Result 4.4
Training Energy Service Manager

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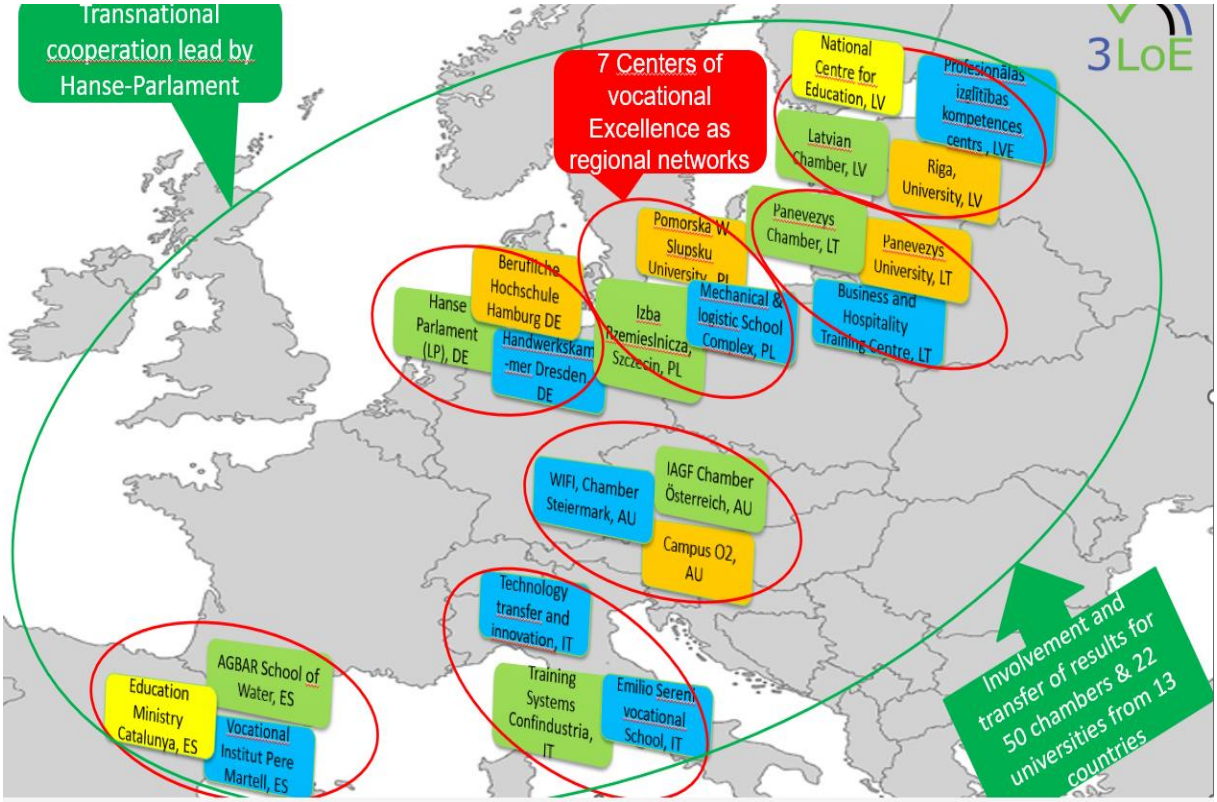

Language

English

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Project Summary and Introduction

1. About the 3LOE project

Around 99% of all EU businesses are SMEs, creating up to 70% of all jobs. In general, SMEs have good growth prospects for the future and are particularly well equipped to solve environmental problems and to enhance the green economy. However, in most of the project countries, SMEs are confronted with a shortage of skilled workers and young entrepreneurs. This shortage of skilled workers is even more alarming taking into account that due to aging of current entrepreneurs, a large and growing number of companies will have to be handed over to the next generation. Furthermore, young specialists and entrepreneurs often lack the qualifications and skills needed in order to respond to contemporary developments in the fields of energy, climate and environmental protection. The following problems have been identified in SMEs working in the fields of green economy, energy and environmental protection:

- Blatant and growing shortage of skilled workers.
- Large qualification deficits, especially in the Green Economy.
- Loss of attractiveness and low qualification of school-based VET.
- Low rates of further training and insufficient orientation of offers to SME needs.
- Ageing of entrepreneurs and increasing shortage of young people (demographic change).
- Failure of business transfers and low rates of business start-ups.
- Low innovation rates and insufficient productivity.
- Not enough cooperation between universities and SMEs and a lack of teaching geared to SME needs.
- Comparably low internationalization of SMEs and vocational training providers.
- Lack of national level support for SMEs”.

To meet these challenges, work-based learning and new paths in vocational training must be provided through cooperation between educational institutions, economic chambers and SMEs. University graduates are often well-qualified in theory, but lack practical knowledge, skills and abilities that are crucial for SMEs. For this reason, VET reforms must also involve higher education, and should implement dual bachelor's degree programs that combine a bachelor's degree with vocational training and on-sight work in companies.

In the 3LOE project, an innovative and complex project structure with 22 project partners from 7 countries as well as 60 associated partners from 13 countries was designed. In each country, centers of vocational excellence (COVEs) in Green Economy will be established, managed and their permanent continuation ensured. A transnational cooperation of the centers will be developed, extended to 60 education stakeholders from 13 countries and operated permanently in an institutionalized form. The centers will offer a wide range of dual education measures in vocational training, further education and higher education, that are being developed, tested and evaluated in the project. These educational measures on EQF levels 3-7 focus on Green Economy, Digitalization and Entrepreneurship. Furthermore, vocational and educational consulting and innovation support for SMEs will be developed and implemented. In total, seven Train-the-Trainer programs will be developed and implemented permanently by the project partners. All results will be transferred to the 60 associated partners together with implementation advice.

The objectives and aimed outcomes of the 3LOE project can be summarized as following:

1. Foundation of a three-level Center in each project country

1.1 Building the "Green Economy" skills alliance for qualifications in SMEs with educational and economic actors from the 7 project countries; development of information and cooperation tools.

1.2 Expansion of the skills alliance to the 60 associated partners from 13 countries, comprising chambers of commerce, SME associations, as well as universities of applied sciences/colleges.

1.3 Development, testing and evaluation of a curriculum and teaching materials for Train the Trainer courses for personnel and center management (vocational schoolteachers, trainers in SMEs and lecturers in further and higher education institutions).

1.4 Evaluation of the construction and operation of the seven centers of Excellence and of the transnational cooperation.

1.5 Development of business and financing plans and ensuring the long-term continuation of the seven centres and transnational cooperation.

1.6 Development, consulting and introduction of political strategy program.

2. Implementation and realization vocational training

2.1 Development and implementation of a tool for vocational and qualification counselling as well as a training for consultants and teachers to use the tool.

2.2 Implementation of the dual system, so that work-based learning is put into practice in the project countries.

Preparation and transfer of curricula and examination regulations for dual vocational training for different professions and implementations in Poland, Lithuania, Latvia and Spain.

Development, test and implementation Trainings for teachers to conduct dual vocational training as well as Training of trainers in SMEs.

2.3 Development political concept for the training and integration of young people with learning difficulties for young people with learning difficulties (EQF level 3).

Development, test and implementation of a dual vocational training "Specialist for Building Insulation”.

2.4 Development, testing and evaluation of education programme, teaching materials and examination regulations for the provision of sector-specific qualifications already during the initial vocational training for stronger learners. Implementation in the dual system, so that work-based learning is put into practice in the project countries.

2.5 Development and implementation five-year technician training „Ecologic Solutions in Logistics”.

3. Implementation and realization of further vocational training

3.1 Development and implementation of concepts and instruments for the management of continuing vocational training.

3.2 Development, test and implementation of a Train-the-Trainer program for teachers to conduct further training.

3.3 Development and implementation of a concept "SME-fair digitalization” as well as development, test and implementation of two train the trainer programs “Basic and advanced digital skills”.

3.4 Transfer and implementation of four further trainings Energy Saving and Renewable Energies.

3.5 Preparation, transfer and implementation of six further trainings in the Green Economy.

3.6 Development, testing and evaluation of different training programs and teaching material for owners, managers and qualified workers of SMEs (EQF level 5 and 6). The trainings are specifically tailored to SME needs and different qualification levels and combine the transfer of technical, professional and management know-how.

- Training Enterprise and Entrepreneurship in Green Economy
- Training Energy Service Manager
- Trainings vocational Master Carpenter and Electric
- Training Construction Technician
- Training Service Technician
- Training Sustainability in foodservice industry

3.7 Development of regulations for new continuing education occupational profiles with a focus on the green economy.

3.8 Development of an integration programme for the unemployed (EQF level 4) in order to be able to place the unemployed in permanent jobs through further training seminars and a further training qualification.

4. Implementation and realization of higher education

4.1 Preparation and transfer of curricula, evaluation and examination regulations for two existing dual Bachelor degree programmes "Management of Renewable Building Energy Technology” and "Business Administration for SMEs”.

4.2 Development and beginning of implementation of new dual Bachelor degree programs

- Business Administration & Sustainable Management of SMEs
- Entrepreneurship and Innovation in Green Economy
- Logistics - Green Supply Chains
- Service technician
- Tutorial “Sustainable management Climate neutrality for companies”

4.3 Development, test and implementation of four study modules (EQF level 6) on SME management in the Green Economy sector, which will be carried out in the dual study system and integrated into existing Bachelor degree programmes.

4.4 Development and implementation of concept for innovation promotion Solutions for manageable R&D tasks of SMEs and conducting manageable R&D projects for SMEs-

4.5 Development, testing and implementation of Training program for university lecturers and SME advisors.

5. Dissemination, transfer and use of the project results

5.1 Development of a concept and summary evaluation of the dissemination results of all partners

5.2Transfer of all educational measures to 60 educational institutions in 13 countries and needs-oriented implementation consultations as well as realization of a bundle of measures for further dissemination of the project results.

5.3 Further dissemination activities such as presentations online, at third-party events, press releases and conferences.

5.4 Book with all results of the project and distribution via book trade.

For each of the three levels of educational measures there will be:

- Target-group-specific educational programs.
- Curricula, teaching materials, etc. developed in a leading role by the educational institutions of the respective level, whereby the educational institutions of the other levels (in particular universities) participate in an advisory and supportive manner.
- Representatives of the participant target groups involved in the development work.

All educational measures will be tested with the respective target groups under different national conditions in the countries, evaluated and completed on the basis of the evaluation results with application notes.

2. About the Training Energy Service Manager

Work Package 4 of the project "Second center level Continuing vocational training" deals with the further training of owners, managers and specialists of SMEs in the energy and environmental sector. An important task in energy-efficient building refurbishment concerns the comprehensive assessment of the buildings, the development of all necessary measures, the preparation of renovation plans, the determination of costs and refinancing options through energy savings and the comprehensive advice to investors. In order to impart the necessary skills, the 3LOE project developed and implemented the professional development program "Energy Service Manager".

The further vocational training program was initially called "Building Energy Consultant" or "Energy Service Technician" when it was developed. When it was completed, it was given the name "Energy Service Manager" in order to make it clear that, in addition to many technical issues, the areas of responsibility also include business management and consulting issues.

Result 4.4 Training Energy Service Manager, which is listed below includes:

- Curriculum Energy Service Manager
- Implementation reports of the tests carried out
- Evaluation concept
- Evaluation reports

Curriculum Energy Service Manager

1. Introduction

All European countries face tremendous challenges in reaching the EU 2020 (EU) climate protection targets.[1] A comprehensive strategy, comprised of a bundle of political and economic efforts for each EU country is needed for shaping political, legal and economic framework conditions, as well as to effectively stimulate and to monitor its implementation in various respects. Across the EU countries, most of that effort relates to the reduction of climate-damaging fossil fuels in energy generation. Further efforts to reach the climate protection targets aim at raising energy efficiency and energy saving of buildings, by introducing of e.g. renewable energies. Overall, country-specific measures towards improved climate protection, improvement of energy efficiency and towards an increased use of renewable energies are generally embedded in extensive growth-oriented economic, financial and labour market policies and related further strategies.[2]

The planned training course concept focuses on targeted further training for specialists to transfer subject-specific contents on improving energy efficiency and on use of renewable energies for residential buildings. On the one hand, in already existing (often old) buildings that do not conform to modern energy standards, large-scale technical measures may show promising results in terms of high savings in energy consumption, in particular heating energy. Whereas, on the other hand, designing new buildings offers a major contribution to prevention or reduction of energy consumption. However, for older and for new buildings, it shall apply in equal measure that planning, avoiding or reducing of energy consumption shall be observed with equal care as thorough executing of the relevant measures. Advising customers, who may be highly interested in energy efficiency of their buildings, is particularly important at a preliminary stage of planning of technical solutions. Therefore, experts are required for various processes – especially for advising, planning, executing and monitoring of energy-efficient rehabilitation and construction projects.[3] The following training course concept is therefore aimed at all groups of experts who are engaged in consultation, planning, execution and monitoring processes in the field of energy-efficient rehabilitation and construction.

In the following, selected organisational and didactic elements of the course concept will be presented. In this context, further training with regards to the German *Energy consultant for buildings* will be discussed – a crucial element in designing the training concept.

