ANALYSIS OF THE TRAINING NEEDS IN RENEWABLE ENERGY SOURCES FOR AGRICULTURAL SECTOR

Zuzana PALKOVA[1], Ioannis HATZILYGEROUDIS[2], Sorin IONITESCU[3]

[1]Slovak university of Agriculture in Nitra, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia,
  Phone: +421 917 913 793, E-mail: Zuzana.Palkova@uniag.sk
[2]University of Patras, Greece, E- mail: ihatz@ceid.upatras.gr
[3]University "Politehnica" of Bucharest, Romania, E-mail: sorin.ionitescu@gmail.com

Corresponding author: Zuzana.Palkova@uniag.sk

Abstract

Global climate changes, the greenhouse gas emissions and reduced sources of traditional fossil fuels are one of the most serious environmental problems of present time. This fact was the starting point for Directive 2009/28/EC, which defined two objectives in the area of RES, the mandatory 20% share of RES in gross final energy consumption in the European Community and the mandatory 10% share of RES in transport, which all Member States must achieve by 2020. In 2011 was the share of renewable energy sources in total energy production in the European Union 13%. Promoting the use of renewable sources for electricity, heat, hot water, as well as promoting the use of biomass energy and construction of energy efficient buildings brings, in addition to environmental aspects, the development of innovative technologies, the transition to an energy-efficient economy and increase employment opportunities. Development in clean technologies becomes a strategic not only in terms of ecology, but has a significant impact on economic development and employment. This paper presents an analysis of training needs in clean technologies and renewable energy sources and through the Leonardo da Vincis' projects – AVARES and C-TEST – supported by European Commission to show how to increase the attractiveness and accessibility of vocational education and training for employees in agricultural sector in the European Union.

Key words: *AVARES, C-TEST, clean technology, Leonardo da Vinci, need analysis, renewable energy sources, vocational education and training*

INTRODUCTION

Vocational education and training (VET) aims to develop knowledge, skills, jobs' habits and other competences of learners. The final effect of a graduation is the qualification, which enables them to engage in the working process as a skilled workforce or continue their studies.

According to the Bruges Communiqué [2] it is essential to adapt the content of vocational training in favour of changing needs of labour market. Integration of needs of the changing labour market into the content of the vocational education and training requires better understanding of skills of new created sectors and related changes within more and more integrated Europe.

VET students and VET-level employees currently have insufficient knowledge about Clean Technologies and sustainability and have lack of skills how to implement these broad themes in to the practice. The EU has made it clear that investing in these qualities is important for a sustainable Europe. The European Council stated in Dec 2010 that this basis in VET-education is weak in its "Council conclusions on education for sustainable Development". Likewise, the European Ministers for Vocational Education and Training stated in the same Bruges Communiqué: "Just as information and communications technology skills are essential for everybody today green skills will be important to almost every job in the future".

MATERIALS AND METHODS

In the frame of the project C-TEST – "Clean Tech Employees & Students" the needs analysis has been realized between participants from Netherlands, Ireland, Slovakia, United Kingdom, Sweden and Hungary.

The need analysis focused on identifying of participants training needs in terms of the current situation in the field of clean technologies. Implementation of the need analysis was conducted in two stages. The first involved the creation of questionnaires focused on the signification of clean technology and sustainable development between managers of small and medium enterprises (SME).

The second phase of the survey focused on the new methods of education in the learning process and relations of SMEs' employees with the modern technologies.

In the first quarter of 2013 around 100 questionnaires were distributed in the partner's countries amongst SME companies – managers and employees. Structure of addressed SMEs was:

- clean technologies,
- agrosector,
- vocational education and training in the agrosector,
- heat and energy management,
- building industry.

All the addressed organisations were more or less active in the field of agriculture therefore all the addressed institutions declared employees with agriculture oriented education.

