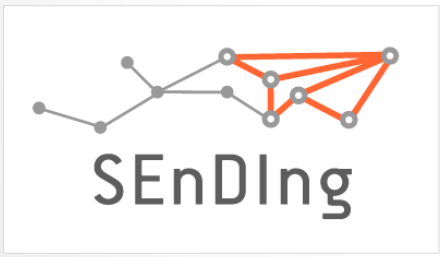

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SEnDIng

D5.3.2

REPORT ABOUT THE DELIVERY AND CERTIFICATION OF DATA SCIENCE VOCATIONAL TRAININGS

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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 on-line asynchronous training, (b) 20 hours of face-to-face training and (c) 4 months 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 project's results.

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1 Introduction

This document is a detailed report with regards to the pilot implementation of the SEnDIng Data Science VET program. The Data Science VET program consists of three phases:

- Phase 1: Data Science online training (103 hours)
- Phase 2: Transversal skills online training (20 hours)
- Phase 3: Work based learning (320 hours)

All those who successfully completed the 3 phases of the training have passed through exams that lead to the Data Science SEnDIng certification.

We would like to notice that the second and third phase of the training were common for the Data Science and IoT VET programs. For more information about the pilot implementation of the SEnDIng IoT VET program, please refer to the deliverable "D5.3.3: Report about the delivery and certification of Internet of Things vocational trainings".

1.1 Profile of professionals expressed interest for participation in the pilot trainings

The participants in the pilots of both VET programs (Data Science and IoT) have been selected following an open call targeting companies which want to upskill/reskill their employees at the Data Science and IoT domains (for more information please refer to the deliverable "D5.3.1: Open call for participation of companies in the vocational trainings"). After collecting the initial interest of companies, we asked them using a google form, to provide their feedback about the details of their employees who are interested to participate in the training.

207 professionals from 35 organizations expressed interest to participate in both pilot training programs. The profile of the professionals is depicted at the following graphs.

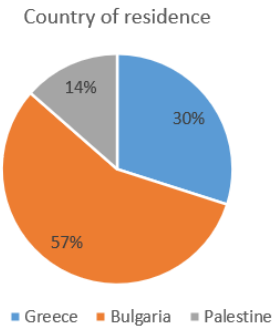


Figure 1: Country of residence of the professionals expressed interest to participate in the pilot trainings

Figure 2: Qualifications of the professionals expressed interest to participate in the pilot trainings

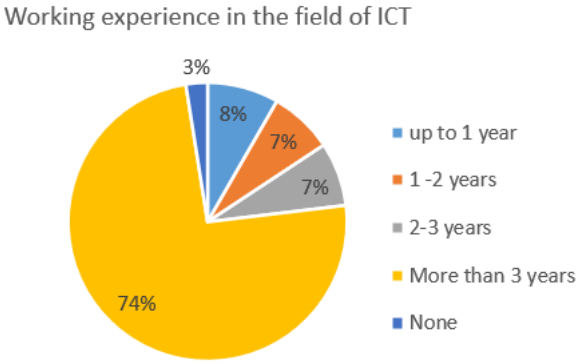


Figure 3: Working experience of the professionals expressed interest to participate in the pilot trainings

Moreover, the majority of those expressed interest to participate in the trainings are coming from the ICT sector (86.7%) followed by the education sector (13.8%) and Finance and Insurance sector (3.4%).

The Data Science and IoT VET programs address a minimum EQF level 5. The entry requirements defined for participation in the pilot trainings are depicted at the following table. Except 2 applicants, the other met the entry requirements.

Diplomas	Work experience in the field of ICT (in years)			
	0	>=1	>=2	>=3
General Upper Secondary Education				✓
Vocational Upper Secondary School or Post-Secondary Education (both in ICT fields)				✓
Bachelor in the field of ICT from a Higher Educational Institute		✓		
Bachelor in the field of engineering (other than ICT), physical sciences, life sciences, mathematics, financials and business administration from a Higher Educational Institute			✓	
Post-graduate degree (MSc and/or Phd) in the field of ICT from a Higher Educational Institute	✓			
Post-graduate degree (MSc and/or Phd) in the field of engineering (other than ICT), physical sciences, life sciences, mathematics, financials and business administration from a Higher Educational Institute		✓		

2 Phase 1: Data Science online training

The Data Science online training started on January 2020. The participants in the training attended the following Data Science online courses at http://mooc.sending-project.eu/:

- DS-EM1: Introduction to Data Science
- DS-EM2: Applied Machine Learning
- DS-EM3: Python for Data Science
- DS-EM4: Storing and Retrieving Data
- DS-EM5: Statistics for Data Science
- DS-EM6: Data Visualization

The number of enrolled users at each online course is depicted at the following table. Note that the same trainees (users) have been enrolled among different online courses.

Online course	Number of enrolled users
DS-EM1: Introduction to Data Science	173
DS-EM2: Applied Machine Learning	137
DS-EM3: Python for Data Science	107
DS-EM4: Storing and Retrieving Data	100
DS-EM5: Statistics for Data Science	96
DS-EM6: Data Visualization	92

Table 1: Number of enrolled users at each Data Science online course.

The estimated effort for each online course was 10 hours per week (unless the DS-EM1 whose estimated effort was 3 hours). We provided an indicative timeline for the completion of each course however we have given also to the trainees the possibility to complete the online courses till the end of the third phase of the training (work-based learning). This has been done taking into account the philosophy of MOOCs giving to the trainees the possibility to adapt the training to their own schedule. The trainees had to successfully complete the 6 Data Science online courses by achieving at least 70% score at the self-evaluation quizzes of each course. The success rate for each course is depicted at the following table.

Online course	Success rate
DS-EM1: Introduction to Data Science	64%
DS-EM2: Applied Machine Learning	42%
DS-EM3: Python for Data Science	57%
DS-EM4: Storing and Retrieving Data	50%
DS-EM5: Statistics for Data Science	31%
DS-EM6: Data Visualization	43%

Table 2: Success rate at each Data Science online course

2.1 Evaluation of Data Science online courses

For each online course, the trainees have been asked through a survey embedded at the end of each course (and using it as a feedback loop) to evaluate various aspects using a scale from "Strongly Disagree" up to "Strongly Agree". The aspects evaluated for each online course are the following:

1. I have enjoyed the course.
2. This course was challenging.
3. The course met my expectations.
4. The quality of the training material was high.
5. The content was well organized and easy to follow.
6. The course will be useful in my work.
7. The objectives of the course were clearly defined.
8. The time allocated for the course was reasonable.
9. The course enhanced my knowledge of the subject matter.
10. In this course, I have been challenged to learn more than I expected.

Totally, 271 responses have been collected for the 6 Data Science online courses. The distribution of responses per online course is depicted at the following table.

Online course	Number of responses
DS-EM1: Introduction to Data Science	80
DS-EM2: Applied Machine Learning	34
DS-EM3: Python for Data Science	30
DS-EM4: Storing and Retrieving Data	28
DS-EM5: Statistics for Data Science	25
DS-EM6: Data Visualization	20
Total number of responses	**217**

Table 3: Number of responses collected for the evaluation of Data Science online courses

The following diagrams depict the evaluation of each course.