- Organising the course and target groups of WB

[1] See in particular the European Commission's information on the Internet at: http://ec.europa.eu/clima/policies/strategies/2020/index_en.htm

[2] See overview of the European Union's growth efforts and the measures and strategies by countries, their strategies, including country-specific recommendations by the European Commission at: http://ec.europa.eu/europe2020/making-it-happen/country-specific-recommendations/index_en.htm

[3] See the preparation of various studies and information on all relevant experts with different focus areas of the construction sector in Germany: Eastern Europe Association of the German Business Community: Analysis of qualification needs for constructing climate-friendly buildings in Germany. Berlin, June 2016 (internal report).

Key attention in designing the training course concept is on structuring of the complex course in two parts (A and B), as well as on orienting the course towards (partly) diverse target groups. Two successive interrelated further training courses (A and B) will be designed in the project. Basically, these further training courses are targeted at those specialists and executives in companies and organisations who bear responsibility for (partly) varying tasks at different phases of a project in the field of consultation, planning, execution and monitoring of construction measures on raising energy efficiency and on the use of renewable energies.

- Compliance with the German further training course *Energy consulting for buildings* (as a reference course for the planned course)

A largely established further education for the German *energy consultant for buildings* (hereinafter also referred to as the reference course) for various professionals across several occupational groups is yet another basis for the development of the course concept.[4] These specialists/experts share, among others, in-depth vocational training and comprehensive expertise in the field of renewable energies for residential buildings. As a rule, these experts are specifically qualified, in accordance with level 6 of the German Qualifications Framework. Their professional scope and duties include dealing with measures aimed at energy-saving rehabilitation of buildings and on raising their energy efficiency. Besides the acquired professional qualifications, such professional background is regarded as an essential necessary prerequisite for the further training for the German *energy consultant for buildings*.

The course program for *energy consultants for buildings* is regulated by law which means that, upon completion, course participants are officially legally authorised to provide on-site independent consulting services for private or commercial customers. The essence of this so-called "on-site consultation" is the presentation of possibilities of energy rehabilitation in buildings based on well-founded figures, data and facts on the current energy performance of residential buildings. Consultants shall submit a well-augmented set of measures intended to improve energy performance of a building, taking into account legal and financial aspects.

The energy policy goals for saving energy and reducing CO2 emissions in Germany and Europe form the basis for establishing further training programs to train energy consultants for buildings.

Listed below are elements of the specific legal framework for rendering "on-site consultation" services in Germany, as broadly outlined above. The project partners decide whether, or in what form, such or similar legal framework conditions are to be implemented in their countries.

- In Germany, it is obligatory to pass an extensive exam for energy consultant for buildings.

[4] In the course of the German text, mostly only the male form is used in the text, when specifying persons or groups of persons (e.g. energy specialist for buildings). This is done for reasons of simplicity. In principle, all statements apply to both sexes, to persons or groups of persons.

- Officially, no consultation services to private or commercial customers are allowed without passing the exam.
- Dedicated organisations check energy consultants for buildings as to whether they are authorised to provide on-site consultation services.
- In order to ensure verification, authorisation/license is documented in a dedicated directory.
- In the German further training course program for energy consultants for buildings, ecological, technical, but also legal and economic aspects are of great relevance for on-site consulting.
- At the end of the consultation and verification process, (prospective) clients are given a concept for energy rehabilitation of an object produced by the energy consultant for buildings.
- Generally, any legal, ecological, technical and economic aspects shall be taken into account as part of the building rehabilitation concept. This also includes, e.g., information on all possible public funding – a matter always of great relevance to the client.

The variety of activities and momentum across Germany, triggered by on-site consulting was subject of research and evaluation in a dedicated study. The following results were obtained:[5]

- The German public-sponsored program for building energy consultation is a key political instrument for increasing energy efficiency in residential buildings as well as in achieving climate protection targets of the German federal government.
- On-site consulting sets important quality standards for the entire energy consulting market.
- On-site consulting for energy rehabilitation of buildings has become an essential tool for dwelling owners in planning their rehabilitation measures or for coordinating their measures sensibly, even if, besides this tool, there are many other choices with respect to energy-focused rehabilitation of buildings.
- On-site consultation services not only trigger capital investment, but also allow for funnelling investments, thus enabling a selection of higher-quality measures on cutting back energy in objects and on energy-saving, which in the long term may lead to improved energy balances and cost savings for clients.
- Clients were encouraged to allocate their investment budget in the most cost-effective manner.

Based on these findings, the involved project partners are convinced that the existing German further training course for energy consultants for buildings will be of fundamental benefit to the project partner countries. To this end, the concept of the further training to become an energy consultant for buildings (so-called on-site consulting) will

[5] See German Federal Office for Economics Affairs and Export Control (BAFA), Unit 415 (Evaluations) (Publisher): Evaluation of on-site consultation on energy saving - Final report. Ver.: May 2014, p. 27 et seq.

serve as a reference course for the further training courses A and B – yet to be developed in the project.

Nonetheless, understandably a “one-by-one transfer” or copying of the reference course by the partnering project countries will not be possible and reasonable.

Accordingly, in the following presentation of the concept and further on, in its ongoing development in the project, special attention will be particularly paid to reasonable transfer chances to the remaining project countries with regard to the German course for energy consultants for buildings as well as to the most likely modified options, eventually needed in order to design own courses A and B. The above outlined considerations constitute therefore a draft for the course concept, subject to further adjustment in the course of the project, as required by the participating project partner countries.

2. Further education target / consultant’s competencies

The key goal of the interrelated consecutive further training courses (A and B) in the project is to qualify course participants as facilitators and consultants for performing a comprehensive and holistic consultation in practical measures on avoiding and reducing energy consumption in residential buildings (raising the object´s energy efficiency). In particular, key results of such energy consulting are subject to a comprehensive preparation and summary for clients or interested parties. The consultants shall acquire the following basic competencies:

Consultant´s key competencies

1. Based on his or her essential knowledge, the consultant shall be able to collect and evaluate the actual state and to identify weaknesses in energy efficiency for an existing residential building.
2. The consultant may provide a description of the proposed measures for energy rehabilitation by producing information on how to achieve improved energy efficiency (by specifying an energy rehabilitation timetable). The consultant also advises and informs about the implementation sequence of the proposed measures and how to harmonise them.
3. Based on the proposed measures, the consultant may predict likely savings in final energy consumption, likely CO 2 emissions and likely final energy costs.
4. The consultant shall be able to determine likely additional energy-related costs.
5. The consultant may provide in one go information on the economic viability of a rehabilitation project or (in the case of a rehabilitation timetable) of the first measure, by using an appropriate key indicator.
6. The consultant shall point out further advantages related to energy rehabilitation.

Such basic competencies, which can only be acquired after attending both further training courses A and B, are next subject to further differentiation and specification, thus producing a clearer picture of the scope of the skills to be strengthened during further training.

Required competencies for the analysis of the actual condition of the building envelope and of systems engineering

1. In an energy consultation report, the consultant shall present the actual energy status of the building envelope (including pictures) and the actual state of the systems installed, as well as creates an energy balance sheet, based on collected data.
2. The consultant shall determine the data required for this purpose in accordance with recognised rules of technology or in line with calculation procedures as set out in the applicable law provisions on energy-saving.
3. For mean value formation, consultants may use data on the final energy consumption from the last three heating periods in order to match them with the final energy demand.
4. The consultant shall explain the difference between final energy demand and consumption.

Competencies in planning and designing an energy rehabilitation concept

1. In the energy rehabilitation concept, the consultant shall present how to achieve a certain energy consumption level by means of time-related measures, clearly below comparable residential buildings (without energy rehabilitation measures), in line with new high European efficiency standards for residential buildings.
2. In case if the in-house engineering system was not based on the use of renewable energies, the consultant shall submit in the form of a supplement a proposal for appropriate measures to improve energy efficiency of the residential building.
3. If introduction of renewable energies is not feasible at an economically viable cost or due to other reasons, the consultant shall comprehensibly explain it in the energy consultation report, even if the advisee (nevertheless) intends to use renewable energies.
4. The consultant shall provide information on the reduction level of final energy consumption, on CO2 emissions and on the final energy costs.
5. The consultant shall assess with a suitable parameter (e.g. amortisation period) the economic viability of all measures required for the achievement of the rehabilitation objective, based on energy-related additional costs, including an explanation of the difference to the full costs.
6. The consultant shall be able to advise on possible public or commercial funding, by characterising all relevant funding programs by type and amount.
7. The consultant shall indicate the need for a ventilation concept upon completion of the energy rehabilitation of the thermal building envelope, unless a ventilation system was already specifically included in the proposed measures.
8. In executing an energy rehabilitation project, the consultant shall point out that monitoring is necessary and reasonable. Where appropriate, he/she shall therefore indicate subsidies granted by public authorities or by other sources.

9. In the analyses, plans and documentations, the consultant shall pay particular attention to compliance with current state-of-the-art provisions as set out in the relevant German Energy Saving Ordinance (EnEV) or in comparable provisions or rules.
10. In planning an energy rehabilitation concept (creation of a so-called rehabilitation plan) the consultant may also propose a reasonable and harmonised step-by-step approach.
11. Based on a rehabilitation plan, the consultant shall present how to comprehensively rehabilitate a residential building by performing coordinated and harmonised measures (single measures vs. combination of measures).
12. The consultant may show that the selected and harmonised measures are based on construction physics, taking into account the effects on system engineering.
13. The consultant shall specify the scope of final energy reduction, final energy costs and CO2 emissions for each rehabilitation measure, based on the proposed harmonised measures.
14. The consultant shall indicate energy-related additional costs for each single rehabilitation measure.
15. The consultant shall point out the necessity of a ventilation concept upon completion of the energy rehabilitation of the thermal envelope, unless the project already included installation of a ventilation system.
16. The consultant shall stress out that monitoring of an energy rehabilitation project is needed and advisable. Where appropriate, he/she also shall draw attention to subsidies granted by public authorities or other sources.

3. Reflections on the organizational and basic content of the courses

Scheduling orientation of promotion of competence offers basically two alternative ways of achieving the desired competencies.

First possibility to promote competencies:

All above mentioned competencies provide the framework for both further training courses, which means that there is no fundamental division or separation of competencies between the two courses. Rather, in both courses’ competencies are fostered to varying degrees and intensity.

Second possibility to promote competencies:

Division or separation of competences: Generally, promotion of competencies in course A is other than in course B. Only the combination of both courses reflects the entire competency profile.

As a result of the following considerations, project partner 2 recommends a combination of both options of promoting competencies.

- Complexity of the topics and scheduling

The content to be conveyed is, to some degree, very complex and challenging in terms of further training, comprising a total of 240 hours. In order to establish competent professional consulting, essential content of the subsequent topics (1-5)[6], which is yet subject to clarification, shall therefore be axiomatically interlinked in a further training course. In the opinion of P2, promotion of basic knowledge in the further training course A (basic course) shall therefore take into account the subject areas 1, 2, 3 and 5.

- Target group (course participants) diversity

According to current knowledge, it cannot be assumed that course providers in the project partner countries can, may, or will differentiate their courses A and B according to target groups. Therefore, it is not unlikely that participants of both courses might have similar or differing educational background, professional qualifications and experience. It is, therefore, quite possible for the different participants to have varying knowledge and experience in the relevant subject areas.

Among other things, also didactic-methodological considerations suggest that it is basically reasonable to tap a variety of knowledge and experience in a complex further training program. Assuming a heterogeneous target group, it may turn out very beneficial in terms of imparting the (partly) ambitious and complex content of diverse subject areas in both further training courses, if, having a heterogeneous background, participants mutually support each other and contribute with their knowledge and experience. Already at the stage of the course A, participants’ contribution to form a common knowledge base is particularly beneficial for subject areas 1, 2, 3 and 5.

- Integrated view on the needs of the business world

The reference further training course to train energy consultants for buildings is a training that was developed mainly as an answer to meet raised market demand for systematic and comprehensive consultation. A “building” constitutes a complex object of interest, including technical, ecological, legal and economic aspects. However, in order to be able to carry out a comprehensive consultation under many technical, ecological, legal and economic aspects requires an in-depth inventory control and a comprehensive description of the existing actual condition of the building, comprising core building and installation systems as well as the electronic and electro technical framework conditions. The therefore required basic knowledge is laid down and structured in part A of the course. Given the background of the supposed diversity of the target groups and the short duration of course A (“only” approx. 80 hrs.), first and foremost the subject matter covered is related to a thorough inventory check to a compliance analysis of the actual technical situation and to legal framework conditions. Course B of the further training program will provide an in-depth insight into resultant thematic areas related to the preparation of an energy consultation report and to the demonstration of reasonable economic measures for energy saving, energy conservation and further related aspects.

From the considerations so far, it seems obvious that it advisable to structure both courses A and B similarly, as well as to convey most of the subject areas in varying

[6] See Chap. 4

intensity. Subsequently, both courses A and B are structured in the form of a basic or elementary course (approx. 80 hours) and an advanced or in-depth course (approx. 240 hours).

Upon explanation of essential basic conditions and conceptual principles, in the following sections the distribution of teaching hours as well as the content or subject areas will be specifically described, following the reference course model.