The two following graphs show that knowledge of renewable energy sources and clean technologies are important for more than 80% of managers within addressed SMEs.
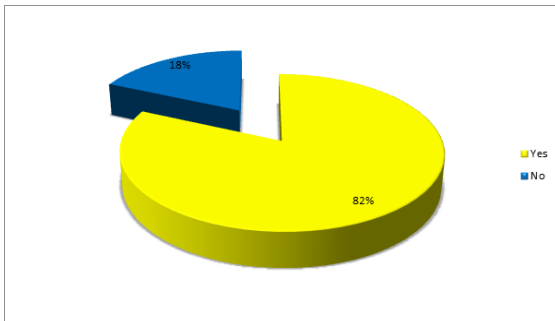

Fig.1.Is it important for your organisations employees to possess knowledge in the field of renewable energy & clean technologies?
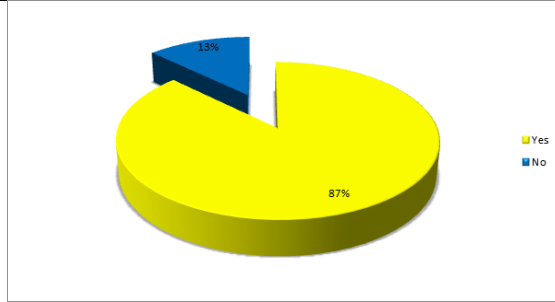

Fig.2.Is it important for your organisations employees to be aware of the importance of renewable energy & clean technologies?

Based on the results of the needs analysis we can say that most interesting topics for SMEs in agriculture are energy efficiency, waste management and energy from biomass (Figure 3). This fact comes from the structure of addressed SMEs – energy efficiency seems to be an interesting topic in time of energy crisis and agriculture oriented companies try to use the biomass for energy purposes.
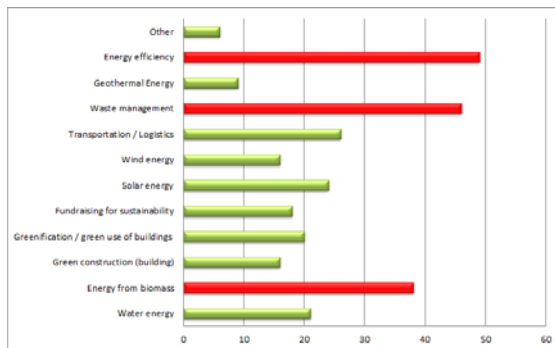

Fig.3.Which of the following topics do you consider to be relevant for your employees to have knowledge about?

Knowledge of traditional RES is relatively wide spread today. Results of the research confirm the worse situation in modern "green" technologies. Managers complied that their employees have the poorest knowledge especially of (Figure 4):

- energy efficiency,
- waste management,
- transportation/logistics,
- fundraising for sustainability,
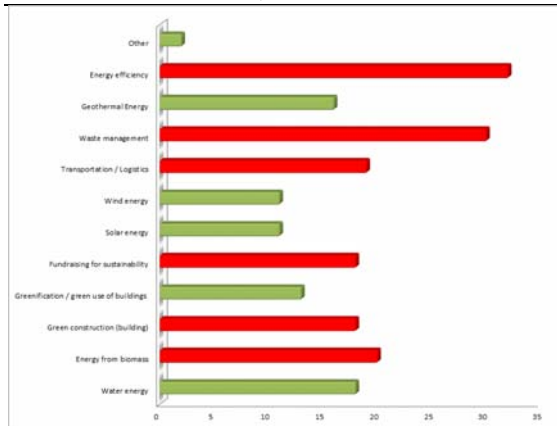- green construction (building),
- energy from biomass.

Fig.4.What knowledge do you feel that your employees lack in the field of sustainability?

One of the last questions for managers considered support of education process by computers and other information and communication technologies. Positive answer gave us 88% of managers (Fig.5).
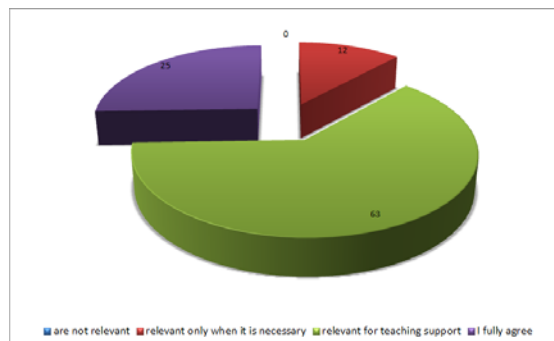

Fig.5.PC and ICT tools within the teaching process

To receive feedback on the new methods of education in the learning process and to make the process more attractive, a group of questions have been prepared with the purpose to study the relationship of employees with the ICT, web 2.0 technologies and new forms of education, as well as getting their views on working with learning multimedia by the means of the so-called Smart devices.

