DEVELOPING THE ADULT EDUCATION TRAINING PROGRAMS THROUGH EDUCATIONAL PROJECTS: LESSONS LEARNED AND PERSPECTIVES

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Abstract: Among other research centers of University "Politehnica" of Bucharest, the CAMIS Centre has participated in several international educational projects, financed by European Union, on domains such as: Welding technologies, Circular Economy, 3D Printing, Augmented Reality. By request, the interested adults can follow one or more professional training program, free of charge, by accessing the online e-learning CAMIS platform. This paper presents some feedback results of the training program which has been designed and implemented in the Project Circular €conomy Digital Training Toolbox to foster Innovative Green Entrepreneurs – Eng@ge Project - together with experienced partners from Spain, Greece, Malta, UK, Bulgaria. More details can be found on the Project website (http://www.engage-ce.eu/). The training program designed during the implementation of this European Project can be attended in five different languages (English, Romanian, Bulgarian, Greek and Spanish). In this way, an increased number of adults could benefit from accessing the training program in order to change economy by developing their skills in the specific areas of expertise. Accordingly, the set of tools developed by the Project experts is complex and useful in various types of learning situations as well as suitable for different needs of adults who want to learn about Circular Economy. By direct observation of the participants' reactions during the training sessions and by analyzing the participants' feedback, the project experts were able to change the content of program or to validate their judgments related to the changes necessary to be made. For example, the training program has been transformed and can be offered into an e-learning course, as well.

Key words: Adult education, Educational project, E-learning platform, On-line training program, Augmented Reality, Circular Economy.

1. INTRODUCTION

Besides the core teaching activities specific to a university (e.g. bachelor, master and doctoral studies), in University "Politehnica" of Bucharest (UPB) we develop and organize adult education programs, many of them throughout nationally and internationally educational projects. In addition to these continuous professional development programs, in other research centers in university, experts on different areas of specialization have organized training activities related to entrepreneurship, career management, social responsibility etc.

An example of such research center involved in developing continuous professional training programs for adults is the CAMIS Center. CAMIS has participated as representative of UPB in several international educational projects, financed by European Union, on domains such as: Welding technologies, Circular Economy, 3D Printing, Augmented Reality [1].

By request, the interested adults can follow one or more professional training program, free of charge, by accessing the online e-learning CAMIS platform (e.g. an

account is set-up, which is validated by administrator and the trainees can enroll themselves and use it for one or all the available training programs on the platform).

In this paper we intend to present some feedback results of a training program which has been designed and implemented in the Project Circular €conomy Digital Training Toolbox to foster Innovative Green Entrepreneurs – Eng@ge (2016-1-RO01-KA202-024493) – together with experienced partners from Spain, Greece, Malta, UK, Bulgaria. More details you could find on the Project website [5].

In the global context of climatic changes and population growth, correlated with the increasing living standards, the utilization of resources used by mankind is growing, too. This problem is more evident if we describe it in numbers. For example, 65 billion tons of materials entered the economic system in 2010 [2]. Europe leads the world in recycling but from 2.6 billion tons of end-of-life waste, only 40% is recycled, composted or reused [3].

This can be improved through a 'Circular Economy (CE)' approach that is based on a vision of nil waste. This is why the Eng@ge Project, one among many other educational projects worldwide, represents an attempt to change the mindsets of the communities involved, in order to identify the sustainability through education.

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On the other hand, the CE approach has also the potential of increasing jobs and improving the economy by maximizing efficiency. As a matter of fact, in December 2015, the EC launched a CE Package [4] to boost competitiveness, create jobs and generate sustainable growth. For this paradigm shift to be achieved, there is a need that CE's principles and benefits be disseminated as widely as possible [9, 10, 11].

There is thus an urgent need that education stakeholders at different levels including VET be equipped with the right knowledge about a CE approach, its principles and benefits to both society and industry as well as the concept that a CE approach can foster a novel breed of "Green Entrepreneurs".