4. Elements of the curriculum

- Overview of the required topics (T) in the
  - Compact course (= further vocational training Part A)
  - Comprehensive course (=further vocational training Part B)
- Allocation of number of hours per individual topic differentiated according to further vocational training Part A and Part B
- Specification of content of the individual topics differentiated according to key topics
- PowerPoint presentations or materials for the organization of seminars differentiated according to topics and further vocational training Part A and Part B
  (Note: These presentations are separate materials in their own PowerPoint files and are not included in this document.)

Explanations

- The conceptual framework and background of the curriculum are contained in a separate report (VESTE course concept).
- The differentiation of topics is based on the differentiation of the recognized further vocational training of experts and consultants in the field of energy technologies for construction in Germany (qualification as consultant for energy technologies for construction).
- Within the framework of the project VESTE, all subjects and relevant contents for a compact course (= Part A of further vocational training) and a comprehensive course (= Part B of further vocational training) were reviewed and agreed upon by all participating project partners.
- An intensive exchange between the project partners with regards to the number of hours per topic in both parts of the further vocational training was also part of the project coordination. To facilitate the transfer of the seminar to different countries, the following range of teaching hours and average hours per topic are indicatives to be used as orientation.
- The PowerPoint presentation and materials serve as suggestions for detailed preparation of the seminar content in the courses. Due to their large size, they are not included in this document, but are prepared as separate documents. Sample tasks and examples from practice were also included in these materials or prepared didactically. Due to the high complexity of the content on specific topics (in particular, T 2, 3 and 4), more detailed information is partially available for a better understanding of the context.

- Trainers are encouraged to consider these materials as blueprints and to adapt them, in particular, to country-specific characteristics and regulations of each topic.
- For both courses/further vocational trainings, individuals with basic skills, competencies and qualifications, as well as practical experience in construction technology and energy technologies for construction qualify as participants.
- Participants of the comprehensive course (further vocational training Part B) also need to have in-depth knowledge of energy assessment of buildings considering technical, environmental and economic aspects, as the independent generation of recommendations for modernization taking into account profitability, is part of the main objective of the course.

Identification Number	Topic (T)	Scope of training continuing education A in hours á 45 min.	Scope of training continuing education B in hours á 45 min.
T 1	Legal aspects	4 – 10[7] (Ø 7)[8]	8 -16 (Ø 12)
T 2	Building envelopes in new and existing buildings	30 - 36 (Ø 33)	68 - 80 (Ø 74)
T 3	Equipment technology and renewable energy sources in new and existing buildings	30 - 36 (Ø 33)	68 - 80 (Ø 74)
T 4	Energy certificates, modernization recommendations and profitability	8 - 10 (Ø 9)	60 - 80 (Ø 70)
T 5	Electrical engineering / lighting	4 - 8 (Ø 6)	8 - 16 (Ø 12)

Overview: Curriculum key points "Energy Service Technicians" (EST)

5. Central subjects and content on topics 1 - 5

[7] This table provides an hourly range for each topic and the corresponding further vocational training Part A and Part B which is based on the results and discussions of the project partners at the project meeting in Hamburg on September 21/22, 2016.

[8] This value represents the average value of the depicted range ([min.+max.]/2), which can deviate in individual cases.

Based on the above-mentioned proposal of the German project partner, the following topics and training content of the key points of the curriculum at the TT seminar were presented and discussed. In principle it holds for the whole content, that even though European law of energy efficiency of buildings are common to all European countries, national laws and regulations in Europe are very different and not always comparable. Consequently, there cannot be a direct transfer of the proposal by the German project partner to the other project countries. Each country is in charge of developing its own content on the different topics, to ensure that especially legal, but also other, specifics (such as technical or technological ones) of the country are appropriately prepared for the target group.

5.1 Topic 1: Legal Aspects

Topic: Regulations of Energy Conservation Charter (EnEV) in practice
Training content: EnEV overview, basic concepts, requirements for new and existing buildings, preparation of energy certificates, protection and conservation of monuments, practical examples

Topic: Legal basics I:
Training content: EU Construction Directive, EU Energy Efficiency Directive, national legal norms regarding buildings and energy efficiency of buildings (in particular, EnE, EnEV, EEWärmeG, state (Bundesland) building regulations, interaction of various laws)

Topic: Legal basics II:
Training content: Other national legal requirements and standards, for Germany especially DIN V 18599, overview of DIN V 18599, energy assessment of buildings in accordance with DIN 4108/4701, assessment of thermal protection and heat consumption, interaction / references to EnEV and standards

5.2 Topic 2: Building envelopes in new and existing buildings

Topic: Energy-efficient buildings, solar construction, climate-friendly building design, heat storage capacity
Training content: knowledge of energy standards for new and existing buildings, requirements for energy efficiency of buildings, alignment and design of buildings, practical examples, interaction of technologies and buildings

Topic: Energy basics
Training content: Physical operating principles and energy coefficients, basic principles of heat and humidity protection (temperature profile of building components, Glaser diagram, user impact, thermal bridges), calculation of U values, thermal bridges, airtightness

Topic: Comparison of thermal insulation materials and systems
Training content: Building materials, properties and applications, fire protection

Topic: External, internal and roof insulation, taking into account humidity, sound and summer heat protection
Training content: Basic constructions of walls, windows, roofs, ceilings, floor coverings, measures of insulation of external components and constituent parts for unheated and partially used premises in existing and new buildings

Topic: Weaknesses of building envelopes: thermal bridges, heat losses through ventilation (high priority)
Training content: Determination, designation, calculation, and prevention of weaknesses (thermal bridges and heat losses through ventilation), taking into account the preservation of comfort by reducing drafts and cold floors by introducing restructuring measures, reducing energy losses - thermal insulation and airtightness (thermal bridges, loss of heat during transmission, heat insulation in summer, etc.) in new and existing buildings.

Topic: Wall and internal insulation (high priority)
Training content: Basics of internal insulation, taking into account thermal bridges, in particular, joints of ceilings, flooring and interior walls with external walls, examples of application for a specific country.

Topic: Basics of maintaining summer comfort / heat insulation (high priority)
Training content: Solar heat load in summer, ways of prevention.

Topic: Detailing: thermal bridges in new and existing buildings, calculation of thermal bridges
Training content: Example of calculating a thermal bridge with software and proof of equivalence.

5.3 Topic 3: Equipment technology and renewable energy sources in new and existing buildings

Topic: Energy carriers
Training content: Specific characteristics of energy carriers, energy content, pollutant emissions, primary energy value, energy costs

Topic: Overview of heating technology
Training content: Overview of heat generators available on the market, low-temperature (NT) boilers, condensing boilers

Topic: Heat accumulation
Training content: Design, dimensions, storage capacity, heat loss, system engineering

Topic: Distribution of heat
Learning content: Hydraulic systems, single-chamber systems, pump design, auxiliary energy, heat insulation and distribution of losses in distribution networks

Topic: Heat Transfer

Training content: Heating surfaces, radiators, air heaters, floor and wall heating, ceiling heating, estimation of heat output, individual room control, hydraulic adjustment, thermal comfort
Topic: Renewable energy sources
Training content: Biomass boilers, solar thermal energy, photovoltaics, fuel cells, heat pumps, combined heat and power plants (CHP)

Topic: Vulnerability analysis of heating technology
Training content: Detection, identification, and elimination of possible weaknesses in existing heating systems

Topic: Water heating
Training content: Energy assessment of various water heating systems (central, decentralized), energy advantages and disadvantages, hot water needs, energy costs and hygiene of hot water

5.4 Topic 4: Energy certificates, modernization recommendations and profitability

Topic: Economics
Training content: Options for calculating profitability (for example, considering the cost of several restructuring proposals), comprehensible presentation of profitability calculations for non-specialists (for example, private homeowners), decision support for new and existing buildings

Topic: Support of energy-efficient measures
Training content: Information on the possibilities for financing energy efficiency and use of renewable energy sources, national financing programs (for example, in Germany, through Kreditanstalt für Wiederaufbau-KfW ("The State Credit Institute" for the economy and private clients with moderate loan repayment terms))

Topic: Computer programs for energy estimation of (residential) buildings
Training content: Information on programs available on the market, review of software use (for example, presentation of advantages and disadvantages)

Topic: Consultations on low-investment ("inexpensive") measures for energy saving, efficiency improvement
Training content: Individual measures in order of profitability ("the cheapest one first"), deepening and optimization of equipment technology through control and regulation, joint sealing, ventilation and simple measures of isolation.

Topic: Issuance of energy certificates and preparation of recommendations for modernization, as well as profitability
Training content: Proposal for rehabilitation using technologically reasonable measures, demonstration of achievable energy-saving measures, practical advice, typical mistakes in issuance of energy certificates, calculations in accordance with recognized procedures, instructions for modernization recommendations (Fundamentals: building envelope / equipment technology vulnerabilities)

Topic: Energy consultation report
Training content: Development of an exemplary report that is in accordance with the minimum requirements of a consultation

Topic: Consultation skills
Training content: Transfer of consultation skills and presentation possibilities of technical contexts (sample report), preparation of presentations, leading meetings with clients

Topic: Demand / consumption balance
Training content: Plausibility check (rule of thumb!), evaluation of calculation results compared to energy consumption, calculation of consumption

Topic: Software usage
Training content: Usage of suitable software to determine relevant building data, explain differences in calculation results, implementation of various calculation methods using software for energy certificate

5.5 Topic 5: Electrical Engineering / Lighting

Topic: Electrical Engineering and Lighting
Training content: Energy-efficient lighting, use of natural lighting, lighting control, energy efficiency for representative consumers (e.g. pumps, household appliances, etc.), building automation systems, energy management, Smart House

6. Teaching Material

- Presentation: Curriculum (Overview)
- Presentation: TB 1 – Rechtliche Grundlagen Teil I
- Presentation: TB 1 - Rechtliche Grundlagen Teil II
- Presentation: Weiterbildungskursus B
- Ergänzende Rechtsvorschriften – Verordnungen für TB 1
- Presentation: TB2 - Gebäudehülle in Neubau und Bestand Kompaktversion A
- Presentation: TB2 - Gebäudehülle in Neubau und Bestand Vollversion B
- Presentation: Weiterbildung A TB 3 Anlagentechnik und erneuerbare Energien
- Presentation: Weiterbildung B TB 3 Anlagentechnik und erneuerbare Energien
- Presentation: TB4 – Energieausweis, Modernisierungsempfehlungen, Wirtschaftlichkeit Vollversion A
- Presentation: TB4 – Energieausweis, Modernisierungsempfehlungen, Wirtschaftlichkeit Vollversion B
- Presentation: TB5 – Elektrotechnik/Beleuchtung Kompaktversion A
- Presentation: TB5 – Elektrotechnik/Beleuchtung Vollversion B

The teaching material was made available in Google drive and on the project website.

Implementation

1. Implementation Report Germany[9]

Introduction

Highly energy-efficient new builds and refurbishments of residential and non-residential buildings are only possible with expert energy advice and monitoring during construction. This requires qualified planners and consultants who can develop and implement innovative construction and building technology concepts. The relevant experts are included in a standardized national energy efficiency list for federal funding programs. Listing for these funding programs is mandatory. Proof of the necessary additional qualification is provided by successfully completing specialized training courses.

Master craftsmen and technicians from certain professional groups can gain further qualifications as energy efficiency experts. The basic course (80 units) offered here, which is part of the basic module for master craftsmen and technicians, is the start of the modular qualification. The basic module (80 units) and the specialization module for residential buildings (40 units) and/or non-residential buildings (80 units) must then be completed to obtain a full qualification as an energy efficiency expert. Both the basic and in-depth modules are offered by our co-operation partner EIPOS. Details and current dates can be found at https://www.eipos.de/themenfelder/energieeffizienz.

Contents of the basic course Energy Efficiency Expert

- Part 1: Building structure and components
- Part 2: Fundamentals of building physics
- Part 3: Building services systems and their components
- Part 4: General principles (legal conditions, laws, etc.)

Length of the basic course

80 hours of training + 8 hours of examination

Target group

Course participants are master craftsmen and technicians from designated professional groups who are aiming to be listed as energy consultants and therefore want to take further modules to achieve the qualification of energy efficiency expert. Furthermore, all interested parties who want or need to use this to expand their general knowledge.

Prerequisite for participation

Anyone who is interested and has a need for further training in energy efficiency for buildings can take part. However, qualification as a recognized energy efficiency expert

[9] Prepared by Mike Seiferheld and Annegret Umlauft, Handwerkskammer Dresden

is only possible as a master craftsman, technician or as a university graduate from a relevant professional group.

Closure

Certificate of participation if you pass the exam, certificate of participation if you do not take the exam.

Special features

During the course, a course-related assignment with a final presentation must be completed.