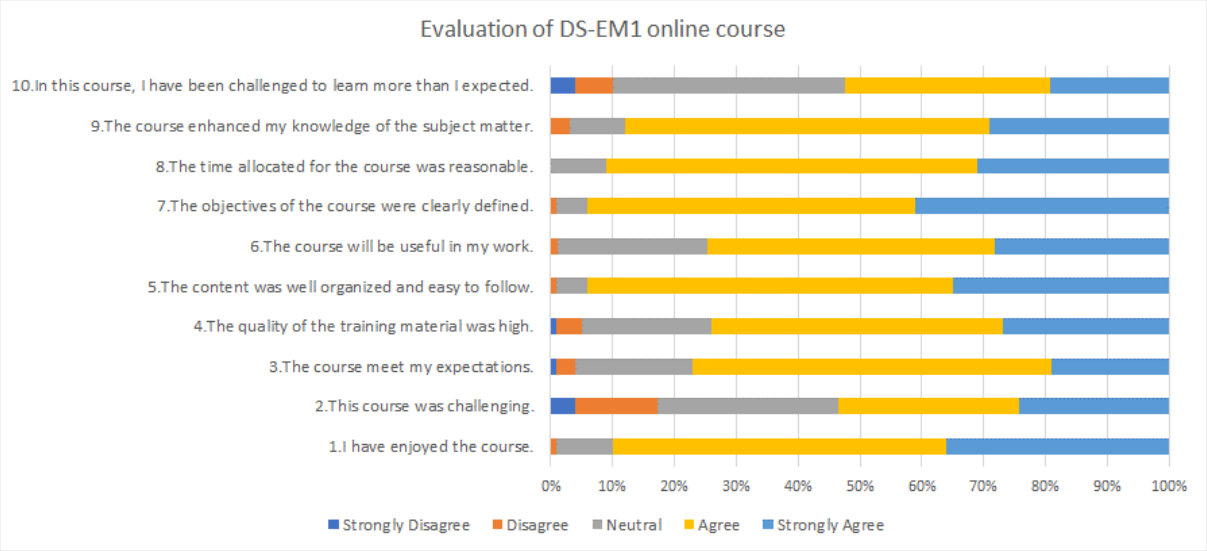


Figure 4: Evaluation of DS-EM1 online course

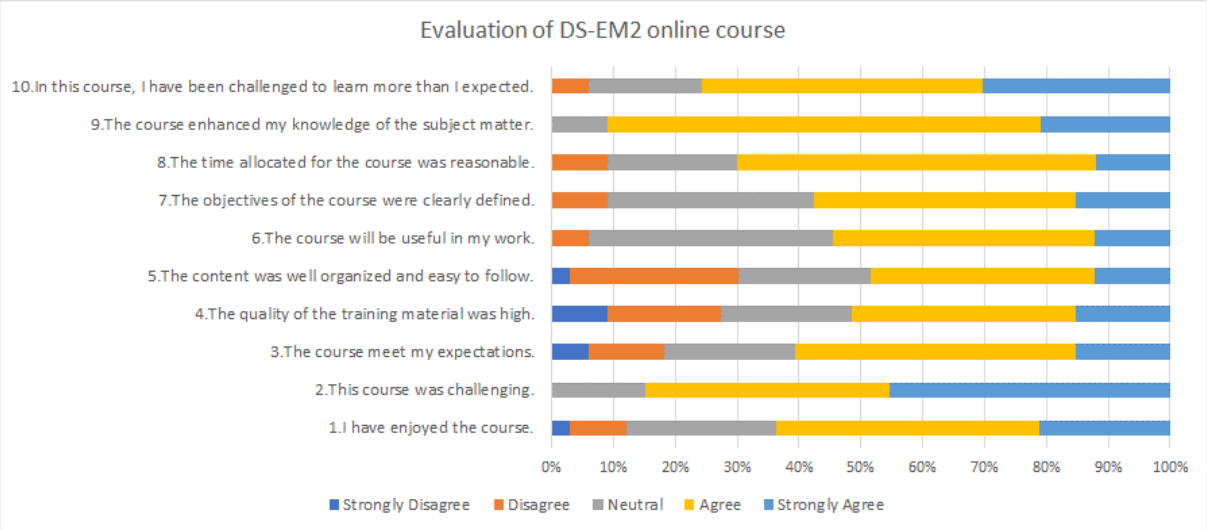


Figure 5: Evaluation of DS-EM2 online course

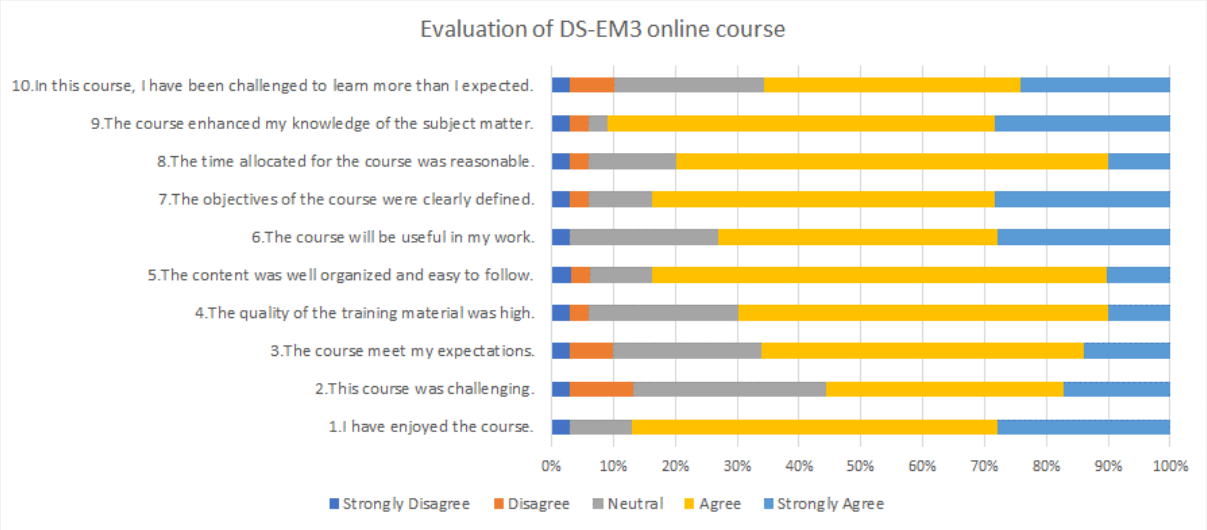


Figure 6: Evaluation of DS-EM3 online course

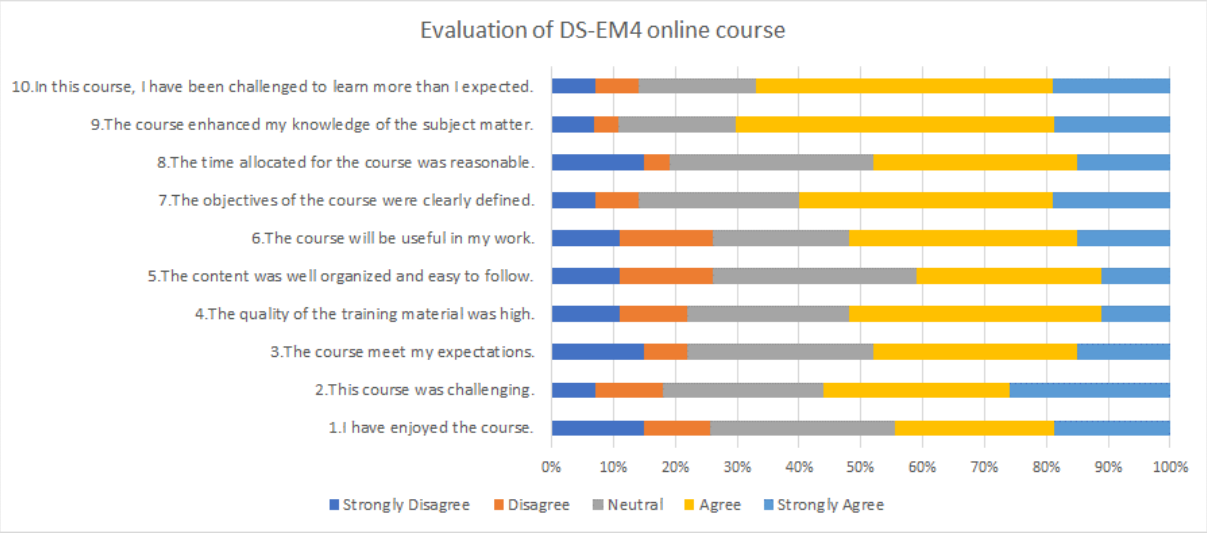


Figure 7: Evaluation of DS-EM4 online course

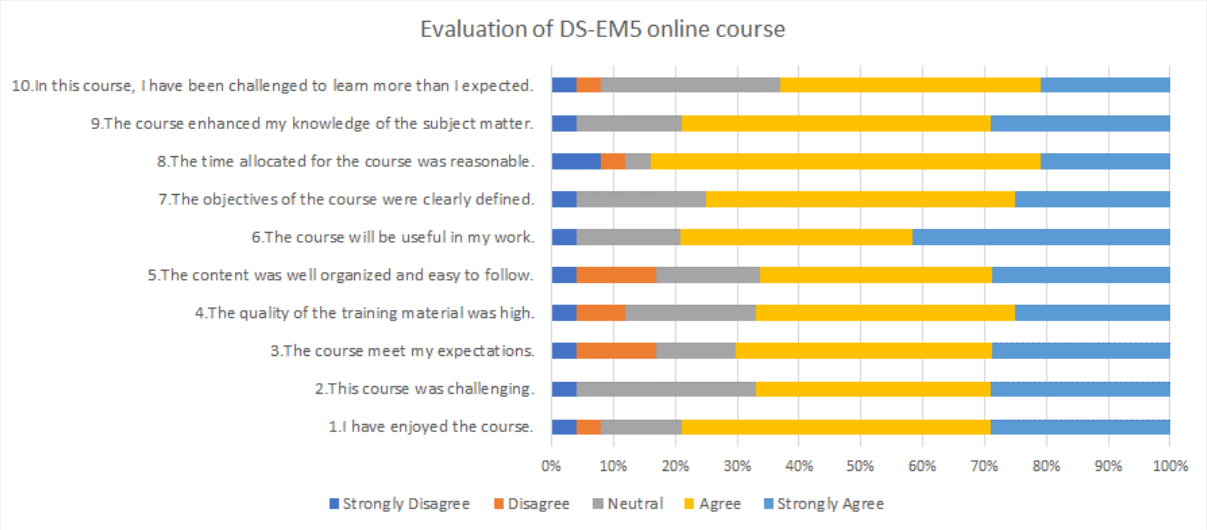


Figure 8: Evaluation of DS-EM5 online course

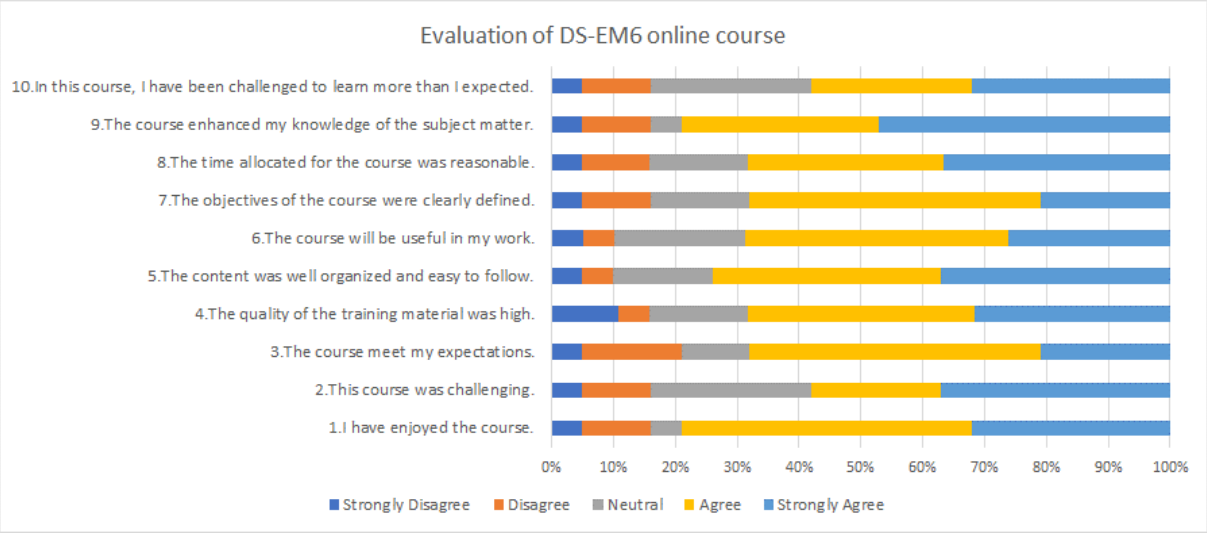


Figure 9: Evaluation of DS-EM6 online course

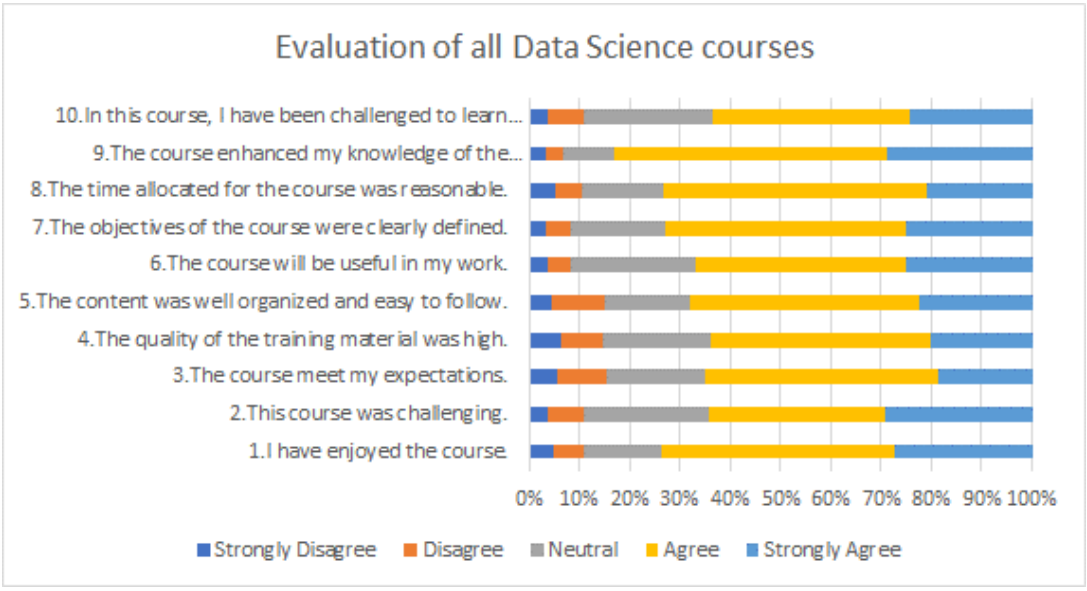


Figure 10: Evaluation of all Data Science online courses

From the evaluation, it is concluded that the trainees were satisfied with the overall Data Science online courses given the following average scores received:

- 74% declared that they enjoyed the courses
- 64% declared that the courses were challenging
- 65% declared that the courses met their expectations
- 64% declared that the quality of the courses was high
- 68% declared that the content was well organized and easy to follow

- 77% declared that the courses will be useful in their work
- 73% declared that the objectives of the courses were clearly defined
- 74% declared that the time allocated for the courses was reasonable
- 83% declared that the courses enhanced their knowledge of the subject matter
- 73% declared that they have been challenged to learn more than they expected

3 Phase 2: Transversal skills online training

Transversal skills training was the second phase of the 2 VET programs (Data Science and IoT). At this phase, the trainees attended 20 hours of synchronous online training on transversal skills development. Olympic Training and Consulting, University of Cyprus and European Software Institute allocated 2 trainers to deliver the trainings. The selection criteria of these trainers were the following:

- Masters equivalent or training in relevant qualifications (preferable more than 200 hours)
- Work experience (2 or 3 years) in the selected fields of training
- Certified adult trainer or have attended one train-the-trainer or equivalent programme
- Experience in adult education (Delivered training sessions of at least 100 hours in relevant fields)
- Experience in professional and personal development
- Strong communication skills
- Enthusiasm for lifelong learning
- Flexible organization skills

A "train-the-trainers" 3 hours online training has organized by Olympic Training and Consulting (with the support of ESI CEE, Nemetschek, Code Runners and BASSCOM) in order to prepare the trainers of phase 2. Moreover, a handbook has been prepared for the trainers of phase 2. For more information, please refer to deliverable "D2.4 Training Methodology".

Although the initial plan was to deliver the transversal skills training through face-to-face sessions, the COVID-19 restrictions forced us to deliver them online. Finally, 42 out of 136 trainees have successfully completed the 20 hours of transversal skills online training. The percentage can be considered satisfactory given that all trainees were employed and the training has run during the peak of COVID-19 (spring 2020) causing difficulties to many trainees to continue with these online sessions due to unscheduled work commitments and other priorities raised.

3.1 Evaluation of transversal skills training by trainees

This section presents the results of transversal skills training's evaluation by trainees. 24 trainees with the following profile have provided their feedback:

- **Sex**: 65% male and 35% female.
- **Age group**: 39% at the range 18-30 years, 43% at the range 31-40 years, 10% at the range 41-50 years, 6% at the range 51-60 years and 2% at the range group 60+.
- **Highest educational level**: 8% High school, 27% College/University, 61% post-graduate studies at MSc level and 4% post-graduate studies at PhD level.
- **Participation in previous trainings on transversal skills.** Yes (55%) and No (45%).

The trainees have been asked to evaluate various aspects of the transversal skills training using a scale from 1 (Not at all/Very Dissatisfied) to 5 (Completely/Very Satisfied). The following graphs depict the results obtained by computing the average values gathered by each examined parameter. The parameters evaluated was the following:

- Fulfilment of expectations prior the start of transversal skills training (Figure 11).
- Objectives of the transversal skills training (Figure 12).
- Transversal skills training aspects (Figure 13).
- Online platform for transversal skills training (Figure 14).
- Training material and methodology (Figure 15).
- Evaluation of trainers (Figure 16).
- Self-assessment of trainees (Figure 17).