In this context, the Eng@ge Project – carried out between 2017–2019 – proposes adequate educational curriculum, training programs for adults from partners' countries and appropriate tools [5], all of these in order to address the personal needs of different categories of learners.

Among the main objectives of the Project, we should mention the following [4]:
- To develop a framework/curriculum (O2);
- To develop an open and innovative digital training toolbox supporting the training framework / curriculum established in O2, consisting of a set of digital training tools / methods and six relevant case studies providing trainers with the means to adapt their training approach to the needs of different learners (O3);
- To disseminate and exploit the results of the Eng@ge Project, particularly to ensure that the innovative digital training toolbox is openly available to at least 10,000 other persons (O5). Its role is to contribute to the development of a new entrepreneurial way of thinking based on the circular economy concept

Taking into consideration the above mentioned project objectives, the paper is aimed to outline the approach of training program from design to implementation, based on trainees' feedback provided after the finalization of the pilot phase.

2. DESCRIPTION OF THE ADULTS TRAINING PROGRAM

The training program designed during the implementation of this European Project can be attended in five different languages (English, Romanian, Bulgarian, Greek and Spanish). In this way, an increased number of adults can benefit from accessing the training program, in order to change economy by developing their skills in the specific areas of expertise already mentioned (e.g. Welding technologies, Circular Economy, 3D Printing, and Augmented Reality). Accordingly, the set of tools developed by the Project experts is complex and useful in various types of learning situations as well as suitable for different need of adults who like to learn about Circular Economy. Particularly, the curriculum is structured on three modules which can be described as follows:

Module 1 – Introduction to Circular Economy
Unit 1.1. – *Introduction to Circular Economy* (*CE*). This unit explains the concept of a linear approach to the consumption of materials and how CE transforms this into a circular approach.

Unit 1.2. – *Circular Economy Business Concept*. This unit stresses the benefits of the Circular economy thinking to a business. It doesn't matter if it is a manufacturer, retailer or service provider because all businesses consume material resources. This unit provides concept information on business models and make trainees think on how to identify material flow in their organizations.

Unit I.3. – *What is new about CE thinking*. In this unit, trainees are challenged to think what is new and find explanations on ideas that are wrapped up in CE thinking – e.g. waste minimization, recycling, re-use, waste prevention, eco-design material choice and moving from product focus to services. Trainees are asked to explain ideas and look at examples.

Module 2 – Fostering Circular Economy
Unit 2.1. – *Recycling*. This unit explains the principles of recycling e.g. what happens to material recycled, drawing on the case studies, explaining that recycled material has value, which can be improved through material segregation.

Unit 2.2. – *Re-use*. This unit explains how a material might maintain its value by continuing to serve the same function.

Unit 2.3. – *Waste prevention*. This unit highlights the existing opportunities for avoiding the waste in the first instance – e.g. better design, encourage product take-back etc. It is important to think that both product and service led organizations.

Unit 2.4. – *Extend product life cycle*. This unit looks on how an organization might extend the life of products it consumes, proper maintenance and procurement decisions.

Unit 2.5. – *Eco-design*. This is a unit setting out the of design decision making in broadest sense and key choices to embed CE thinking.

Unit 2.6. – *Servitisation*. This unit seeks to challenge existing approach to products and consumption from both supplier and consumer perspective. This is the most advanced level of CE thinking.

Module 3 – Exploiting CE
While module 1 and module 2 are focused on concepts and understanding, module 3 focuses on practical implementation of CE. A short description of the module's units is presented below.

Unit 3.1. – *Business value in the Circular Economy*. This unit focusses on the value of CE thinking, in principal on the economic benefits as well as on business improvement processes that lead to less primary resource consumption and waste production. An example can be to find photos and videos of 2–3 workplaces and ask trainees how they can apply skills into this particular environment and try the CE thinking.