Approval and organisation of the training

Period of realization:
09.11.2023 – 26.01.2024
Selection of participants/target group:
The seminar is generally aimed at master craftsmen and technicians from relevant professional groups.
Participants can register independently via the training centre's course portal at https://njumii.de.
The motivation for participants to register is their desire to be listed as an energy consultant. The costs for the training are either borne by the company, as the possible transfer of new tasks or the more efficient performance of current tasks creates corresponding added value for the company. Alternatively, the participant pays the training costs themselves, as they are pursuing a personal interest (e.g. they want to become self-employed). Participants must have completed vocational training in a building trade. This is because basic knowledge from one of the many different construction trades is the basis for understanding the topics covered in the course.
Participants receive comprehensive support at the Dresden Chamber of Crafts training centre. Customer support is the point of contact before the start of the course, e.g. with regard to costs, time frame, general conditions and admission requirements. After registration or at the start of the course, the course administration takes over the participant support. At the beginning of the course, they will provide comprehensive information on the general conditions in the centre and the course schedule. A welcome, information on break times, house rules and instructions are provided at the start of the course. The course administration will also answer any questions that arise at the beginning or during the course. The course comprises 80 teaching units, which are offered on a part-time basis (see teaching schedule).

Details of the lecturers
Our lecturers are university lecturers, master insulators, architects, independent civil engineers and experts with years of experience in the field of building refurbishment.
Teaching schedule

Unterrichtstageplan

Bildungsträger:	**Handwerkskammer Dresden**
Lehrgangsbezeichnung:	**Grundkurs zum Energieeffizienz-Experten**
Lehrgangsdauer:	**09.11.2023 bis 26.01.2024**
Lehrgangsort:	njumii - Das Bildungszentrum des Handwerks, Am Lagerplatz 8, 01099 Dresden

Monat Jahr \ Tag	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	Summe d. U.-Tage pro Monat	Summe d. U.-Std. pro Monat
Nov 23									8	8	8											Ft								8		4	32
Dez 23	8	8																														2	16
Jan 24											8	8	8													8						4	32
Feb 24		Pr																														0	0
																																10	80

8 -	8 h theoretischer/praktischer Unterricht, 9 bis 16 Uhr
Pr -	Abgabe Projekt und Prüfung

Realisation of the training

A concept with the curriculum of the advanced basic course was developed in advance together with the advanced training institution EIPOS (European Institute for Postgraduate Education GmbH).

The course content covers the following topics:

- Building structure and components 16 teaching units
- Building materials for shell and finishing 4 teaching units
- Building physics basics 20 teaching units
- Building services systems and their components 20 teaching units
- General principles, building laws, monument protection 20 teaching units

As a test, each participant developed and presented a project with a renovation concept. The participants had to prepare a short presentation and submit a refurbishment concept corresponding to the project for a possible application.

All participants/ examinees submitted and presented a smaller or larger project. Depending on the pre-qualification, the presentation was sometimes less good and sometimes very good. All in all, however, all participants achieved good results.

The participants were very impressed by the basic course to become a building energy efficiency consultant. This is because the course reflects information and knowledge from all areas of building refurbishment.

Main results and conclusions

The course and its content were very well received and the practical relevance to projects and building materials was praised. The implementation and communication of the learning content by the lecturers was also rated highly by the participants.

With the basic course for building energy efficiency consultants, the participants are well prepared for the basic course at the EIPOS training institute and can start their further training there with confidence.

Information from the evaluation:

The course could be advertised even more to promote an understanding of building materials in renovation.

The course should continue in the future and be refined through constant dialogue. The target group continues to be construction companies, building technology firms and planning offices. Furthermore, more plastic materials could be used to increase the practical relevance.

2. Implementation Report Lithuania[10]

Introduction

The training is classified at EQF level 4 in the national system of continuing vocational training.

Invitation to participate in the training was disseminated by emails, project newsletters and via Chamber website.

A group of 14 participants was formed including 5 business owners or managers and 9 employees of the companies from various sectors of economic activity. The training was attended by representatives of the companies that had an interest in improvement of energy efficiency and use of renewable energies in buildings.

Participation in the training required at least basic competences, skills and practical experience

in the area of construction technology and energy technologies for construction.

Participants profile and organisation of the training

Number of participants: 14, the signed list of participants is attached to this report.

Participating SMEs represented the following sectors: construction, real estate development, engineering and maintenance services, production of solar panels, heat supply services, manufacture and trade of equipment, etc.

The training was carried out according to the Curriculum “Energy Service Manager”. The content of the curriculum was modified and adapted according to the country-specific context (mainly the topics on legal requirements, directives and regulations related to energy efficiency of buildings as well as national funding programmes).

The main topics covered included the following:

- Legal aspects.

- Building envelopes in new and existing buildings.

- Equipment technology and renewable energy sources in new and existing buildings.

- Energy certificates, modernization recommendations and profitability.

- Electrical Engineering / Lighting.

Implementation of the training was organized on part-time basis, one 3-hour afternoon class a week. The total scope of the training - 78 hours (compact course A).

In addition to the two main trainers, volunteer experts were also invited to provide practical consultations to the participants on different aspects of energy-efficient refurbishment and construction.

[10] Prepared by Panevezys Chamber of Commerce Industry and Crafts

The methods used included lectures, discussions, group work and case studies.

Main findings and conclusions

The participants have stated that general conditions, the overall content of the training course was good or very good. They gained new valuable insights and practical knowledge during the training. The participants were happy they had received practical information and personalised tips from the experts on how to identify the existing weaknesses of different engineering systems of the buildings and use technically reasonable measures to improve them. The group members were also able to compare different energy saving alternatives, exchange ideas and experiences with specialists from other companies. All participants said they would be able to use the gained knowledge in the future.

The curriculum „Energy Service Manager" is well prepared, clearly divided into parts with detailed description. If needed, the training can be adapted to country-specific context and modified taking into account specific needs of the participants, their previous experience and knowledge.

The training can be used by PP8 as the guidelines for organising future longer trainings or separate shorts seminars on the topics of energy efficiency.

3. Implementation Report Italy[11]

General Course Information

The course ran from Tuesday, October 3, 2023, to Tuesday, March 19, 2024. It was attended by twenty-three (23) participants. These individuals are from construction companies in the Verona area (Veneto, Italy) and occupy various administrative, operational, and construction site management roles within their organizations.

Their job responsibilities within the companies are diverse and include general management activities (administration, accounting, safety management, technical organization of production) and field verification tasks (site inspections for verification and coordination of the execution of construction works). They all share involvement in the construction production process, ranging from project analysis, scheduling, and verification of execution works, to certification and testing of the completed works.

The training sessions: twenty-three (23) meetings were held and were conducted in three different formats:

→ Interactive classroom lessons (18 meetings), where instructors presented the assigned content contextualized specifically to construction production, engaging students in a discussion/comparison to analyze the application of these contents to their specific company realities.
→ Site and company visits (2 meetings), where practical implementations of construction organization and production previously discussed during the lessons were observed.
→ Project work activities (3 meetings) coordinated among the students to simulate a specific corporate collaboration activity.

Each meeting had a standard duration of 4 hours. The total number of hours dedicated to direct activities with the students was 92. The average attendance during the lessons was 85%, peaking at 96% attendance, with a single session towards the end of the course having a low of 57%.

Given their professional backgrounds in construction production, these data demonstrate the great interest and involvement of the students, who only missed a few sessions due to specific company needs.

Customization of Content

The content provided in this training and in-depth study course was developed from the original project. It was organized according to the following general topics:

- T1 - Legal Requirements;
- T2 - Building Envelope for New and Existing Buildings
- T3 - Systems and Renewable Energies for Existing and New Buildings
- T4 - Energy Certification, Modernization Recommendations, and Efficiency Improvements

[11] Prepared by Trasferimento Tecnologico e Innovazione Scarl

The content matrix prepared by the training project offered us the opportunity to customize the content by focusing on aspects most effective for the companies involved.

Before the course began, a preliminary consultation was held with the management of the construction companies from which the participants were drawn. This consultation allowed us to tailor the training path.

All the content and activities conducted during the course were reformulated from the builder's perspective. The goal was to provide and strengthen specific skills of the participants across all key aspects necessary for understanding the project, the technological solutions it includes, and the managerial organization of its practical execution.

Another important aspect of customization involved building coordination bases among different companies to promote collaborative processes between them and with their respective supply chains.

As stated at the outset, the people who participated in the course come from construction companies operating in the area, each with its own areas of specialization. Within the activities carried out, space was also given to the evaluation and analysis of cooperation processes among the different construction companies.

GENERAL TOPIC	**SPECIFIC LESSON TOPIC**
T1 - Legal Requirements	General notions on contract works according to Italian regulations
	Legal bases for managing efficiency contracts in private tenders
	Legal bases for managing efficiency contracts in public tenders (GPP / CAM)
T2 - Building Envelope for New and Existing Buildings	Weak points of building envelopes: thermal bridges, heat losses through ventilation Insulation of walls and interiors Basic notions on maintaining summer comfort / thermal insulation Detailed analysis: thermal bridges in new and existing buildings
	Implementation of efficiency projects: analysis and management of realization costs
T3 - Systems and Renewable Energies for Existing and New Buildings	Overview of heating equipment Analysis of vulnerabilities in heating technology Overview of ventilation systems, heat recovery, controlled residential ventilation (KWL) for residential use Control technology for heating and residential ventilation systems
T4 - Energy Certification, Modernization Recommendations, and Efficiency Improvements	Transfer of consulting skills: AGILE

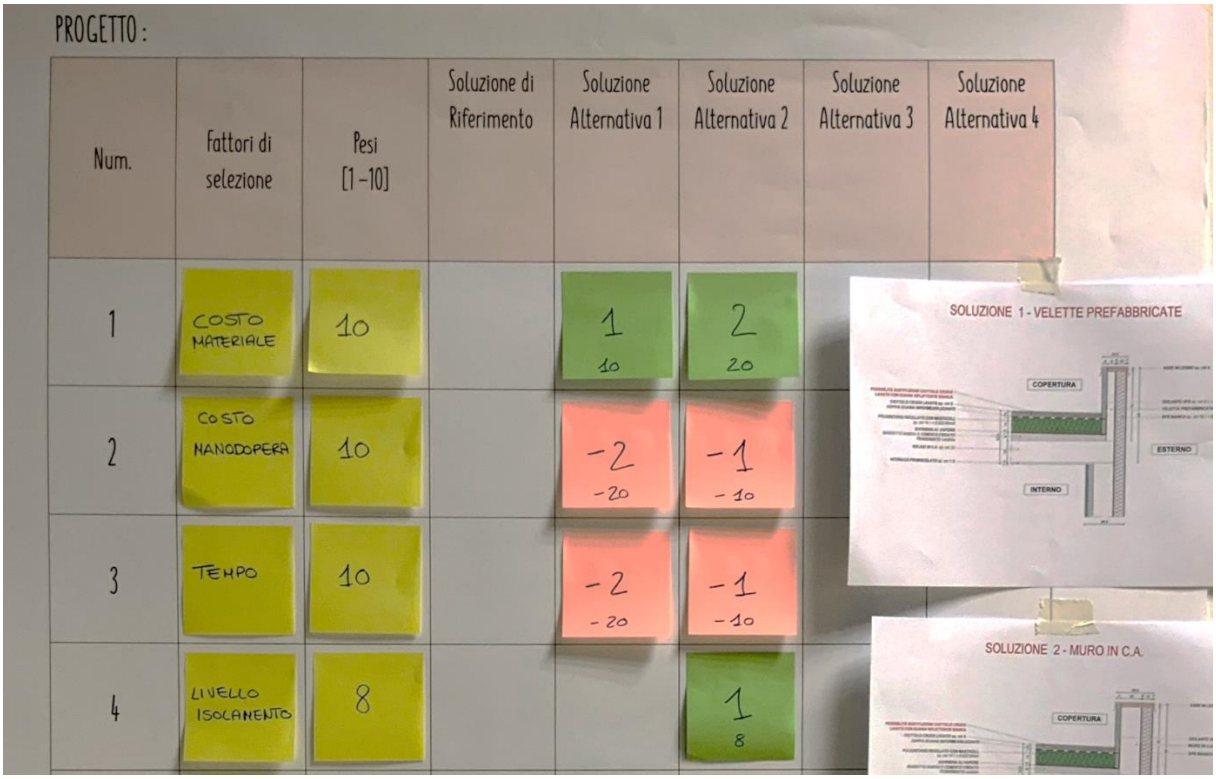
GENERAL TOPIC	**SPECIFIC LESSON TOPIC**
	Market analysis and comparison of interventions Transfer of consulting skills: presentations in technical contexts and conducting meetings with clients
	Issuance of energy certificates and preparation of recommendations for modernization Software programs for energy estimation of residential buildings Use of appropriate software to determine relevant construction data Comparison of requirements and consumption analysis
	Economic balance analysis Options for profitability calculation, decision support for new and existing buildings
	Traditional and innovative financing sources to support energy efficiency