The results of the questionnaire survey show that participants - employees in agrosector - are familiar with ICT and that they use these technologies.

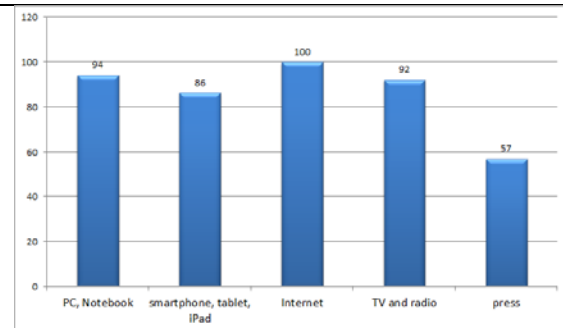An interesting finding is the fact that 100% of respondents use the Internet, but only 94% use PC.

Fig.6.What ICT tools do you use? (Multiple choose)

This fact documents the assumption that traditional usage of computers falls and usage of smart devices is rising (smartphones, iPads, iPhones, etc.).
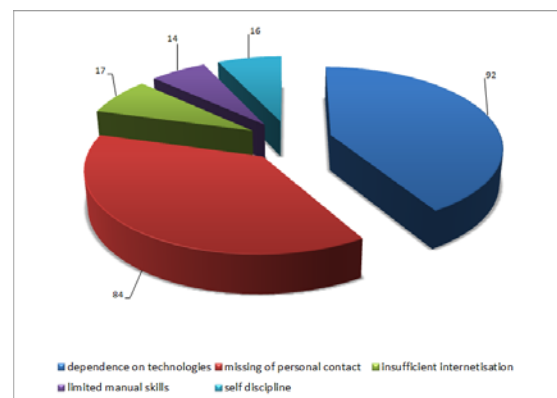

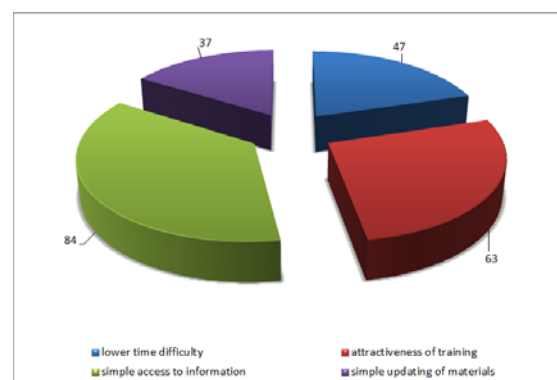Fig.7.What are the e - learning and blended learning disadvantages? (multiple choose)

Fig.8.What are the e - learning and blended learning advantages? (multiple choose)

Regarding the evaluation of e-learning as a form of learning process (**Error! Reference source not found.**, **Error! Reference source not found.**), the biggest drawback seems to be dependence on technology (92%), lack of personal contact and interaction between learners and tutors as well as among learners

themselves. On the other hand, the greatest benefits of the implementation of ICT and e-learning methods in the learning process can be easy access to information (84%) and greater attractiveness of education (63%). 49% of respondents reported another advantage which is less time of learning and 37% of respondents reported an easy update of instructional materials. As disadvantages were reported: self-discipline (15%) and limited options to gain manual skills (14%).

RESULTS AND DISCUSSIONS

Results of the presented survey help to partners from Slovakia, Greece, Bulgaria, Germany, Portugal and Lithuania to identify the didactical and training needs for vocational education and training in terms of the current situation in the field of clean technologies and renewable energy sources and to develop learning courses for specific topic of learning. The project AVARES – "Enhance attractiveness of renewable energy training by virtual reality", is a project supported by the European Commission under the Leonardo da Vinci Transfer of Innovation grant scheme. It aims to develop a Virtual Reality Environment and innovative learning methodologies for vocational education and training with the emphasis on improve attractiveness of vocational education in the field of renewable energies and clean technologies. The project integrates a developed virtual world with a traditional Learning Management System (LMS), represented by Moodle, for more attractive learning in the challenging field of Renewable Energy Sources (RES).