They should look into the innovative opportunities provided. Trainers should be able to derive scenarios for training.

Unit 3.2. – *Green Entrepreneurship and CE*. This unit will focus on how CE concepts can be exploited by new start-ups to provide new business models and a

practical approach. All VET trainees follow some sort of entrepreneurial training (e.g. either to work in a company or to set up their own company) and should be able to view examples from different workplaces and apply CE. This unit also presents business opportunities in CE and various case studies or scenarios that are focused on different areas (e.g. manufacturing, office environment services, and construction) for example: Managing used tires, Wastewater recycling, Re-Tek, etc.

3. RESEARCH METHODOLOGY

The training program has been piloted one-time running in a face-to-face interaction. The trial was hosted by the Chamber of Commerce and Industry Bistrița-Năsăud. During 4 days the pilot program aimed to validate the content, the structure, and the tools/applications used by the trainers in order to ensure the appropriate quality standards for implementation to a larger group of adults (about 1,000 persons).

This *pilot phase* was supported by highly experienced trainers from Greece, Romania (University "Politehnica" of Bucharest) and Bulgaria (Fig. 1). The course's content has been taught in an interactive way so that the participants were able to develop skills and competences regarding the environmental protection, green entrepreneurship, efficiency of consumption resources, etc.

At the end of the training program, the participants completed a feedback questionnaire which integrated their assessment about the modules' contents, the methods used, the pedagogical approach etc. This "beneficiaries' assessment", based on participants' responses of feedback questionnaire, represents the core of the empirical research we intend to describe, focusing on the main items' analysis. Consequently, the objectives of this investigation underline the participants' opinions and comments regarding the practical features of the training program they have attended.

In order to achieve the objectives of this empirical research, a questionnaire has been elaborated as an instrument for collecting data [6, 7, 8].

The questionnaire contains 9 items with answers required on a Likert scale in five steps. The questionnaire was administered to each participant on paper and analyzed based on descriptive statistic methods.

A number of 17 adults has attended the pilot training program in Romania. Based on their opinions and feedback the program has been adjusted in terms of content, teaching methods, duration and pedagogical approach.

The VET trainers participating in pilot face-to-face training program, from Romania (University "Politehnica" of Bucharest), Bulgaria (Asen Zlatarov University of Varna) and Greece (Drosostalida) have experience and expertise not only regarding the specific content and teaching activities but also in digitalization of the content.

The digitalization was the purpose of the next phase of the project in terms of interactions with the adult trainees to transform the program into an e-learning course, followed firstly by trainers of trainees in five languages (English, Spanish, Romanian, Greek and Bulgarian). The core part of the e-learning course is represented by the digital toolbox which contains the curriculum designed by all the partner countries, the learning framework, the case studies and the learning material. Afterwards, the trainers of trainees become, more or less, facilitators of distance learning for those who were interested to attend the program, in order for them to develop their skills in the circular economy which will become a key concept for the future.

4. ANALYSIS OF RESULTS

By analyzing the participants' feedback, the project experts were able to change the content of program or to validate their judgments related to the changes necessary to be made. The first questionnaire's item asked the participants about their expectations related to the course content, assessed module by module. In response, the trainees have considered the most attractive module Unit 1.2. (Circular Economy business concepts) and the less attractive Unit 1.3 (European context of circular economy). This last unit also contains the legislation in force now. Taking into consideration the observations, the main result was the revision of the module *European context of circular economy* e.g. restructuring it in a better manner for understanding as well as its transformation into the digital format. On the other hand, the Augmented Reality's elements inserted in the course's content have been appreciated and maximized as effects by all the participants. The trainees' expectations about the program content are presented in Fig. 2.
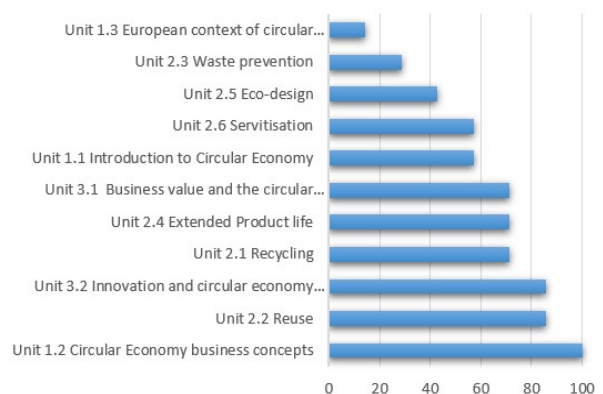