Project Work

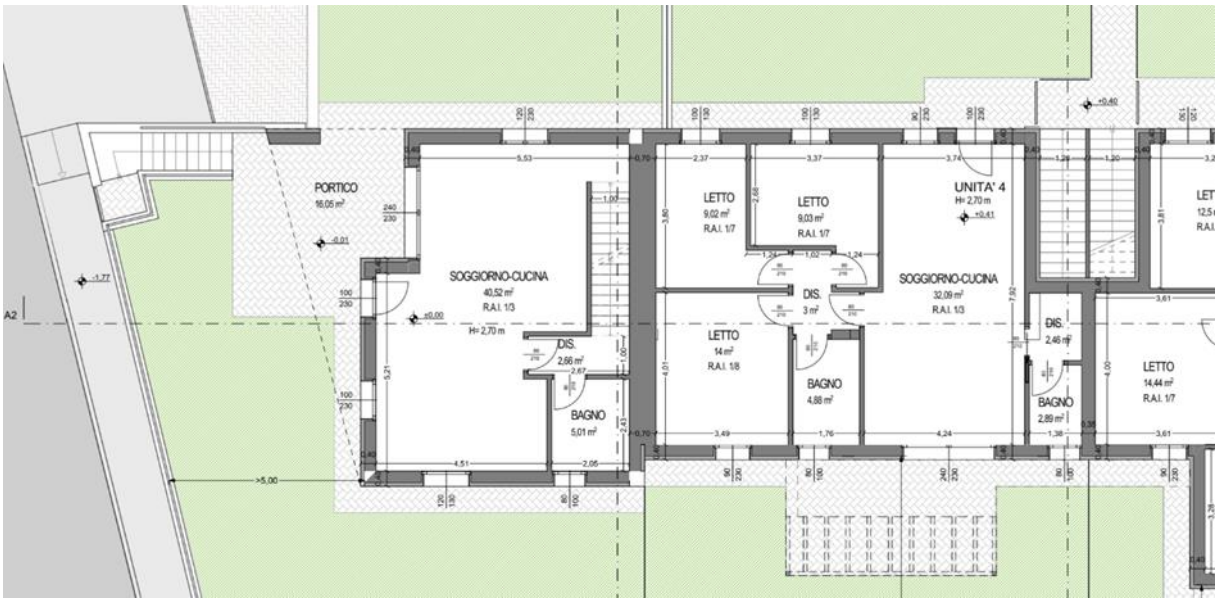
As mentioned at the outset, one of the most compelling aspects of this course was the desire of the group of involved companies to explore and experiment with cooperation dynamics among themselves. Acknowledging their corporate structure and what distinguishes them in their field (types of services offered, sectoral specializations, technical staff, and equipment in their company workforce, etc.), their ambition was to seek an effective collaboration methodology aimed at optimizing work, reducing costs, and making the construction production process more effective and efficient.

To achieve this, BIM (Building Information Modeling) tools for design and AGILE organizational methodologies were used to study and coordinate the work to be carried out.

The entire project work focused on organizing the execution of a construction project in coordination among the companies. Another highly valuable aspect was that the course time was utilized for training in the use of the mentioned design and organizational methodologies (BIM / AGILE). After the training period, this project became the first practical test of concrete and effective cooperation among the companies: it is currently being executed.



The final phase of the project work was thus implemented on this single project: the construction of a residential building located in Castelnuovo del Garda (VR), on Igino Nicolis Street.



As seen in the attached documentation, the participants were provided with real and detailed project plans for the work to be carried out and, with the assistance of the instructor, set up and scheduled the execution using the AGILE methodology. The decision to work on a single project was intentional to initiate the experimental collaboration among the companies. The goal was to build an effective and realistic simulation experience of the work to be executed, focusing on this single case. As noted in the

SWOT analysis at the end of this document, this was very effective for many but of less interest to the technicians from companies not directly involved in the subsequent execution in progress.

This entire activity was made possible thanks to the territorial coordination of ANCE Verona (National Association of Building Contractors – Verona Section - Veneto, Italy), which brought together the companies and created the connections among the technicians.

SWOT Analysis of the Training Program

During the classroom activities, continuous feedback and monitoring with the participants were conducted to refine the teaching methodologies in place, gathering opinions and customization requests.

Below is a summary of the collected insights.

	HELPFUL	HAMFUL
	STRENGHTS	WEAKNESSES
INTERNAL ORIGIN	The course was tailored with input from the participants' companies. The instructors were all field professionals capable of addressing their topics by illustrating practical implementation. Specific cases related to the construction companies of the participants were addressed.	Participants' inability to fully attend the course due to work commitments. In the simulated practical implementation, reducing the group size to create more projects and obtain a more representative sample of the real work environment.

4. Implementation Report Latvia[12]

Main information about course

Further Vocational Training Energy Service Technicians. 15 participants took part in the training who are active employees or self-employed in energy sector companies.

Although the project has not completely solved the industry's labor force problems, the goals of the planned activity have been achieved by training 15 field employees in order to remedy the lack of experts for the comprehensive assessment of energy-related building refurbishment. With previously tested curricula and their comprehensive content, a curriculum of 80 academic hours has been implemented, certificates have been issued.

Duration of training courses: 3.-7., 10.-14. June, from 10:00 am – 4:00 pm

Agenda (80 academic hours). To implement the training, the curriculum Further Vocational Training for Energy Service Technicians (VESTE) part A is used, practical skills are acquired in real working conditions by executing customer projects.

Topic (hours)
T1 Legal Aspects (4h)
T5 Electrical Engineering and Lighting (4h)
T2 Building envelopes in new and existing buildings (32h)
T3 Equipment technology and renewable energy sources in new and existing buildings (32h)
T4 Energy certificates, modernization recommendations and profitability (8h)

Curriculum topics

3. June - Day 1

Time	**Topic (hours)**
	T1 Legal Aspects (4h)
10:00 am	Legislative requirements for the industry
	EU Construction Directive, EU Energy Efficiency Directive, national legal norms regarding buildings and energy efficiency of buildings
1:00 pm	Lunch
2:00 pm	**T5 Electrical Engineering and Lighting (4h)**
	Energy-efficient lighting, use of natural lighting, lighting control, energy efficiency for representative consumers (e.g. pumps, household

[12] Prepared by: Liepaja State Technical School

	appliances, etc.), building automation systems, energy management, Smart House. Installation of power and lighting electrical networks.

4. June – Day 2

Time	Topic (hours)
	T2 Building envelopes in new and existing buildings (32h)
10:00 am	Energy-efficient buildings, solar construction, climate-friendly building design, heat storage capacity.
1:00 pm	Lunch
2:00 pm	Energy basics. Physical operating principles and energy coefficients, basic principles of heat and humidity protection. Basic processes of electric power and types of electrotechnical works.

5. June – Day 3

Time	Topic (hours)
	T2 Building envelopes in new and existing buildings (32h)
10:00 am	Comparison of thermal insulation materials and systems. Building materials, properties and application, fire safety.
1:00 pm	Lunch
2:00 pm	External, internal and roof insulation, taking into account humidity, sound and summer heat protection. Installation and setup of renewable energy equipment.

6. June - Day 4

Time	Topic (hours)
	T2 Building envelopes in new and existing buildings (32h)
10:00 am	Weaknesses of building envelopes: thermal bridges, heat losses through ventilation. Methods of determining swellings, types of calculations.
1:00 pm	Lunch
2:00 pm	Drawing up a plan of the planned measures and evaluating the long-term usefulness of thermal insulation and hermeticity (thermal bridges, heat loss during transmission, thermal insulation in summer, etc.) in new and existing buildings.Completing the electrotechnical documentation.

7. June - Day 5

Time	Topic (hours)
	T2 Building envelopes in new and existing buildings (32h)
10:00 am	Wall and internal insulation (high priority). Basics of internal insulation, taking into account thermal bridges, in particular, joints of ceilings, flooring and interior walls with external walls, examples of application for a specific country.Electrical safety in operational works.
1:00 pm	Lunch
2:00 pm	Basics of maintaining summer comfort / heat insulation (high priority).
	Detailing: thermal bridges in new and existing buildings, calculation of thermal bridges. Electrical safety in assembly works.

10. June - Day 6

Time	Topic (hours)
	T3 Equipment technology and renewable energy sources in new and existing buildings (32h)
10:00 am	Energy carriers. Specific characteristics of energy carriers, energy content, pollutant emissions, primary energy value, energy cost.
1:00 pm	Lunch
2:00 pm	Princips of electrical engineering and electrical measurements.

11. June - Day 7

Time	Topic (hours)
	T3 Equipment technology and renewable energy sources in new and existing buildings (32h)
10:00 am	Overview of heating technology. Overview of heat generators available on the market, low-temperature (NT) boilers, condensing boilers. Heat accumulation. Design, dimensions, storage capacity, heat loss, system engineering.
1:00 pm	Lunch
2:00 pm	Selection of goods and services for assembly works.

12. June- Day 8

Time	Topic (hours)
	T3 Equipment technology and renewable energy sources in new and existing buildings (32h)
10:00 am	Distribution of heat. Hydraulic systems, single-chamber systems, pump design, auxiliary energy, heat insulation and distribution of losses in distribution networks.Construction of electrical networks and organization of works
1:00 pm	Lunch
2:00 pm	Heat Transfer. Heating surfaces, radiators, air heaters, floor and wall heating, ceiling heating, estimation of heat output, individual room control, hydraulic adjustment, thermal comfort.

13. June - Day 9

Time	Topic (hours)
	T3 Equipment technology and renewable energy sources in new and existing buildings (32h)
10:00 am	Renewable energy sources. Biomass boilers, solar thermal energy, photovoltaics, fuel cells, heat pumps, combined heat and power plants (CHP).

	Vulnerability analysis of heating technology. Detection, and elimination of possible weaknesses in existing heating systems. Connecting and setting up electrical machines and equipment.
1:00 pm	Lunch
2:00 pm	Water heating. Energy assessment of various water heating systems (central, decentralized), energy advantages and disadvantages, hot water needs, energy costs and hygiene of hot water.

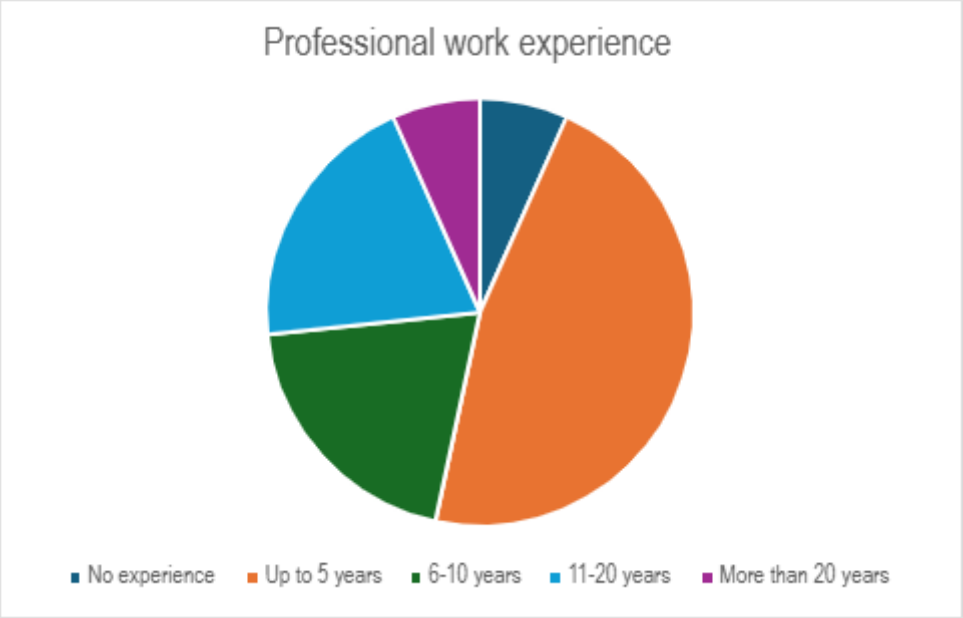
14. June - Day 10

Time	**Topic (hours)**
10:00 am	**T4 Energy certificates, modernization recommendations and profitability (8h)**
	Economics
	Support of energy-efficient measures
	Computer programs for energy estimation of (residential) buildings
	Consultations on low-investment ("inexpensive") measures for energy saving, efficiency improvement.
	Issuance of energy certificates and preparation of recommendations for modernization, as well as profitability
1:00 pm	Lunch
2:00 pm	Energy consultation report
	Consultation skills
	Demand / consumption balance
	Electrical equipment assembly works and their organization
4:00 pm	Conclusion, issuance of certificates

Evaluation report

By consulting with employers and those working in the energy sector, the best solutions were found for the implementation of the training. The topics of the curriculum should be conducted in a concentrated manner within 2 weeks, practical matters being implemented accordingly in the implementation of the client's projects. Training course instructors are practicing experts in the field to provide a base of both theoretical and practical examples.

At the end of the course, a survey was conducted, asking questions and receiving a rating, which is summarized below.



The participants of the training course provided feedback on both organizational and content questions, giving answers in gradations from strongly disagree to strongly agree. Accordingly, converting the point system from 1 to 5, the results are as follows.

No.	**Question/ criteria**	**Average rating**
1.	The location (auditorium, technical equipment, etc.) was suitable for the course	4,4
2.	The training time and schedule were appropriate	4,1
3.	The topics and questions discussed were relevant and corresponded to the learning objectives	4,3
4.	During the training, the instructors explained well the topics of the lessons, additional questions, experiences and current events that arose during the course	4,4

5.	Sufficient time was allocated to each course topic	4
6.	I gained valuable knowledge from the lessons and the examples presented by the lecturers	4,2
7.	I believe that I can use the knowledge gained in the courses in my future career	4,1
8.	I can use the new skills and knowledge in my professional activities, for example, advising clients/students	4

After summarizing the average rating, it can be seen that it is in the range of 4 - 4.4. Depending on the experience and each participant's expectations about the training course, the overall feedback is positive, without significant reprimands or suggestions for improvement, the theoretical content of the course is appropriate for the needs of practical work.