Outcomes of the project
Virtual learning environment, which contains learning materials in a structured way. At the present "social network" time, it is a social place. As in a real classroom, the students can communicate between them and with the teacher and collaborate in learning experience. A hybrid education platform developed in the project combines traditional educational practices, provided via learning management

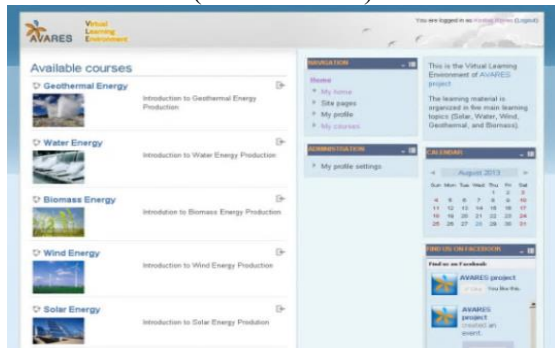system (LMS) Moodle (Fig. 9 and Fig.10) and a virtual world (3D RES Park).

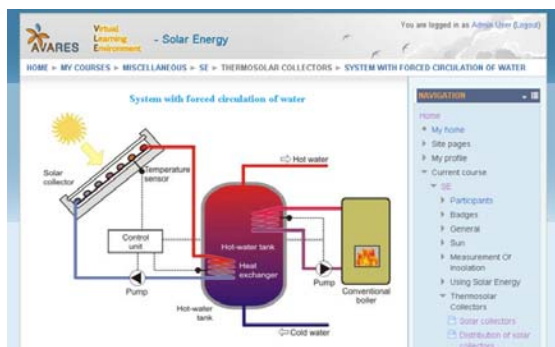Fig.9.Virtual learning environment combines the advantages of LMS Moodle and virtual reality

Fig.10.The Solar Energy module in the Virtual Learning Environment

LMS Moodle focuses on the learning process management and delivers to students a theoretical background for the RES field. Students can explore and learn about RES domain through 5 courses:
– Solar Energy,
– Water Energy,
– Wind Energy,
– Geothermal Energy,
– Energy of Biomass.
Students can register to the Virtual Learning Environment (VLE) platform and create personal accounts. After that, they can anytime access the platform with their credentials. The course material mainly consists of presentations that the students can download and study on their own pace. Learning materials also include textbooks, web-pages, animations and videos.
The 3D Virtual RES Park offers an environment that allows shifting the traditional educational process to the new way of learning that is interactive and more visual (see Fig.10). Virtual reality offers an

attractive and effective way of learning where students can learn through experimentation and interactions in the virtual world.
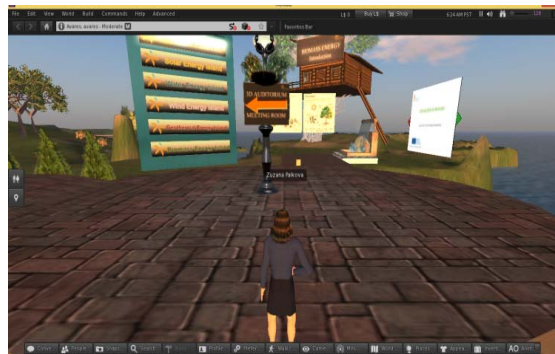

Fig.11.The virtual world gives students the ability to communicate with other students or interact with the objects

The AVARES 3D RES Virtual Park consists of:
  – sub-Areas dedicated to each course with 3D models,
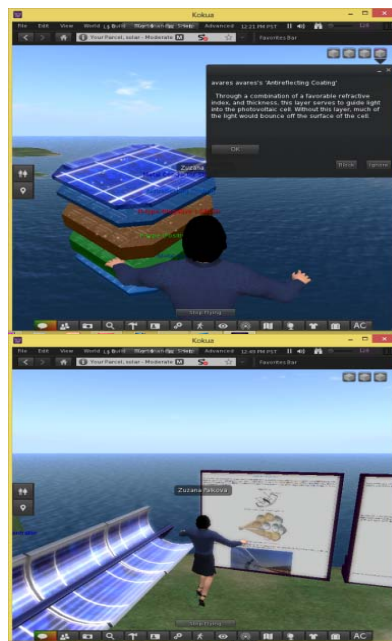 – 3D Auditorium,
  – classrooms/Meeting Rooms.