Fig. 1. Image from training.

Fig. 2. Classification of learning units (most appreciated).
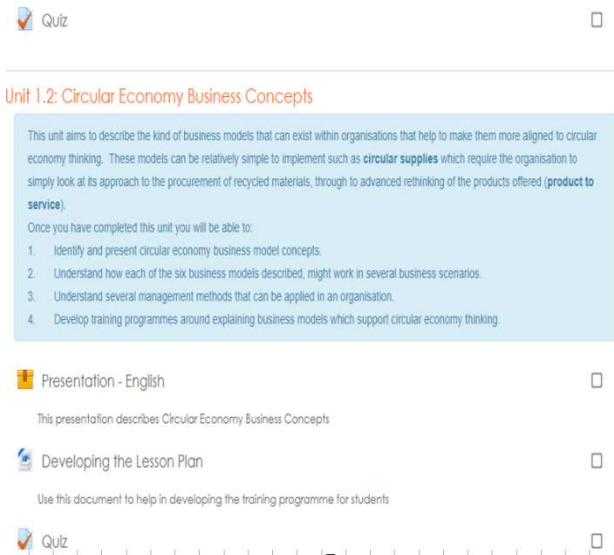
Fig. 3. Unit 2 of the e-learning platform.

Another consequence of the feedback results was that the content has been improved for the on-line version of the training program by adding, among other things:

- five adapted case studies, as good practice examples;
- a data base including possible questions and answers for clarifying and better understanding of the specific theoretical concepts.

Therefore, after feedback, the general template of each unit has been completed and ready to be posted on the e-learning platforms of all projects' partners. Now it contains unit's objectives, specific content in SCORM format and didactical project for teaching/learning, including an evaluation form (Fig. 3).

As far as the utilization of the training methods and instruments are concerned, the participants answered that they have had a high level of satisfaction, taking into consideration the activities carried out in all 4 days of face-to-face training. These activities mixed theory and practice, used many examples related to daily life and offered comparative perspectives of analyses and opportunities to share learning experiences in an active-participative manner of involvement, as shown in Fig. 4.

The next item is related to the communication skills of trainers as an important element which contributes to clear understanding of content, and more than that, to the good interactions between trainers and trainees, on the one hand, and among trainees, on the other hand. In spite of turning this course into a distance learning course, where this kind of communication skills could be seen less important, the participants' feedback validates the idea that they expect from trainers to be always encouraged and provoked to explore their knowledge limits.
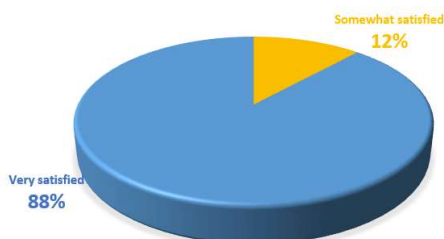

Fig. 4. The satisfaction of using the training methods and instruments.
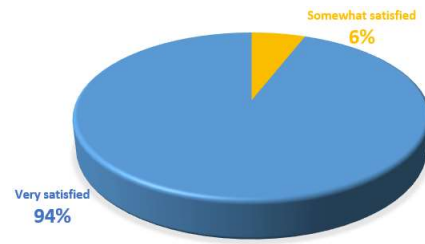

Fig. 5. The satisfaction about trainers' communication skills.