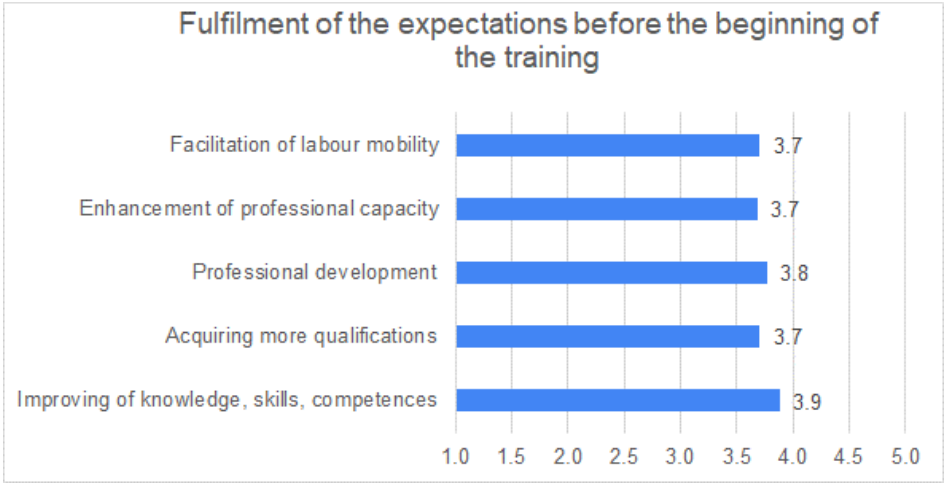


Figure 11: Fulfilment of the expectations before the beginning of the training

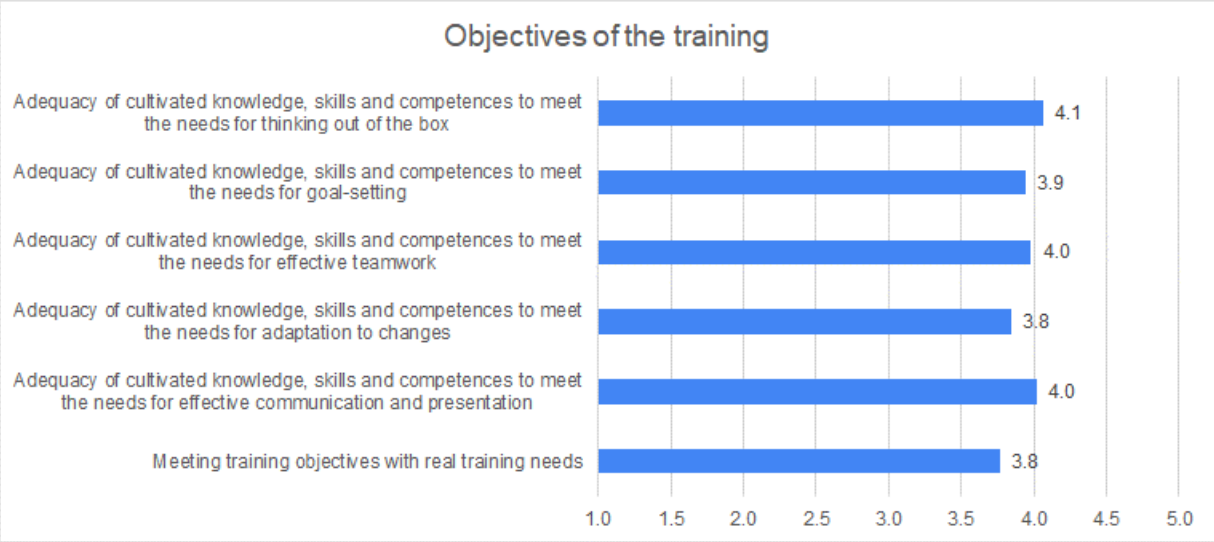


Figure 12: Evaluation of the objectives of the training

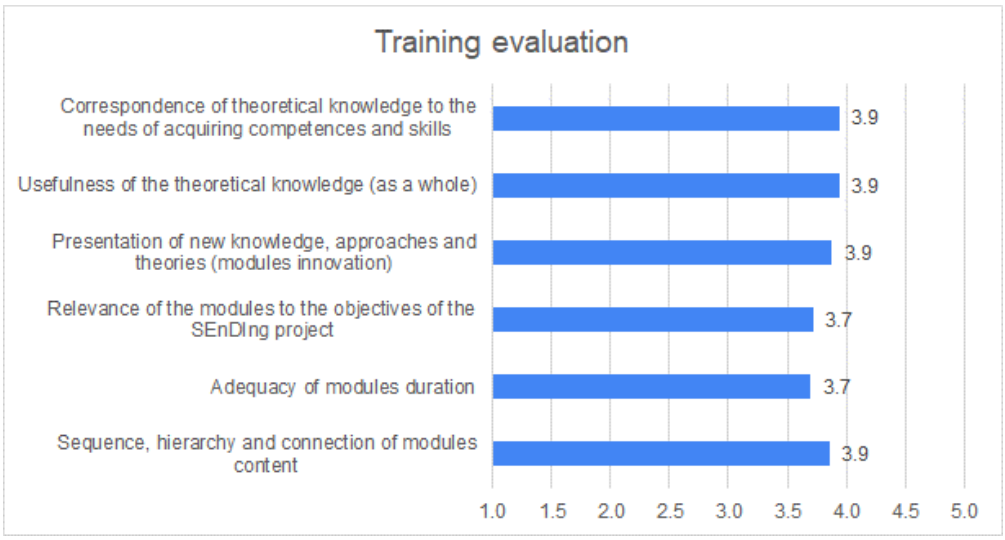


Figure 13: Evaluation of the training

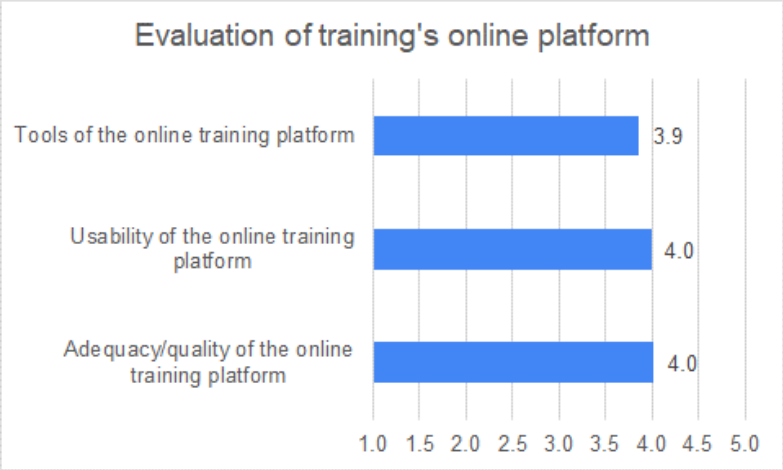


Figure 14: Evaluation of training's online platform

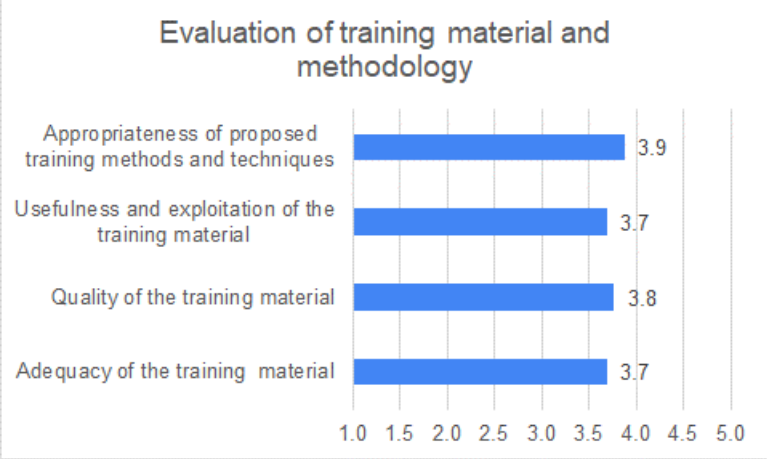


Figure 15: Evaluation of training material and methodology

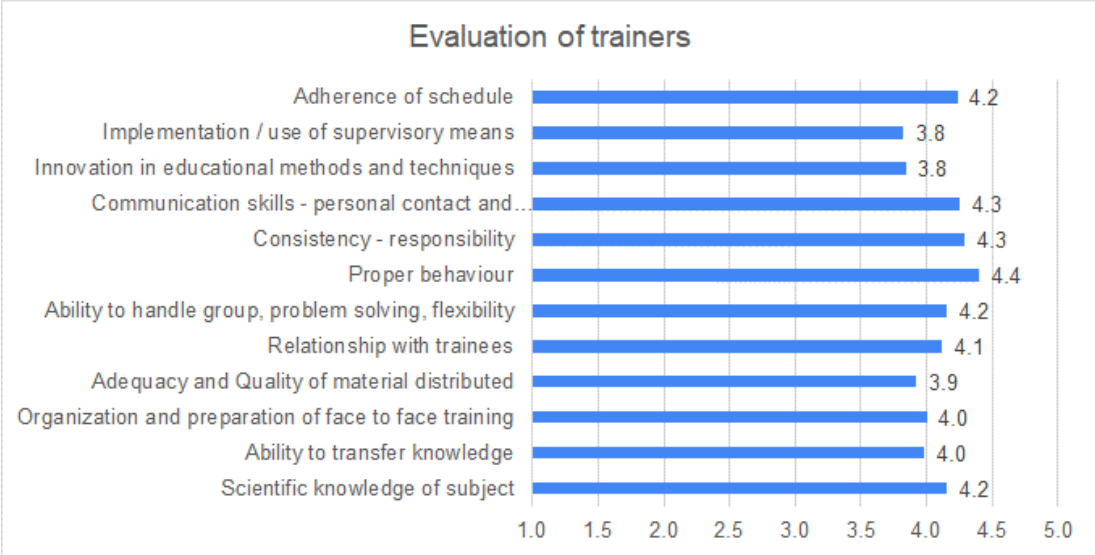


Figure 16: Evaluation of trainers

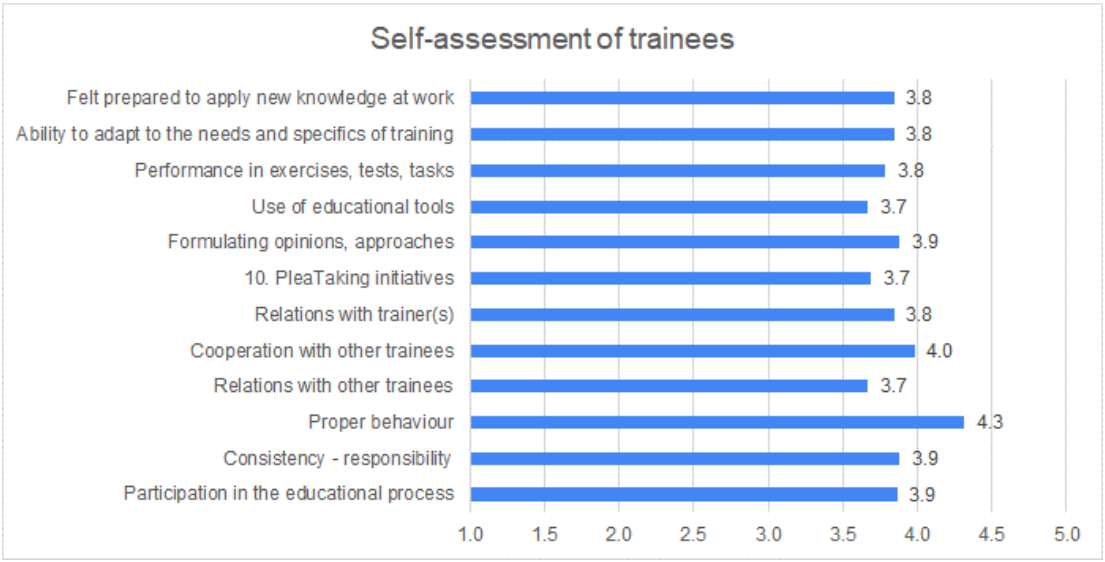


Figure 17: Self-assessment of trainers

The overall results obtained by the evaluation are positive given that the average score of the transversals skills training collected among the evaluated parameters is 3.9. This means that the satisfaction level of the trainees from the transversal skills training's methodology, process, available documentation and support from SEnDIng partners was high.

3.2 Evaluation of transversal skills training by trainers

This section presents the results of transversal skills training evaluation by trainers. In total, 5 trainers with the following profile have provided their feedback:

- **Sex**: 60% male and 40% female.
- **Age group**: 100% at the range 41-50 years.
- **Highest educational level**: 60% College/University and 40% post-graduate studies at MSc level.
- **Years of experience in adult education.** 1-3 years (20%), 7-10 years (20%) and more than 10 years (60%).

The trainers have been asked to evaluate various aspects of the transversal skills training using a scale from 1 (Not at all/Very Dissatisfied) to 5 (Completely/Very Satisfied). The following graphs depict the results obtained by computing the average values gathered by each examined parameter. The parameters evaluated was the following:

- Available documentation prior to the training (Figure 18).
- Training objectives (Figure 19).
- Training aspects (Figure 20).
- Online training platform (Figure 21).
- Training material and methodology (Figure 22).
- Evaluation of trainees (Figure 23 and Figure 24).
- Self-assessment of trainers (Figure 25 and Figure 26).