Evaluation

1. Concept

1.1 Introduction

The objective of the evaluation is to determine whether the goals of the program will be achieved in the implementations evaluated, and how the program has impact on student’s career and opportunities.

The type of the evaluation follows standard course evaluation methods, i.e. formative, process and outcome evaluation, the latter only partial: The formative evaluation will pro-vide feedback to the curriculum designers, developers and implementers to ensure that de-signed and implemented courses really meets the needs of the intended audience, i.e. assure or improve the quality of program. The planned duration of the course varies depending to the educational level and purposes. Each lesson lasts 45 minutes.

Methods used in lessons will be lectures, teaching talks, working in small groups, case studies and examples from real world. Material used during the teaching consists of e.g. in-formation material (basics & backgrounds, thematic introductions etc.), presentations, questionnaires, question guides, checklists, analysis results, good practice examples and so on. Course should contain at least following issues: Basics/overview of essential tasks and con-tents of business-oriented and productivity-enhancing measures in circular economy and workplace innovation (in each of the courses).

1.2 Main terms of the evaluation

Evaluation will answer to the following questions:

a. Were the goals and objectives suitable for the audience?

b. Were the training methods and course materials appropriate for the audience?

c. Should the program or some part of it be developed further and how?

d. What additional information would be beneficial for the development of the program, facilities, and timing.

The process of the evaluation will provide information about the training and lectures:

- Process of the evaluation will be focused on procedures and actions used to produce results.
- Evaluation process is supposed to take place during the training delivery and at the end of the training.
- The co-organizer (Responsible for the course) will:
- monitor the training.
- describe the training process as a whole and record the findings into the written report.
- The outcome of the evaluation tries to find out how the knowledge, attitudes, and behaviors of the audience developed.
- It takes a long time to find out the outcomes of the education and training, so in this stage only the main topics will be assessed.

The evaluation process will be as follows:

- Questionnaires will be suggested by RSU and discussed with organizers of the training before the training starts.
- The questionnaires in a digital form will be applied.
- The co-organizer (responsible for the course) will suggest fulfilling the questionnaires available to the participants to be filled in before leaving the course and on-line.
- The purposes of the questionnaire and how the data will be used should be explained clearly to the participants. This will help to improve the response rate and encourage them to make comments that can be useful to improve future programs.
- The evaluation approach will be based on a combination of qualitative and quantitative methods.
- The Microsoft Excel package will be used to transcribe the feedback and interviews.
- Open questions will be categorized, and qualitative analysis of the groups will be done.

1.3 The evaluation procedure

Semi-structured questionnaires will be suggested to the participants (ANNEX A). Different topics [topic no. 1, topic no.2 etc.] should be proposed by the organizers of the training ac-cording to the program for the training or parts of the course.

It is recommended:

1) Co-organizer (Responsible for the course) fills in all required information:

- the Name of the school / institution.

- the Title of the evaluated course and the number of the workshop (1st / 2nd) in the beginning of the questionnaire to make sure that the ‘identification data needed in the evaluation is correct.

Semi-structured questionnaires will be created for the leaders of the training/course - trainers / lecturers / teachers) (ANNEX B).

It is recommended:

1) Co-organizer (Responsible for the course) fills in all required information:

- the Name of the school / institution.

- the Title of the evaluated course and the number of the workshop (1st / 2nd) in the beginning of the questionnaire before printing it to make sure that the identification data needed in the evaluation is correct.

2) Time for the survey (approx. 10 minutes) will be allocated in the end of each workshop.

3) In the beginning of the course the co-organizer (Responsible for the course) will inform participants about the evaluation and its importance for further development actions.

4) The co-organizer (Responsible for the course) will make the link to the questionnaires available to the participants to be filled in before leaving the workshop. The purposes of the questionnaire and how the data will be used should be explained clearly to the participants. This will help to improve the response rate and encourage them to make comments that can be useful to improve future programs.

Note: Survey for participants will be conducted twice, in the end of both workshops!

5) The participants complete the questionnaires and return them to the co-organizer.

6) The co-organizer distributes the lecturer`s questionnaire to each lecturer to be compiled immediately after his / her part of the course has been finished.

Note: If the lecturer teaches in both workshops, he / she completes the questionnaire twice!

7) In the end of the learning on the job -phase, representant of each enterprise involved in the training will be interviewed by the co-organizer. Guidelines for the interview will be found in appendix C. Interviews can be conducted face to face or via Skype, Microsoft Teams or e-mail, some examples to be given.

8) The co-organizer collects the questionnaires and answers of interviews and deliver them to the evaluator. If there are free speech answers in some other language than English, it is recommendable that the co-organizer translates them to English.

9) The evaluator compiles all feedback and summarizes written analysis on the evaluations.

The evaluation approach will be based on a combination of qualitative and quantitative methods. The Microsoft Excel package will be used to transcribe the feedback and inter-views. Open questions will be categorized, and qualitative analysis of the groups will be done.

1.4 Content of the final evaluation report

The final evaluation report will discuss the following issues:

Did the curriculum reach the targets?

How well was the knowledge creation and sharing realized?

Did the participants assimilate knowledge and tools?

Was the venue and equipment appropriate for the training course?

What kind of further development will be needed, if any?

1.5 Annex

ANNEX A

Questionnaire for participants of the

……..course

Please mark with a cross where applicable

Gender	Female		Male	
Age	<50		>50	
Workplace	Education		Business	

Please mark the scale that applies to your opinion on the following aspects of the training that you participated.

1. **Please indicate in which training course you participated**
    - **……**
    - **……..**
    - **……..**
    - **……..**
2. **What is your background?**
    - I am a company owner/manager
    - I am a company employee
    - I am a student/trainee
    - Other (please indicate)
3. **Please rate the general conditions of the training course**
    - **The facilities (location, room, online tool etc.) for the training course were suitable**

Scale:

1=Strongly disagree
2=Disagree,
3=Neither disagree nor agree,
4=Agree,
5=Strongly agree

- **The time frame and schedule for the training course were suitable**

Scale:
1= Strongly disagree,
2=Disagree,
3=Neither disagree nor agree,
4=Agree,

5=Strongly agree

- **Comments**

4. **Please rate the overall content of the training course**

Scale:
1= Strongly disagree,
2=Disagree,
3=Neither disagree nor agree,

4=Agree,
5=Strongly agree

In common					
The topics and issues covered were relevant and responded to the goals of training	1	2	3	4	5
The lecturers explained topics of the lessons, additional questions, experiences, and topical issues arisen during the course well	1	2	3	4	5
There was enough time scheduled for each topic	1	2	3	4	5
I gained valuable knowledge from lessons and examples presented by lecturers	1	2	3	4	5
I believe that can apply knowledge gained from lessons and use it in my future career	1	2	3	4	5
I can use new skills trained and knowledge gained in my future career, e.g. when consulting my clients	1	2	3	4	5
Comments concerning the common issues					
5. What was most interesting for you during the training course?					
6. What could have been done better? (E.g. was some topic missing or unnecessary)					
7. Would you recommend the course to someone you know? If not, why not?					
8. Was anything missing that you might need in your (future) profession life ?					
9. Was the proportion of topics and time frame of the training course content suitable or should some parts be increased/decreased?					
10. Is there any other feedback on the training course you would like to share					

Thank you for your answers! Please press "done" to submit the survey!

ANNEX B

Questionnaire for lecturers of the …….. course

Dear Lecturer,

Thank you for taking your time to evaluate a training course, that was developed and tested as part of the Erasmus+ project "3LOE". This survey is anonymous and will take 5-10 minutes.

1. **Please indicate which training course you were lecturing**
   - title of the course
   - title of the course
   - title of the course
   - title of the course
   - Other, please indicate

2. Please indicate how many years of experience in teaching you have

- **Less than 2 years**
- **Between 2 and 5 years**
- **More than 5 years**

3. Please rate the general conditions of the teaching during the training course

Scale: 1= Poor, 2=Satisfactory, 3= Good 4=Very good, 5=Excellent

- The facilities (location, room, online tool etc.) for the training course were...
- The time frame and schedule for the training course were...
- The curriculum provided was...
- The background knowledge of the training participants was...
- The motivation of the training participants was...

Comments

4. Please rate the overall content of the training course

Scale: 1= Poor, 2=Satisfactory, 3= Good 4=Very good, 5=Excellent

- The overall content of the training course was...
- The way the content responded to the needs and goals of the training participants was...
- The relevance of the training course content for the overall qualification was.

Comments:

1 What could be done better? (e.g. was some topic missing or unnecessary)

2 Is there any other feedback on the training course you would like to share?

Thank you for your answers! Please press "done" to submit the survey.

ANNEX C

Questionnaire for interviews of enterprises

…… course

Date ___/___/2022___ Course_____ Enterprise _____

The interviewer will ask the following questions from each enterprise's representative.

1. Schedule: Was the schedule of theory and practice in line with the company's needs? Are you satisfied with the schedule and order of topics?

2. Content: Did the training contain topics and issues needed in your business? Was something missing? If is, please write what in your opinion was missing?

3. Implemented project: Did the project, implemented during the learning at the job -phase, achieve the goals set to it? If not, what remained incomplete?

4. What could have been done differently? And what should not be changed?

Thank you for your answers!

2. Report[13]

2.1 Introduction

The objective of the evaluation is to determine whether the goals of the program were achieved and does the teaching instrument has an impact on student's career and opportunities.

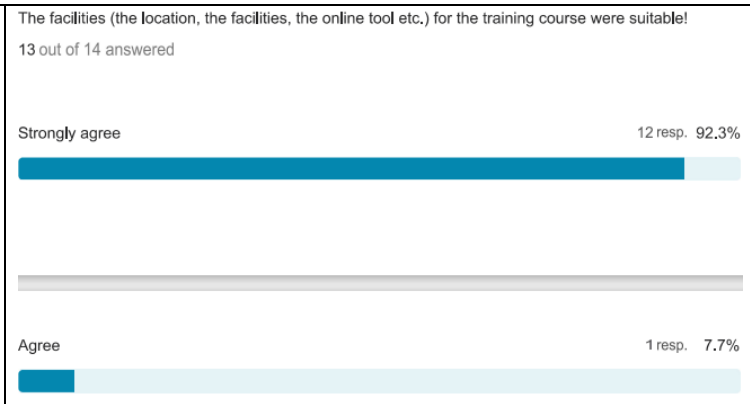
The type of the evaluation follows standard course evaluation methods, i.e. formative, process by analyzing feedback surveys (see annex no. 1-6) to ensure that designed and implemented training really met the needs of the training participants, i.e. assure or improve the quality of program.
Feedback surveys were designed to collect data from training participants and teachers of the course. Respondents were asked to fill in online survey designed in typeform.com platforms. Feedback surveys were filled in just after the finalization of the training following the invitation of training organizers. The organizers of the training have clearly explained to respondents' purposes of the feedback survey and further usage of data collected. The participation in evaluation by filling in the online feedback survey was voluntary.

51 training participants have submitted their feedback. The gender representation: female 1%, male 99%. Age groups: 50 or younger – 82%, below 50 – 18%.

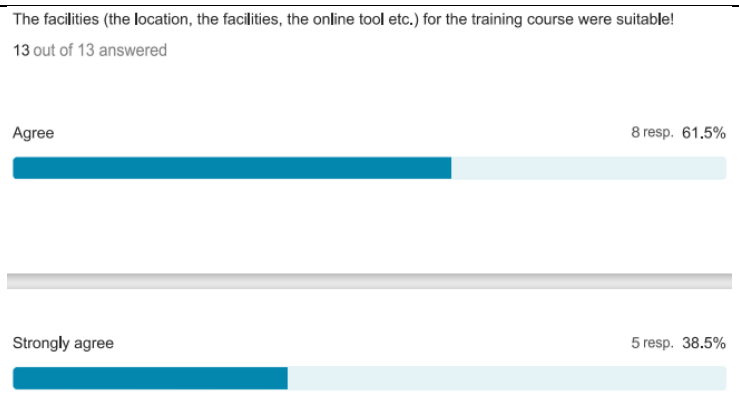
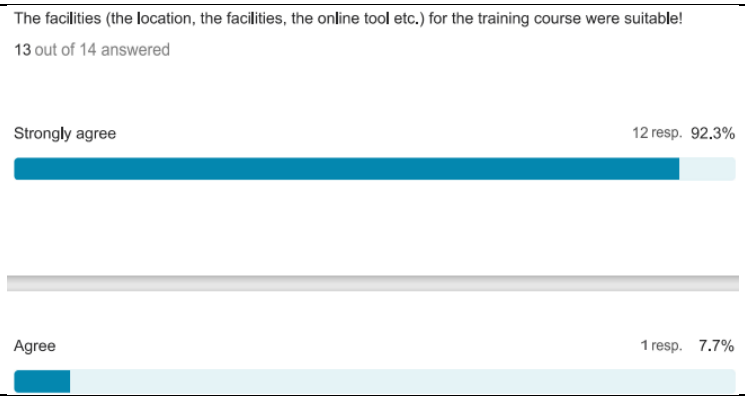
2.2 Results