Accordingly, a significant percentage of 94.12% of respondents (Fig. 5) appreciated the trainers' communication skills as very satisfying.

The length of the pilot training program was 4 full days which was appreciated as very satisfying in respondents' expectations, as well. To this opinion has also contributed the fact that the course was accommodated in a different location from their work environments, ensuring all the logistic conditions for a proper training with adults.

Another item was related to the degree of usefulness of exercises and applications during the training program. A percentage of 88.24% of respondents (Fig. 6) shared the opinion that there is a good balance between theory and practice reflected in the course content. This was explained because of the role of exercises and applications played for a better understanding of trainees from the knowledge usefulness point of view.

Finally, the general quality of the pilot training program was appreciated as a high level of professionalism (Fig. 7).

Among other opinions expressed by the participants, as final remarks, they stated that the training program needs a longer period of time for implementation as well as more applications integrated into content, with reference to correlations of day by day life experiences in a knowledge society.

At the same time, the participants appreciated the case studies which can be developed depending on the European Qualification Framework (EQF) levels that can be achieved, by offering different learning experiences.

The main suggestions given by the participants for the improvement of the course have been summarized in Table 1.
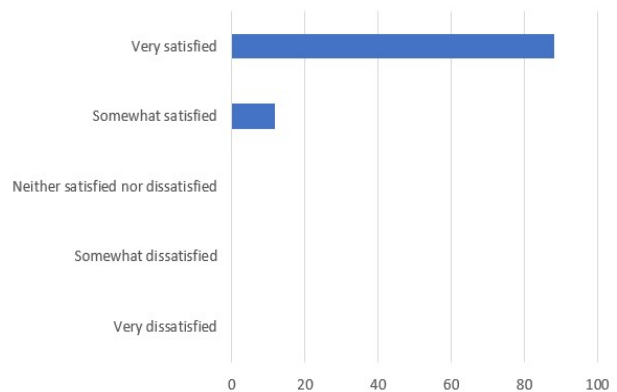

Fig. 6. Respondent's satisfaction regarding the balance between theory and practical applications.
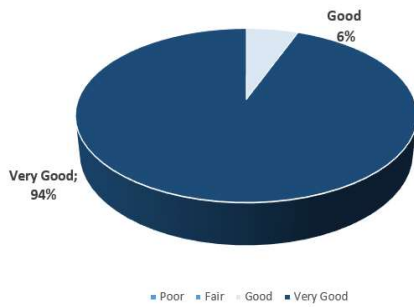
Fig. 7. The appreciation of the program's quality.

Table 1

Suggestion offered by the participants

Suggestions	%
Everything is ok / the program has achieved its objectives	82
Extension of the training duration	16
More practical applications	2

5. CONCLUSIONS, LESSONS LEARNED AND PERSPECTIVES

From an organizational perspective, professional development represents a key concept responsible for ensuring the expected level of performance improvements, based on the main adult education principles. In different contexts, adults should prove that they are autonomous and responsible for planning, evaluation and organization of the learning activities, working with minimum co-ordination as well as they assume the role of facilitator in the learning process.

At the same time, the adults have enough life experience and knowledge, including working activities carried out, family responsibilities and previous educational background. They should value creatively these experiences in the learning process.

Not the last, the adults are very practical and goal-oriented in order not only to meet the specific objectives but also to focus on the most useful aspects of the training program. Coming back to the notion of experience it is well known there is one of the most important sources for adults' learning, especially the learning in non-formal and informal contexts. That is why when we validate the learning gained in other ways than formal, we actually "validate" someone experience. Therefore, the core methodology of adult education should prioritize the analysis of experience. Individual experience increases with age depending on practice, work or continuous training.