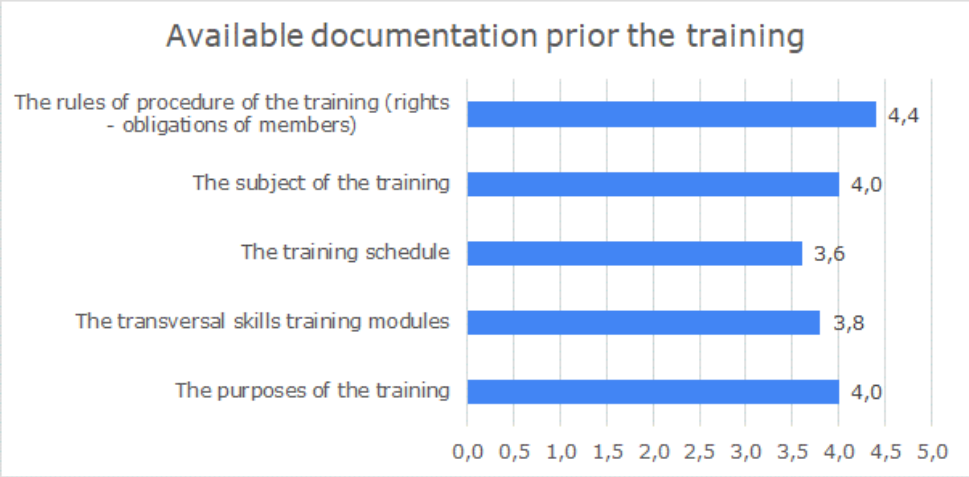


Figure 18: Evaluation of available documentation prior the training

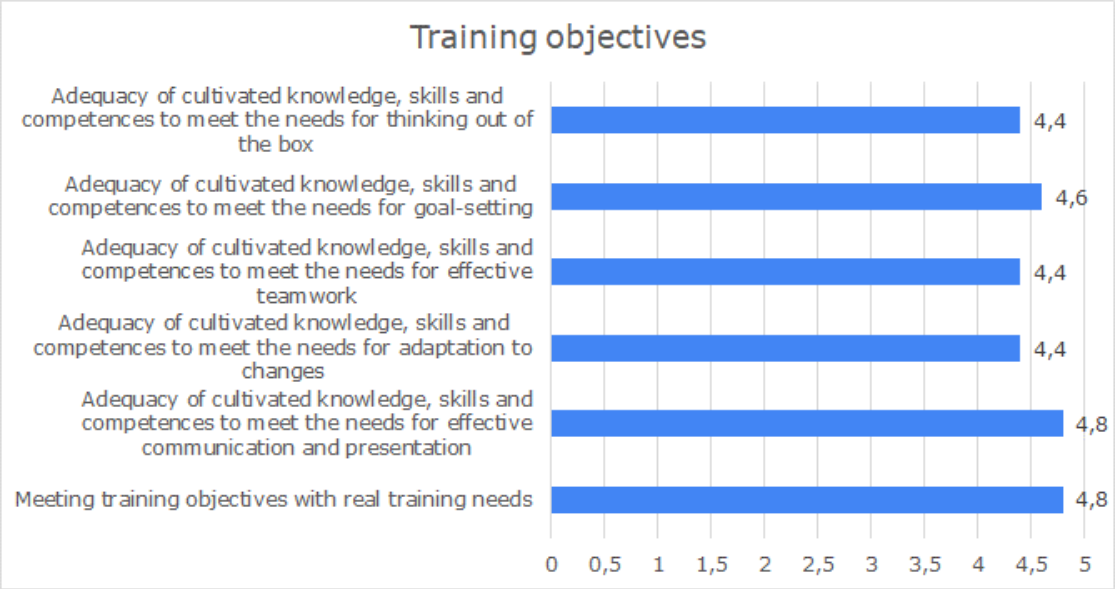


Figure 19: Evaluation of training objectives

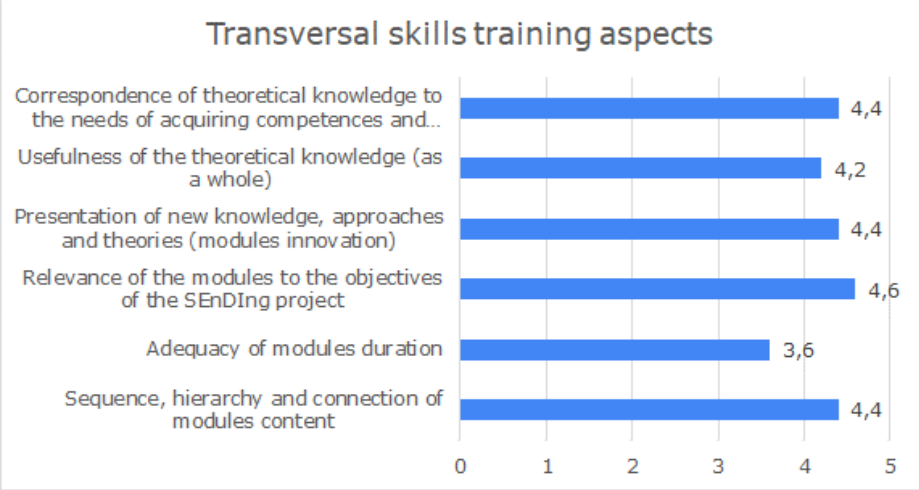


Figure 20: Evaluation of training aspects

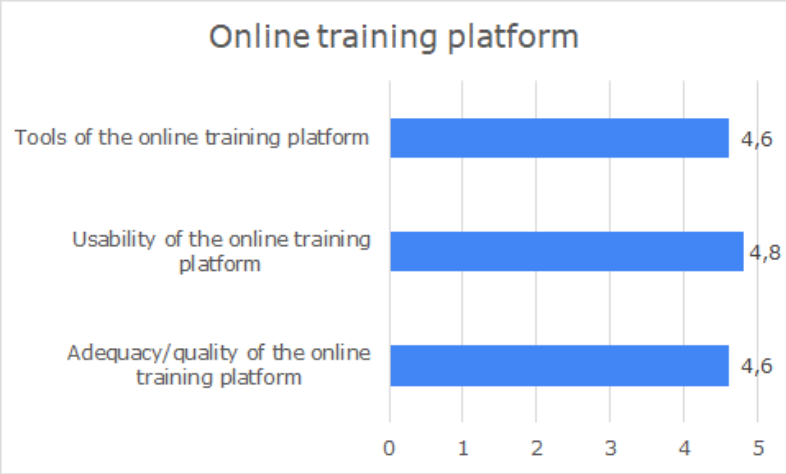


Figure 21: Evaluation of online training platform

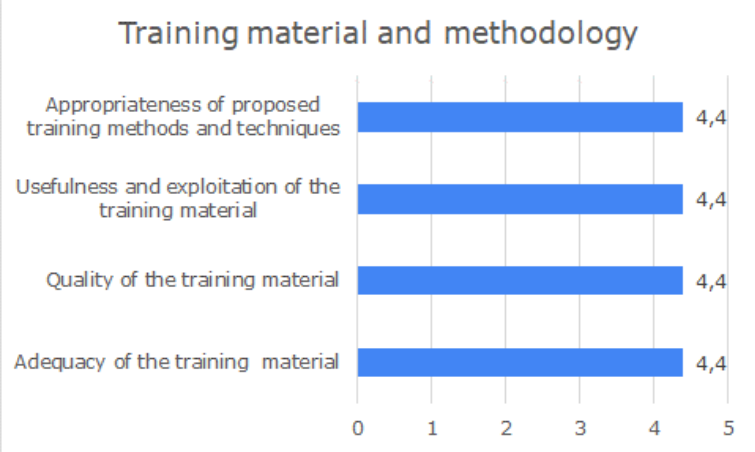


Figure 22: Evaluation of training material and methodology

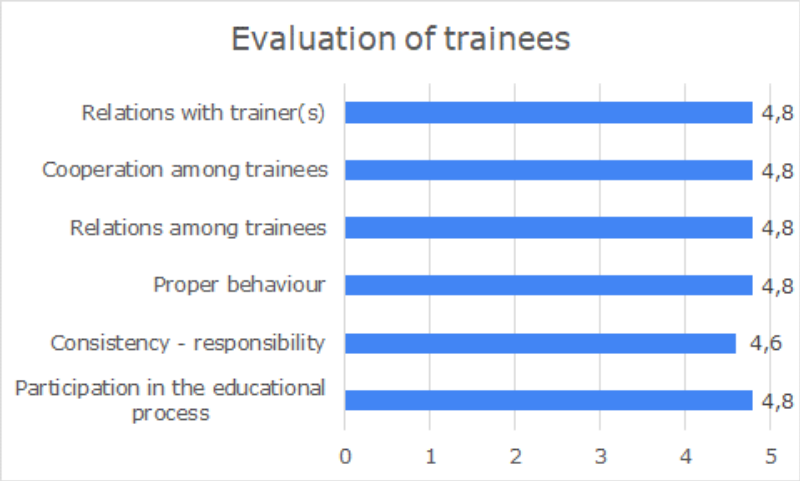


Figure 23: Evaluation of trainees (1/2)

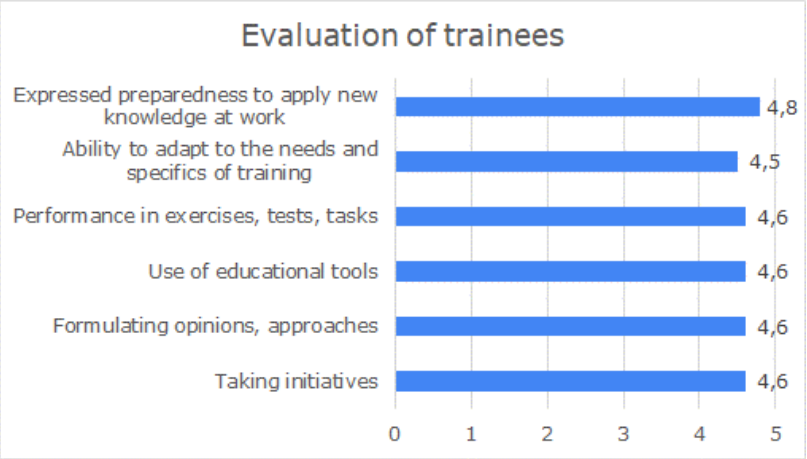


Figure 24: Evaluation of trainees (2/2)

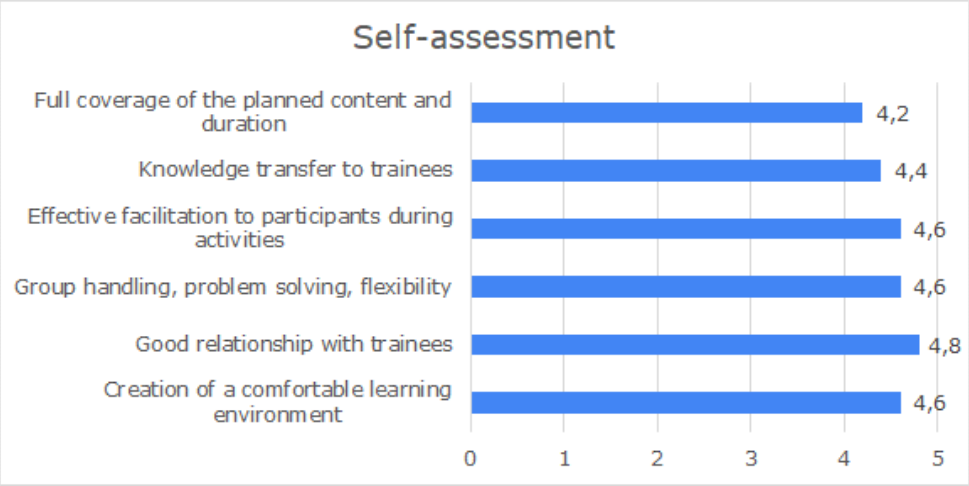


Figure 25: Self-assessment of trainers (1/2)

Figure 26: Self-assessment of trainers (2/2)

The overall results obtained by the evaluation are positive given that the average score of the transversals skills training collected among the examined parameters is 4.5. This means that the satisfaction level of the trainers from the transversal skills training's methodology, process, available documentation and support from SEnDIng partners was very high.

4 Phase 3: Work based learning

Work based learning was the third and final phase of the 2 VET programs (Data Science and IoT). At this phase, the trainees have been provided with hands-on Data Science and IoT projects to run (depending on the VET program they attend). These projects have been designed by SEnDIng partners, where there were also cases that companies hosting the work-based learning have provided projects based on their needs.

The companies participating in the training have been asked to assign an in-company mentor to guide their trainees during the work-based learning in cooperation with SEnDIng partners. The suggested criteria for the selection of the in-company mentors were the following:

- Technical skills at the area of Data Science and/or IoT
- Knowledge transfer skills
- Emotional intelligence, empathy – understanding employees' points of view
- Communication skills
- Leadership skills
- Ability to motivate
- Basics of organizational behaviour – ability to identify employee strengths and weaknesses
- Patience and helpfulness

The in-company mentors have attended a 3-hours online "train-the-trainers" training organized by Olympic Training and Consulting (with the support of ESI CEE, Nemetschek, Code Runners and BASSCOM) aiming to guide them through the work-based learning phase. A handbook has also prepared for the companies' trainers/mentors of work-based learning. For more information, please refer to deliverable "D2.4 Training Methodology". Moreover, an FAQ have been developed to provide answers to common questions of the trainees and trainers.

Although the initial plan was to run the work-based learning till the end of August 2020 the COVID-19 restrictions and the requests received by many companies forced us to extend the work-based learning period till the end of November 2020. Finally, 23 trainees have completed the work-based learning.

4.1 Evaluation of work-based learning by trainees

This section presents the results of work-based learning evaluation by trainees. In total, 21 trainees with the following profile have provided their feedback:

- **Sex**: 67% male and 33% female.
- **Age group**: 24% at the range 18-30 years, 57% at the range 31-40 years, 14% at the range 41-50 years and 5% at the range 51-60 years.
- **Highest educational level**: 29% College/University, 67% post-graduate studies at MSc level and 5% post-graduate studies at PhD level.
- **Years of work experience in the field of Data Science**: 0 years (43%), 1-5 years (52%) and 6-10 years (5%)

- **Years of work experience in the field of IoT**: 0 years (52%) and 1-5 years.

The trainees have been asked to evaluate various aspects of the work-based learning using a scale from 1 (Not at all/Very Dissatisfied) to 5 (Completely/Very Satisfied). The following graphs depict the results obtained by computing the average values gathered by each examined parameter. The parameters evaluated was the following:

- Fulfilment of expectations prior the start of work-based learning (Figure 27).
- Connection of work-based learning with the other phases of SEnDIng training (Figure 28).
- Outcomes of work-based learning (Figure 29).
- Work-based learning aspects (Figure 30).
- Training material and methodology of work-based learning (Figure 31).
- Evaluation of in-company mentors (Figure 32 and Figure 33).
- Self-assessment of trainees (Figure 34and Figure 35).