FEEDBACK FROM PARTICIPANTS

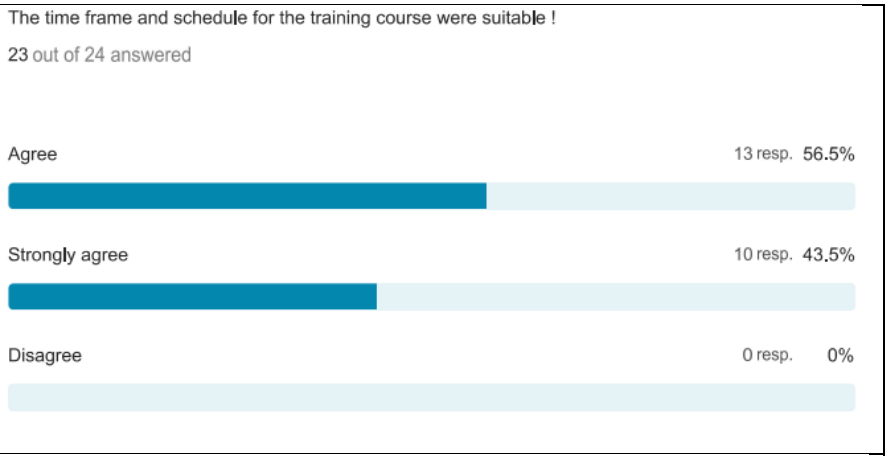
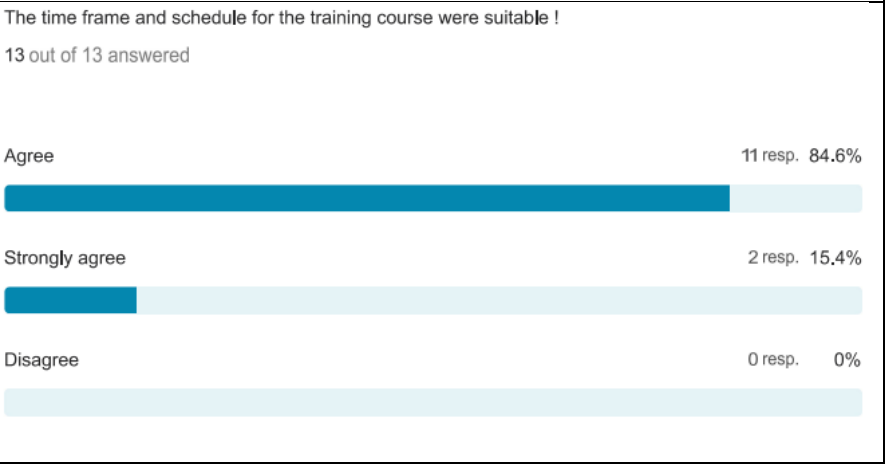
Evaluation of facilities represent in average satisfactory level:

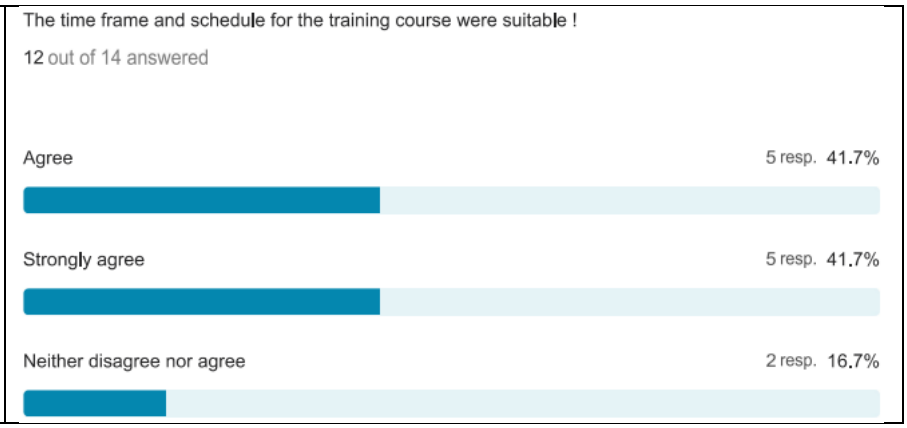
Group no.1 PP16 T2I	

[13] Prepared by Riga Stradiņš University representatives Prof. Tatjana Muravska, Dr.adm. Sergejs Stacenko, Mg.iur, PhD cand. Liga Sileniece

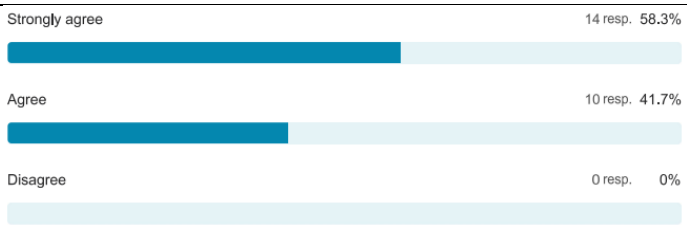
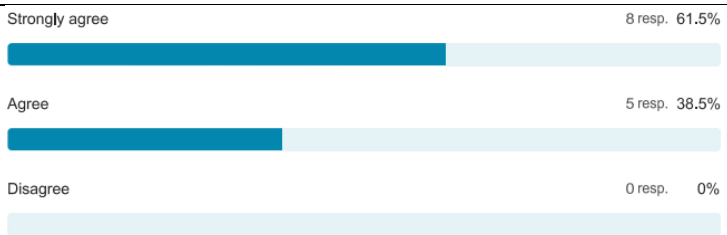
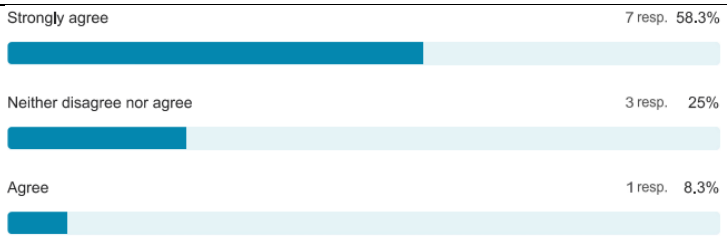
Group no. 2 PP8 PCCIC with PP9 PC	
Group no. 3 PP2 HWKD	

Evaluation of time frame and schedule represents in average satisfactory level:

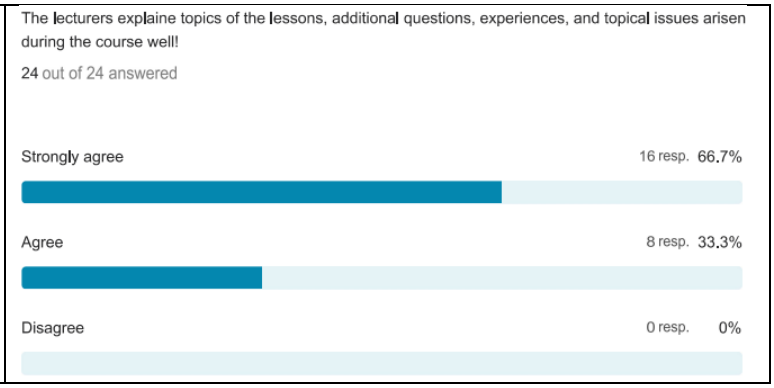
Group no.1 PP16 T2I	
Group no. 2 PP8 PCCIC with PP9 PC	

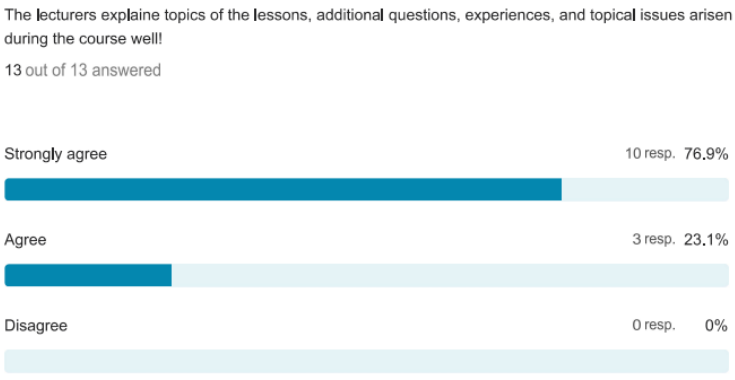
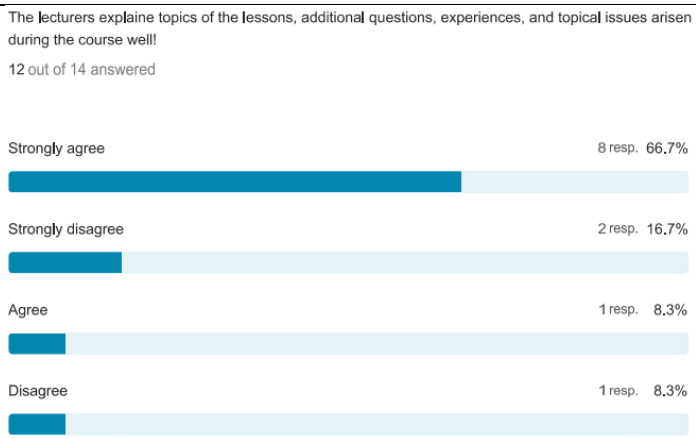
Group no. 3 PP2 HWKD	

Evaluation of relevance of the topics and issues represents in average satisfactory level:

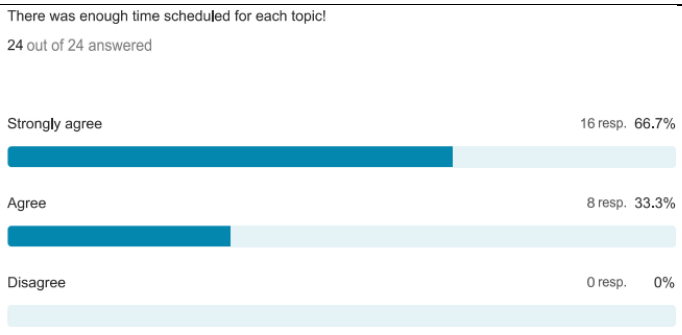
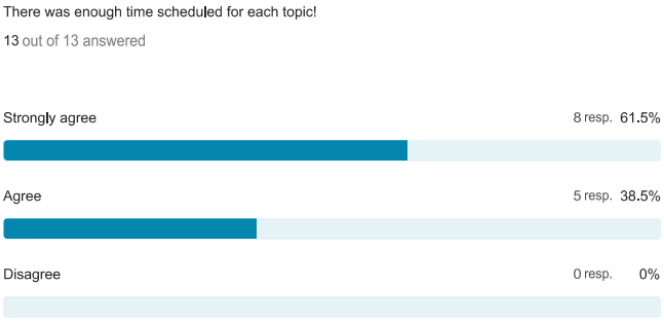
Group no.1 PP16 T2I	
Group no. 2 PP8 PCCIC with PP9 PC	
Group no. 3 PP2 HWKD	

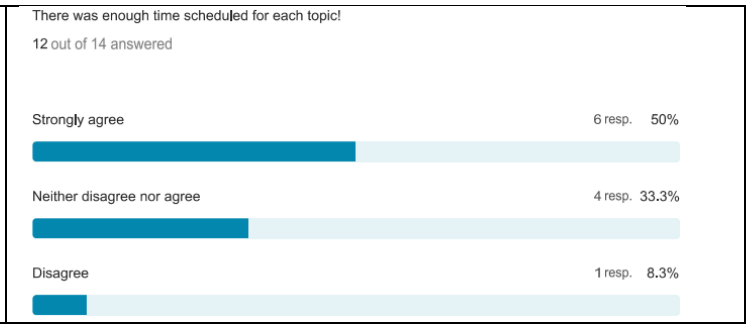
Evaluation of study content delivery process represents in average satisfactory level:

Group no.1 PP16 T2I	

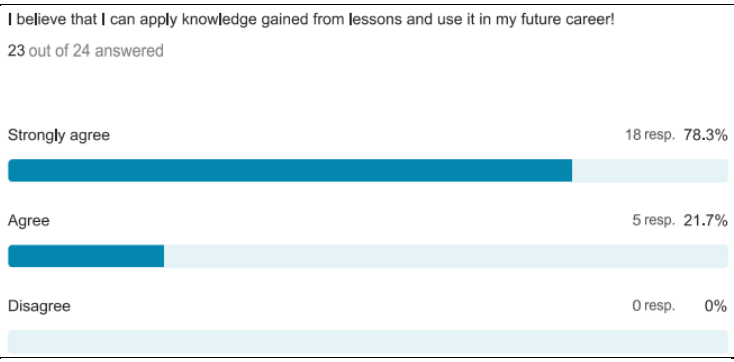
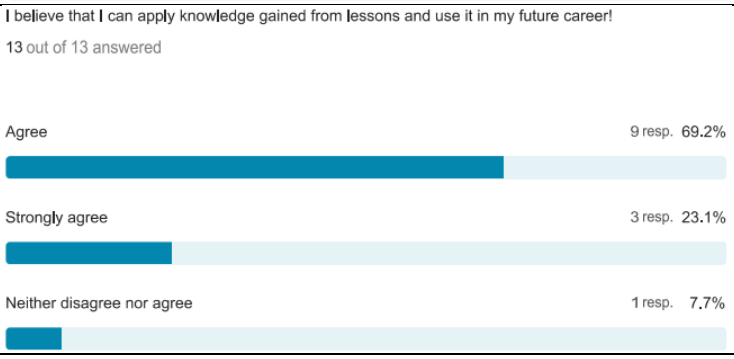
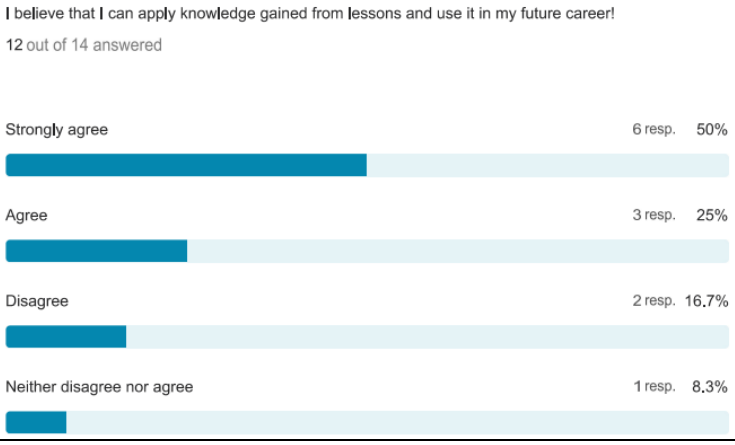
Group no. 2 PP8 PCCIC with PP9 PC	
Group no. 3 PP2 HWKD	