Moreover, defining adult education as the main activity by which the adults acquire knowledge, competences and learning experience, we need to take into consideration the phases of the adult learning planning process. According to R. Swanson there are four planning phase which refers to the need to [12]:

- determine what type of learning is necessary to achieve the learning goals;
- create the education strategy, develop and/or identify the resources to achieve the learning goals;

- implement the education strategy and use the specific resources;
- evaluate the achievement of the learning goals and the entire process to meet them.

In addition, it is known that the quality and efficiency of adult education and training are determined by the capacity of learners to achieve the necessary basic skills and competences for their credentials and employability.

As far as the above described training program is concerned, after piloting, this was implemented in five languages (Romanian, English, Greek, Bulgarian and Spanish) in 9 countries, using an e-learning format. Some statistical data are presented in Figs. 8 and 9.

The design of the training program has encouraged the cooperation between all trainers involved, in both approaches – face to face and on line course –, the experts on different subjects/modules developed, and not the last, the trainees, including those who attended the course in the e-learning format.

The novelty of our research is the creation of the digital training toolbox. We have already mentioned above that it helps both the trainers and trainees to create a learning environment in which they change the way of thinking based on the circular economy concept.

On the other hand, this toolbox will also ensure a method to generalize results to other economic sectors by generating new business models, based on improved production design and processes, new way of consumption, waste management and transfer from waste to resources.

In conclusion, the training program presented in this paper represents the main achievement for the persons
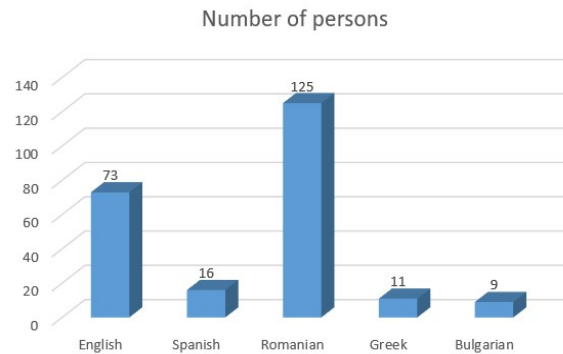

Fig. 8. Number of online learners – distribution by language.
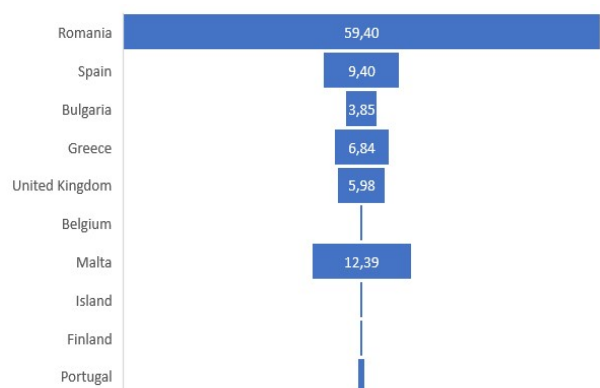

Fig. 9. Number of online learners – distribution by country.

who attended it. Further on, transforming it from a pilot into a large-scale training program (the next phase) is also a key issue for all those who are willing to learn about circular economy, augmented reality and business concepts as well as to improve their entrepreneurial competences.

We also need to mention, after delivering the course in both formats (face-to-face and e-learning) that a blended learning approach might be more appropriate, by using the platform for an easy and permanent access to the resources in order to obtain the best results and efficiency.

Based on this paradigm, the learning environment values information exchange among heterogeneous participants, exploratory learning and critical thinking, in a collaborative work design closely related to a real-world context. This is a lesson to confirm what we have learned by developing training programs for adults in different educational projects during the last decade, at national and international levels.

Based on this learned lesson we came to the conclusion that beyond the implementation of the training program with regard to the taught curriculum and learning assessment, the main benefit for the participants involved in this adult learning is the innovative approach concerning the administration format, in a friendly teaching-learning environment which has encouraged the development of communication and exchanges of trainees opinions, focused on the development and use of resources, established a functional peer cooperation, even in a distance learning format.

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