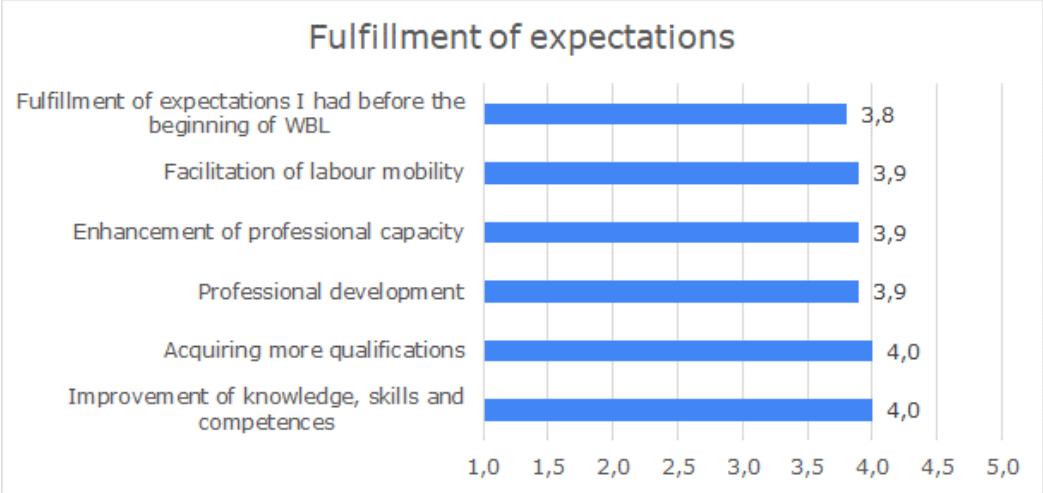


Figure 27: Fulfilment of the expectations that trainees had by work-based learning before its beginning

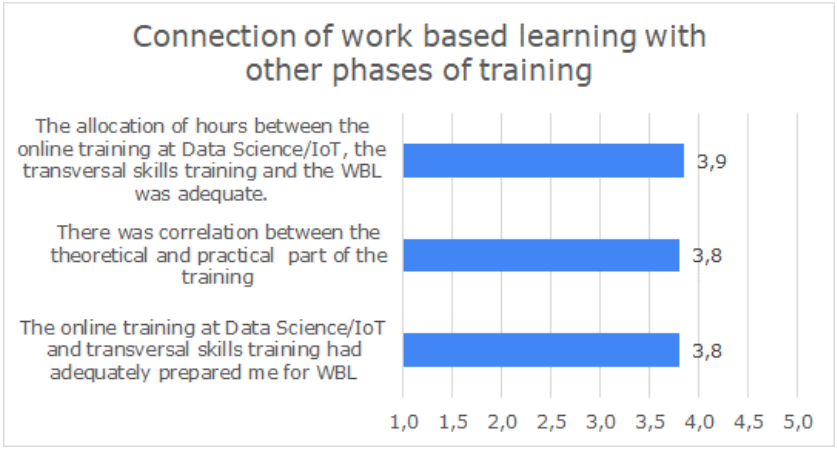


Figure 28: Connection of work-based learning with the other phases of SEnDIng training.

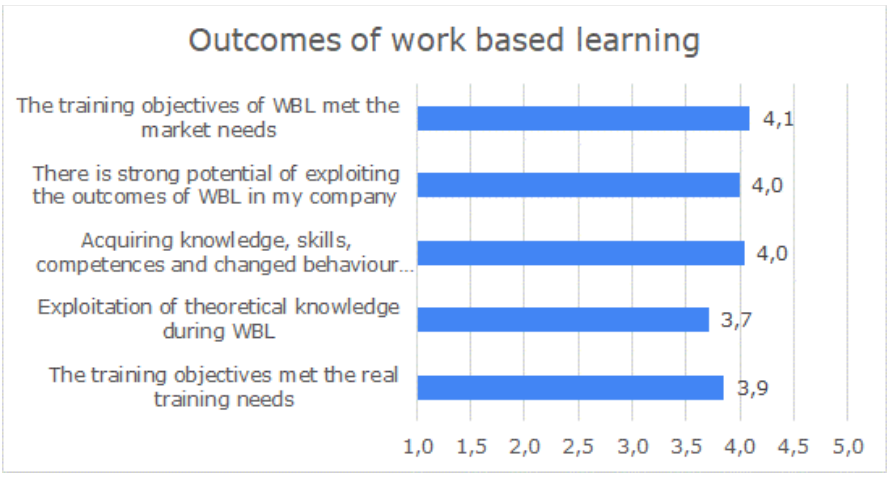


Figure 29: Evaluation of work-based learning outcomes

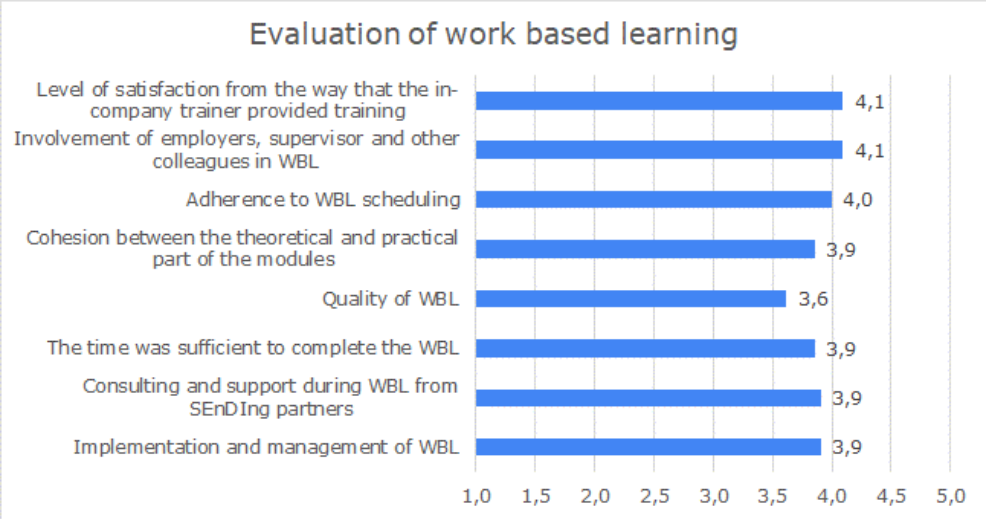


Figure 30: Evaluation of work-based learning

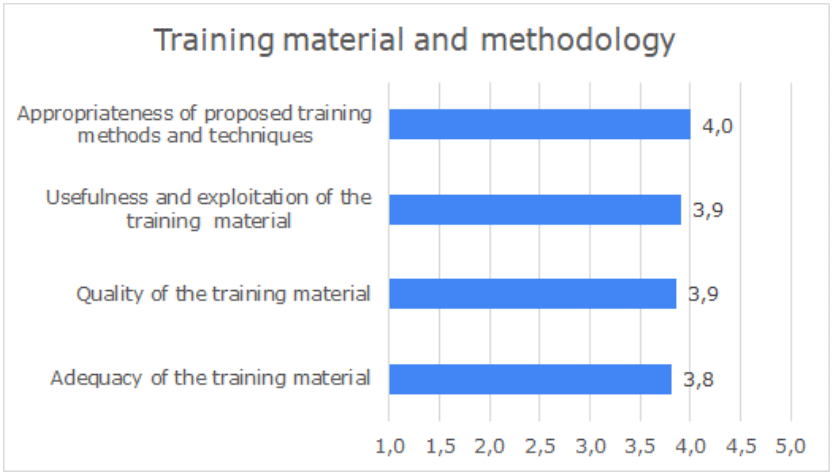


Figure 31: Evaluation of work-based learning training material and methodology

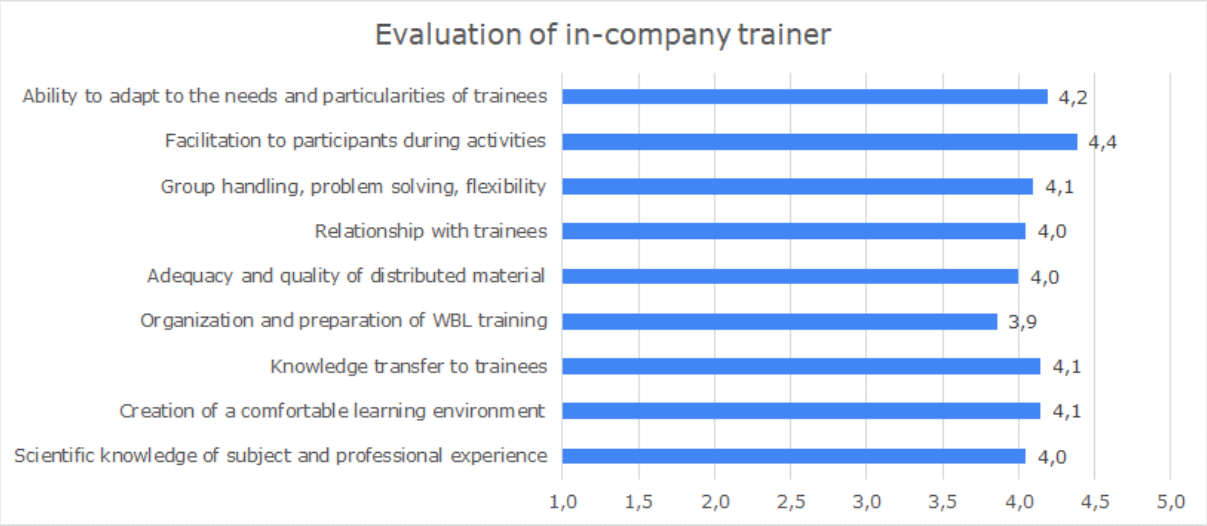


Figure 32: Evaluation of in-company trainers (1/2)

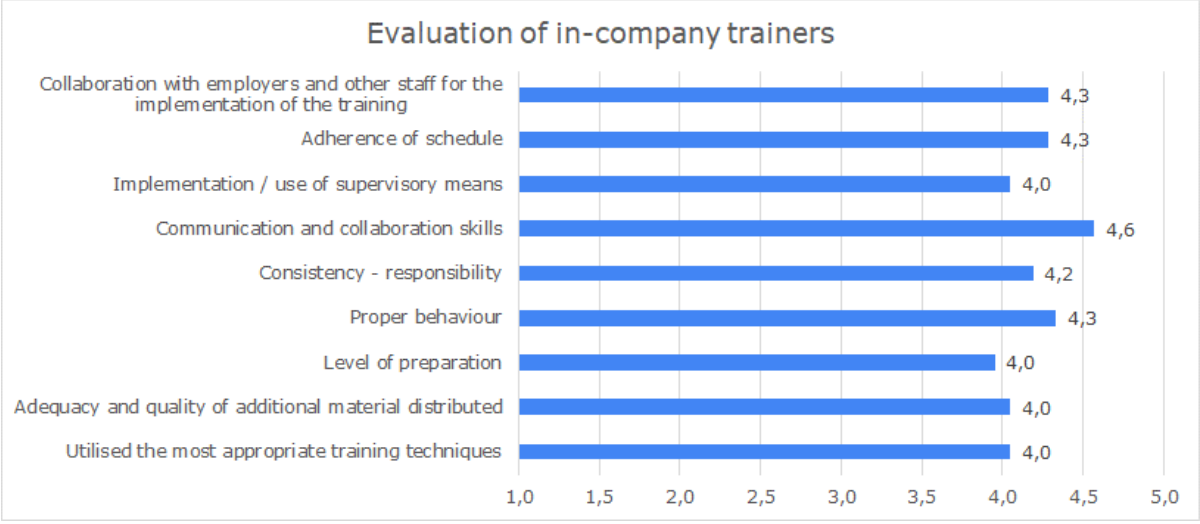


Figure 33: Evaluation of in-company trainers (2/2)

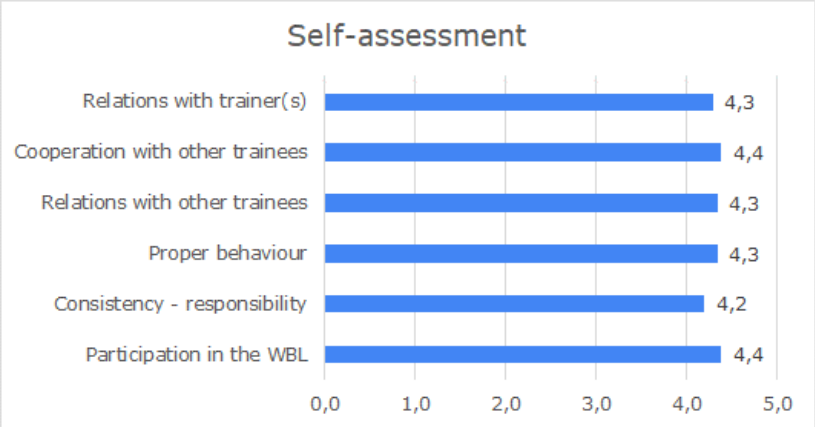


Figure 34: Self-assessment of trainees (1/2)

Figure 35: Self-assessment of trainees (2/2)

The overall results obtained by the evaluation are positive given that the average score of the work-based learning collected among the examined parameters is 3.9. This means that the satisfaction level of the trainees from the work-based learning methodology, process, available documentation and support from SEnDIng partners was high.