Evaluation of the time frame differs among groups, but in average represents satisfactory level:

Group no.1 PP16 T2I	
Group no. 2 PP8 PCCIC with PP9 PC	

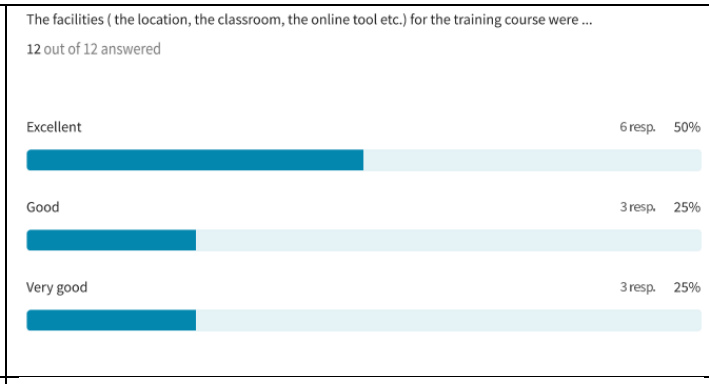
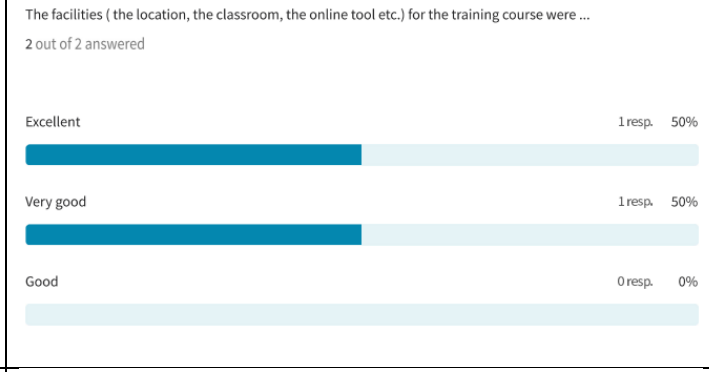
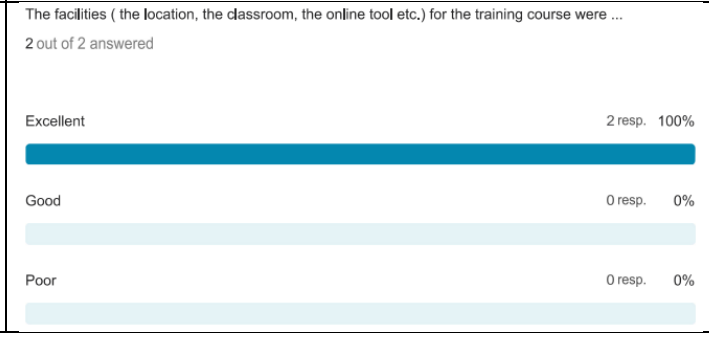
Group no. 3 PP2 HWKD	

Evaluation of the outcomes and impact on professional carrier growth differs among groups. Minor part of participants reported that they disagree with statement that gained knowledge will have impact on their future career.

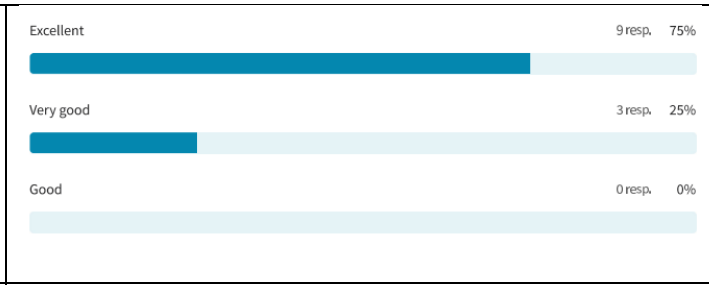
Group no.1 PP16 T2I	
Group no. 2 PP8 PCCIC with PP9 PC	
Group no. 3 PP2 HWKD	

FEEDBACK FROM LECTUERS

Facilities are evaluated as good, very good and excellent, what results in minor differences of evaluation of particular criteria.

Group no.1 PP16 T2I	
Group no. 2 PP8 PCCIC with PP9 PC	
Group no. 3 PP2 HWKD	

Facilities are evaluated as good, very good and excellent, what results in minor differences of evaluation of particular criteria.

Group no.1 PP16 T2I	
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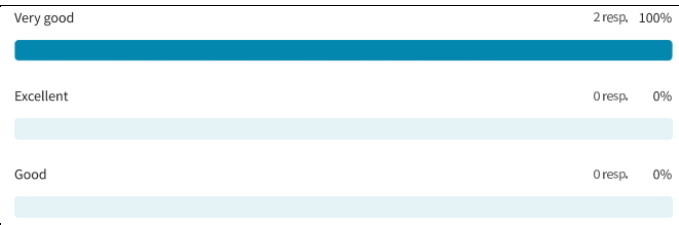
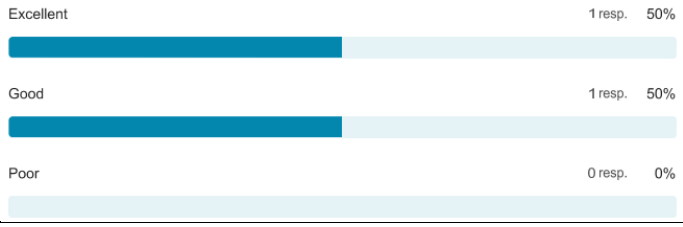
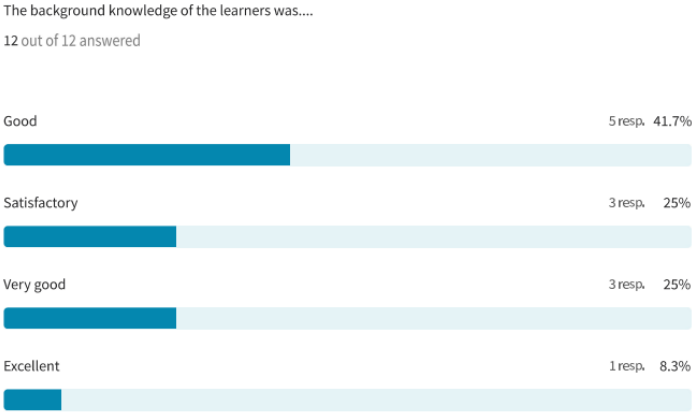
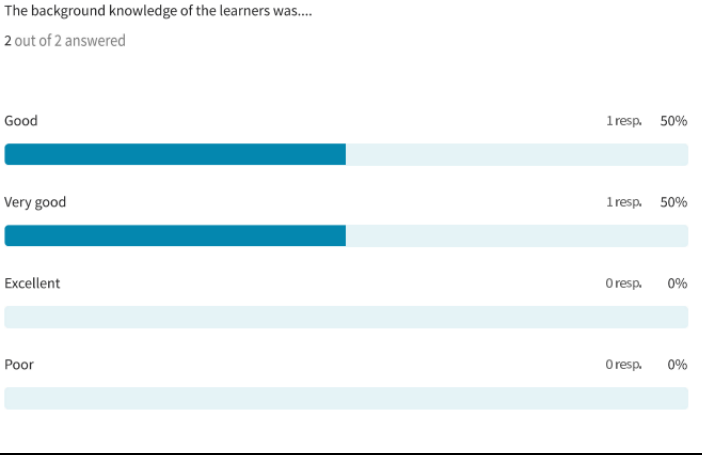
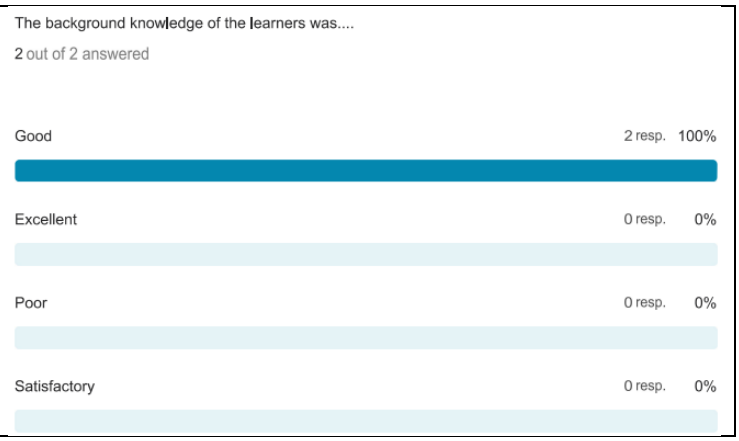
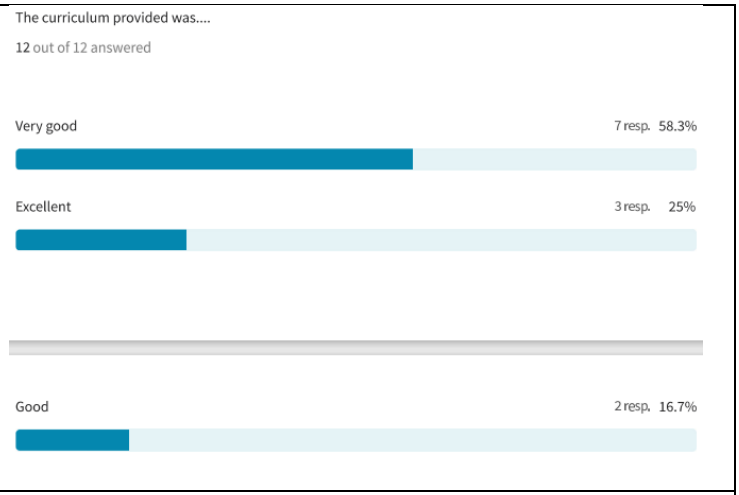
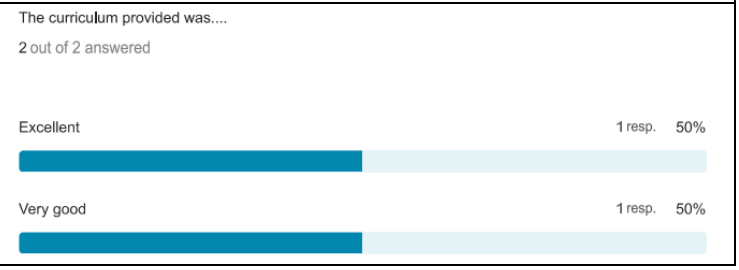
	
Group no. 3 PP2 HWKD	

Bacground knowledge of learners was evaluated as "excellent", "satisfactory", " good" and "very good". Thus, in the context of learners` rediness to aquire new knowledge the design of the training instrument is apropriate for chosen target gropus.

Group no.1 PP16 T2I	
Group no. 2 PP8 PCCIC with PP9 PC	

Group no. 3 PP2 HWKD	

The curiculum of the training instrymet was evaluated as "excellent" , " very good" and "satisfactory", what results in differences of evaluation of particular criteria.

Group no.1 PP16 T2I	
Group no. 2 PP8 PCCIC with PP9 PC	
Group no. 3 PP2 HWKD	

2.3 Conclusion

Based on the evaluation results it is concluded that the teaching instrument "Energy Service Manager" developed and tested by Project partners PP16 T2I, PP8 PCCIC with PP9 PC, PP2 HWKD with in 3LoE Project - Three-level centres of professional excellence: Qualification, entrepreneurship and innovation in the Green Economy meets the relevance of achieving the goal of teaching instrument and overall has expected impact on professional development of training participants.

Feedback form training participants and teachers suggest that the curriculum meets the targets of the teaching instrument. The knowledge creation and sharing were realized appropriately, and participants have participants assimilated knowledge and tools. Evaluation of the outcomes and impact on professional carrier growth differs among groups. Minor part of participants reported that they disagree with statement that gained knowledge will have impact on their future career. The venue and equipment were appropriate for the training course.