Fig.12.Interactive 3D models allow understanding the principles of their operation

The learning materials stored in the VLE (Moodle) are via Sloodle [14] available in the 3D RES Virtual Park as well. Specific activities and presentations can be displayed as posters or boards at various areas of the 3D Virtual RES Park.
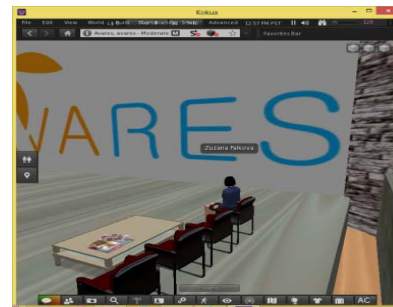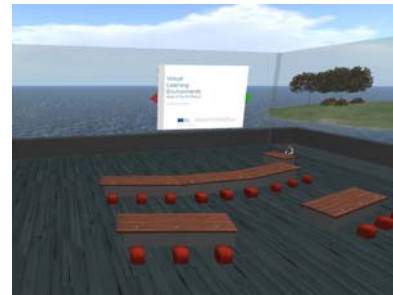

Fig.13.An auditorium and classroom in the Virtual Word.

As depicted in Figure 12, adjacent to 3D models representing RES systems users can read the corresponding learning material from VLE. Trainers/teachers can give their lectures in the 3D Auditorium where they are able to load learning materials from the VLE or even upload their own slides.

CONCLUSIONS

The European Union, en bloc, is more than 50% dependent on imports of the primary energy sources, often from politically or economically not very stable regions. Therefore, the EU strategy on energy is primary focused on energy efficiency, clean technologies and renewable energy sources. From this point of view it is very important to focus education and training on the acquirement expertise and knowledge of the technologies that relate to this area.

The paper describes a process of creation the multimedia learning materials for vocational education and training in the field of renewable energies. Realized survey and developed courses give possibility to:

-shift from the "passive" book paradigm to a new "active" e-learning content,

-integrating measurement and control elements into the digital content and thus improve the efficiency of the VET process,

-in accordance with a deputy of Bruges Communiqué "… green skills will be important to almost every job in the future." improve knowledge and skills for employees of SMEs in agrosector in the progressive area of clean technologies and renewable energy sources.

ACKNOWLEDGMENTS

a)

b)

REFERENCES

[1] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_ind_335a&lang=en
[2]Supporting vocational education and training in Europe: the Bruges Communiqué, http://ec.europa.eu/education/vocational-education/doc/bruges_en.pdf
[3]http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0028:EN:NOT
[4]http://www.mhsr.sk/ext_dok-energeticka-politika/133566c
[5]Palková, Z., 2009. Renewable energy sources for landscape development - project Resnet. In: Scientific papers. series "management, economic engineering in agriculture and rural development". - Bucharest: University of agricultural sciences and veterinary medicine, 2009, Vol. 10(1):159-162.
[6]Palková, Z., Schwarczová, L., Roháčiková, O., 2011. Enhancing the attractiveness of renewable energy training in the green sector. In: Scientific papers Series "Management, economic engineering in agriculture and rural development". Bucharest, University of agricultural sciences and veterinary medicine. Vol. 11, (1): 165-169
[7]AVARES, 2014. AVARES LdV TOI project web site (http://www.avares.org)
[8]Bartle, R. A., 2004. Designing Virtual Worlds. New Riders Publishing.
[9]Bronack, S., Cheney, A., Riedl, R. E. and Tashner, J. H., 2008. Designing Virtual Worlds to Facilitate Meaningful Communication: Issues, Considerations, and Lessons Learned. Technical Communication, 55(3), pp. 261-269.
[10]Kluge, S. and Riley, L., 2008. Teaching in Virtual Worlds: Opportunities and Challenges. Issues in Informing Science & Information Technology, 5, pp. 127-135.
[11]McKerlich, R., 2007. Virtual Worlds for Learning: An Analysis in the Use of Immersive Environments for Training. Brandon Hall Research.
[12]Miah, A. and Jones, J., 2011. Virtual Worlds, in Barnett, G. A., ed, Encyclopedia of Social Networks, SAGE Publications, pp. 930-935.
[13]OECD, 2011. Virtual Worlds: Immersive Online Platforms for Collaboration, Creativity and Learning. OECD Digital Economy Paper, No 184, OECD Publishing.
[14]Sloodle, 2014. Simulation Linked Object Oriented Dynamic Learning Environment (http://www.sloodle.org).