4.2 Evaluation of work-based learning by trainers

This section presents the results of work-based learning evaluation by trainers (in-company mentors). In total, 12 trainers with the following profile have provided their feedback:

- **Sex**: 75% male and 25% female.
- **Age group**: 58% at the range 31-40 years, 33% at the range 41-50 years and 8% at the range 51-60 years.

- **Highest educational level**: 8% high school, 42% College/University, 42% post-graduate studies at MSc level and 8% post-graduate studies at PhD level.
- **Years of work experience in the field of Data Science**: 0 years (17%), 1-5 years (58%), 6-10 years (17%), 11-20 years (8%)
- **Years of work experience in the field of IoT**: 0 years (17%), 1-5 years (58%) and 6-10 years (25%).

The trainers have been asked to evaluate various aspects of the work-based learning using a scale from 1 (Not at all/Very Dissatisfied) to 5 (Completely/Very Satisfied). The following graphs depict the results obtained by computing the average values gathered by each examined parameter. The parameters evaluated was the following:

- Information that the trainees had at the beginning of work-based learning (Figure 36).
- Connection of work-based learning with the other phases of SEnDIng training (Figure 37).
- Outcomes of work-based learning (Figure 38).
- Work-based learning aspects (Figure 39).
- Training material and methodology of work-based learning (Figure 40).
- Self-assessment of trainers (Figure 41 and Figure 42).

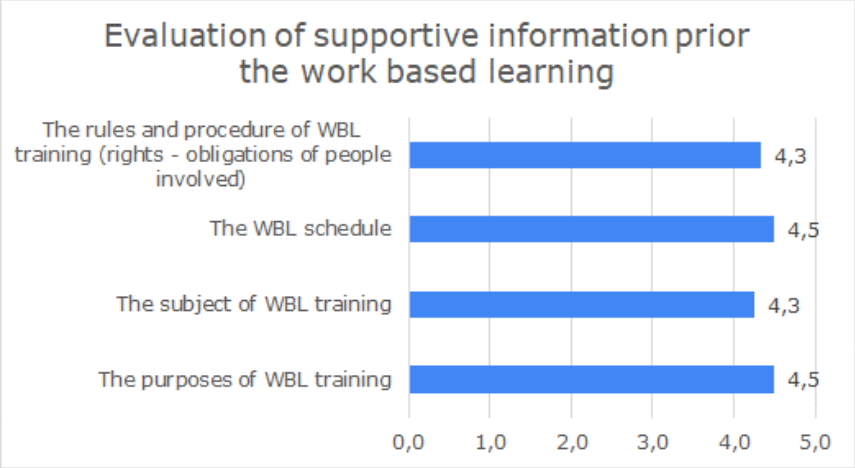


Figure 36: Evaluation of supportive information prior the work-based learning

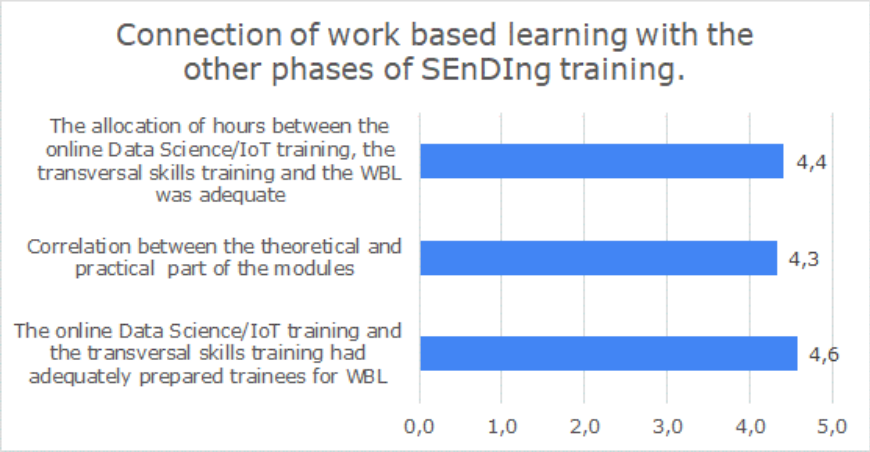


Figure 37: Connection of work-based learning with the other phases of SEnDIng training.

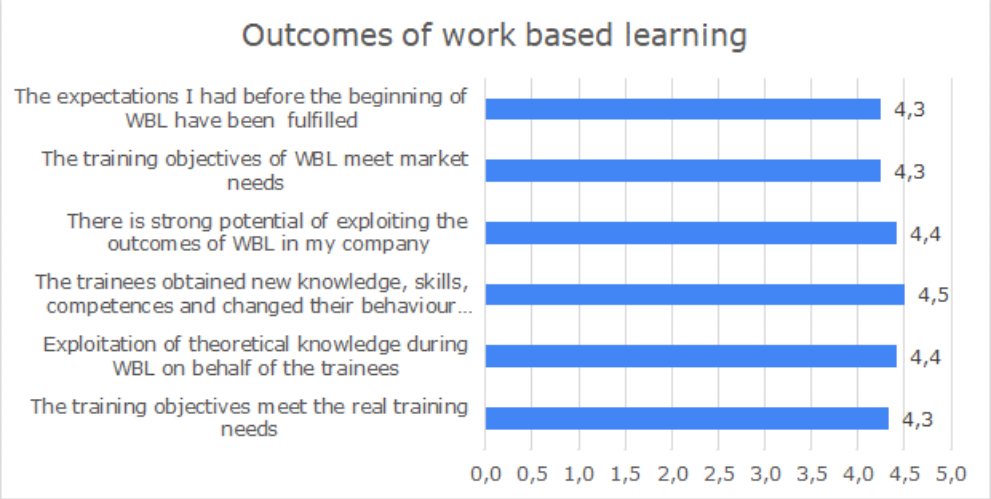


Figure 38: Evaluation of work-based learning outcomes

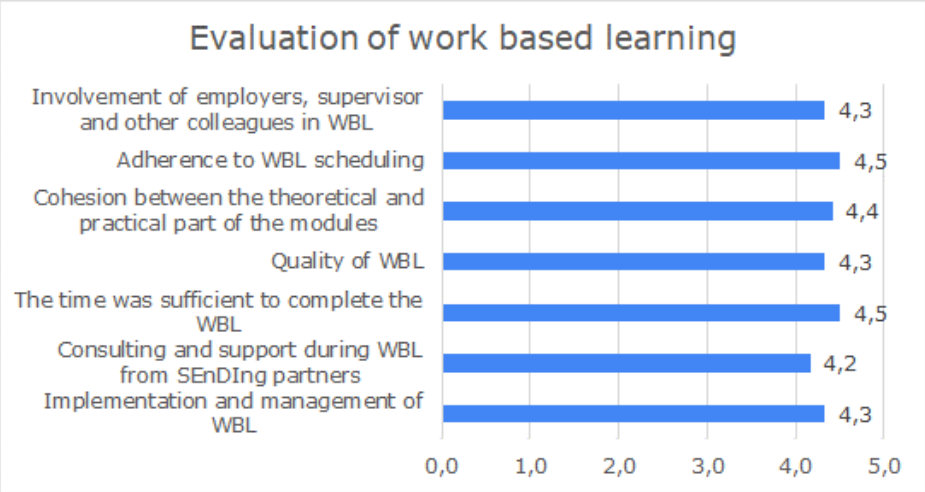


Figure 39: Evaluation of work-based learning

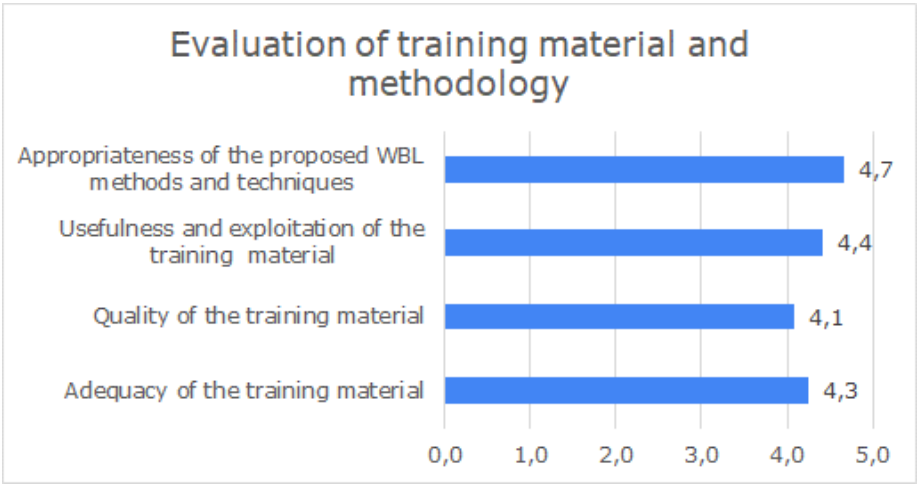


Figure 40: Evaluation of training material and methodology

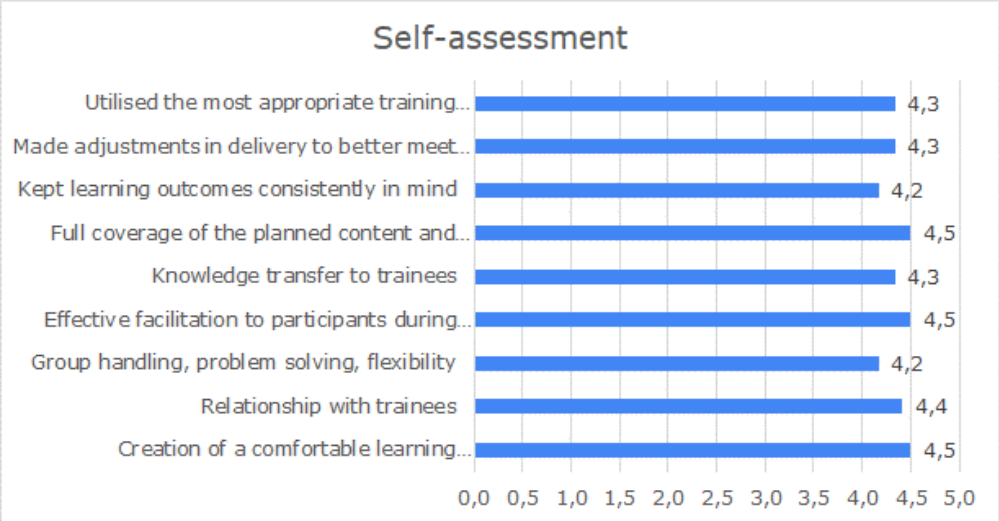


Figure 41: Self-assessment of trainers (1/2)

Figure 42: Self-assessment of trainers (2/2)

The overall results obtained by the evaluation are very positive given that the average score of the work-based learning collected among the examined parameters is 4.4 (higher than that gathered by the trainees). This means that the satisfaction level of the in-company mentors from the work-based learning methodology, process, available documentation and support from SEnDIng partners was very high.

5 Certification exams

At the end of the work-based learning, the trainees have been asked to declare their intention to participate in the certification exams. The successful completion of the 3

phases of the training was a pre-requisite for participation in the certification exams. 23 out of 47 trainees that declared interest to participate in the certification exams met the prerequisites. Due to COVID-19 restrictions, the certification exams that during the application has been planned to be delivered at the premises of SEnDIng partners has been rescheduled and were delivered online. This change requested a lot of effort and time given that a teleproctoring system has been implemented by UNICERT in conjunction with an online application form for participation in the certification exams.

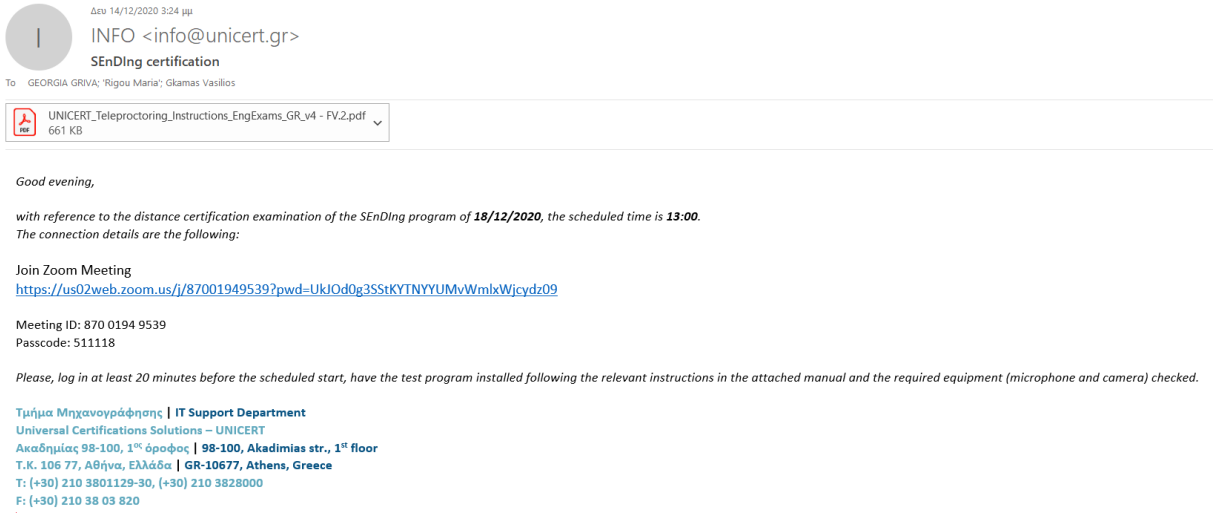
The trainees who met the pre-requisites for participation in the exams have been asked to fill in the online form https://unicert.gr/european-project-en/?lang=en with the following data:

- Personal Data
  - First Name, Last Name, Father's name, Mother's name
  - Identity number (dentification card (ID) / Passport / Other)
  - Gender (Male/Female)
  - Full address (Street / Number / Area / P.C / City)
  - Landline Number
  - Mobile phone number
  - E-mail address
  - Country
  - Occupation
- Special needs
- Supporting documents
  - Photocopy of ID document
  - Photocopy of graduation certificate from an educational institution (at least of Compulsory Education)
- Preferrable date for participation in exams

At the aforementioned site was also provided:

- An FAQ regarding the certification exams
- Instructions about the UNICERT teleproctoring exams system

Before the exams the trainees have received an email like the following one that includes the Zoom link and instructions for the exams.



Δευ 14/12/2020 3:24 μμ

INFO <info@unicert.gr>

SEnDIng certification

To GEORGIA GRIVA; 'Rigou Maria'; Gkamas Vasilios

UNICERT_Teleproctoring_Instructions_EngExams_GR_v4 - FV.2.pdf
661 KB

Good evening,

*with reference to the distance certification examination of the SEnDIng program of **18/12/2020**, the scheduled time is **13:00**.*
The connection details are the following:

Join Zoom Meeting
https://us02web.zoom.us/j/87001949539?pwd=UkJOd0g3SStKYTNYYUMvWmlxWjcydz09

Meeting ID: 870 0194 9539
Passcode: 511118

Please, log in at least 20 minutes before the scheduled start, have the test program installed following the relevant instructions in the attached manual and the required equipment (microphone and camera) checked.

Τμήμα Μηχανογράφησης | **IT Support Department**
Universal Certifications Solutions – UNICERT
Ακαδημίας 98-100, 1ος όροφος | **98-100, Akadimias str., 1st floor**
Τ.Κ. 106 77, Αθήνα, Ελλάδα | **GR-10677, Athens, Greece**
T: (+30) 210 3801129-30, (+30) 210 3828000
F: (+30) 210 38 03 820

The score threshold to pass the exams have been defined to 70%. 100% (23 out of 23[1]) of the trainees have succeed at the Data Science and IoT certification exams with 77% average score. The score achieved by each individual is presented at the following table.

VET program	Certification card ID	Score
Data Science	SKI 15988	71%
	SKI 15987	92%
	SKI 15989	71%
	SKI 16108	82%
	SKI 16125	75%
	SKI 16124	71%
	SKI 16057	78%
	SKI 16058	85%
	SKI 16126	71%
	SKI 16203	82%
	SKI 16059	78%
	SKI 16205	71%
	SKI 16056	78%

[1] Two of the trainees have participated in the certification exams of both programs.

Internet of Things	SKI 16054	75%
	SKI 16055	92%
	SKI 16105	78%
	SKI 16106	75%
	SKI 16107	71%
	SKI 16052	71%
	SKI 16057	78%
	SKI 16058	75%
	SKI 16053	71%
	SKI 16202	96%
	SKI 16204	100%
	SKI 16205	92%

5.1 Evaluation of Data Science and IoT certification exams

This section presents the results of the evaluation of certification exams. In total, 17 individuals have provided their feedback. The trainees have been asked to evaluate various aspects of the certification exams using a scale from 1 (Not at all/Very Dissatisfied) to 5 (Completely/Very Satisfied). The following graph depict the results obtained by computing the average values gathered by each examined parameter. The parameters evaluated was the following:

- Documents and instructions sent
- Organization of the certification procedure
- The presence of the supervisor
- The certification system
- The experience with the certification exams.

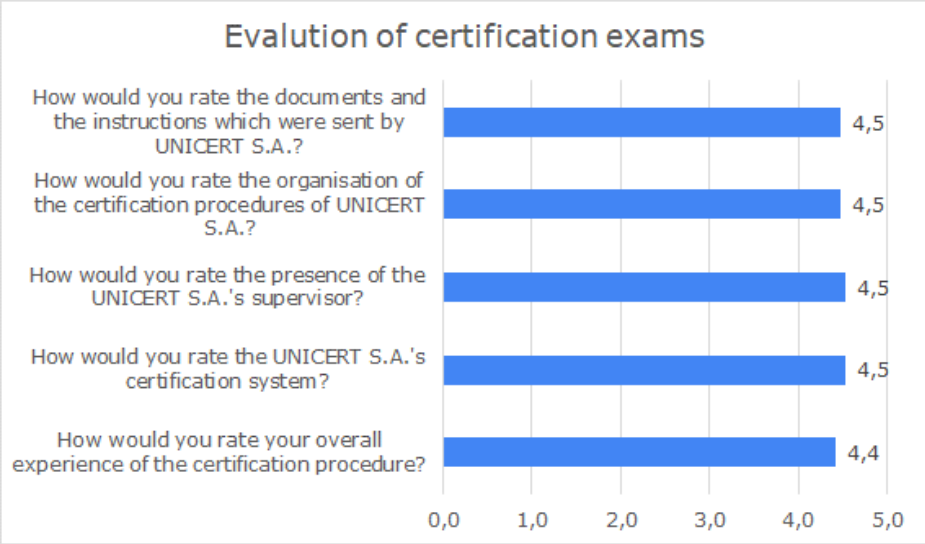


Figure 43: Evaluation of certification exams

From the graph it is depicted that the trainees are very satisfied with all aspects of the certification exams.

6 Conclusions from the pilot delivery of Data Science VET program

The overall implementation of the piloting of the Data Science VET program can be considered satisfactory given the profile of the trainees (employed professionals with work commitments) and the completion rates achieved through each phase of the training:

- 46 out of 119 trainees (38.7%) have successfully completed 103 hours of Data Science online training and received a certification of completion. The completion rate of the online courses at SEnDIng MOOC is much higher than the average completion rates (20%) observed at MOOCs provided by big brands like Harvard, MIT and Stanford.
- 42 out of 136 trainees (30%) -common among the Data Science and IoT VET programs- have successfully completed the 20 hours of transversal skills online training.
- 23 out of 23 trainees (100%) -common among the Data Science and IoT VET programs- have successfully completed the 320 hours work based learning, passed the certification exams and received the (Data Science or IoT) SEnDIng certification.

Generally speaking, the difficulties that the trainees faced due to the COVID-19 situation (e.g. due to the pandemic and to the long period employees stopped working or worked remotely, companies have gone through a phase where they had other priorities other than providing work-based training for their employees and this in many cases resulted in employees not being able to allocate enough hours to SEnDIng-related projects during the work-based learning phase) has affected their participation in the program and for this reason a drop rate is observed through the 3 phases of the Data Science VET program.

Moreover, we faced two main challenges during piloting:

- Deliver online the transversal skills training. Although the initial plan was to deliver the transversal skills training through face-to-face sessions, the COVID-19 restrictions forced us to reschedule this training and move to online sessions. The main challenge was to keep the motivation of the trainees and promote collaborative learning and the continuous interaction between the trainer and the trainees through the online sessions using various training techniques (e.g., role play, working in teams, teambuilding).

- Running work-based learning. Running the work-based learning was a key challenge faced at this phase due to the different expertise of the participating companies and moreover, due to their different culture as a consequence of different national contexts. For this reason, we run an online training for the in-company mentors who had the responsibility for guiding their trainees, while we have also provided a handbook describing all the details and methods for monitoring the work-based learning and assessing their trainees. An additional challenge has been raised due to COVID-19 given that work-based learning was adapted at the internal policies of each company with regards to the remote or on-site work of their employees.