GREEN BUILDING TRAINING THROUGH WEB MODULES - EXCHANGE OF GOOD PRACTICES

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Abstract: Achieving EU objectives for the efficient use of natural resources leads to the use of new materials, techniques, norms and standards in the construction sector that require the acquisition of new skills and competencies of employees in the sector. The main task in this study is in line with the EU Skills Program for Europe, 10.06.2016, and in particular the Green Skills Program. The lack of green skills in the professions in the construction sector is already present and, unfortunately, traditional educational institutions cannot meet this demand. The report considers the possibility of creating within the Erasmus+ project an educational product of 4 interactive multimedia modules to improve the green skills and skills of workers in the construction sector.

Keywords: GREEN CONSTRUCTION; MOODLE; E-LEARNING, GREEN TECHNOLOGIES; DISTANCE LEARNING

1. Introduction. Essence of sustainable construction

"Ensuring the sustainable development of humanity is the most important problem faced by the world community." This statement was made in 1987 by the UN General Assembly. Since then, it has not lost its significance. The concept of sustainable development has been actively discussed by world leaders today [1], [2], [3], [4].

Climate change and its impact are becoming increasingly important and attracting attention worldwide. Thus, climate change and sustainability issues are becoming a priority for governments, stakeholders, construction industry leaders and companies.

The impact of sustainable construction has environmental, social, economic and other aspects.

The consumption of a lot of energy in modern construction of buildings and their maintenance have negative consequences, which calls for the buildings' refurbishment and renovation. Ecological aspects also include excessive water consumption, environmental pollution (noise, vibrations, fumes, etc.) as well as disturbance to biodiversity. Social aspects concern the creation of a more comfortable environment for the building's inhabitants.

Sustainable construction does not tolerate the waste of materials, energy and raw materials (such as water and air, for example), encourages the use of recyclable products, and draws attention to the technological solutions that ensure the proper exploitation of a building and the comfort of the residents. Reducing the impact of buildings on the environment throughout their life cycle, but also optimizing their economic value, quality and efficiency - this is the main goal of sustainable construction.

It sets out best practices in the design, implementation, maintenance and reconstruction of buildings.

Sustainable construction is not only wishful thinking, but a trend driven by a number of factors, such as increasing resource prices, climate change, and last but not least, the concern about nature. But let's define what the criteria for a building to be green (or sustainable) are. First of all, this is the reduction of costs of natural resources, greenhouse gas emissions, electricity, water and natural gas, waste disposal and environmental impact (Fig.2).

Fig. 2 The reduction which brings the green buildings

Also the use of renewable resources and recyclable materials as well as the use of alternative energy sources.

2. Sustainable green construction

2.1. Principles of sustainable green construction

The concept of sustainable development in construction can be traced back in time to the energy crisis of the 1970s and the ensuing environmental protection initiative. The aim is to have more energy-efficient and environmentally friendly building technologies. There are many reasons to build sustainable - ecological, economic and public benefits. At the same time, an integrated approach is needed both for the design of new buildings and for the renovation of existing ones.

Sustainable / Green Building combines a wide range of techniques and practices that aim to reduce and ultimately eliminate the impact of newly built buildings on the environment and human health. This often draws attention to the use of renewable sources such as solar radiation for electricity generation, water heating, or rain water for irrigation and domestic purposes, or the construction of roof and rainforest gardens. While good practices and technologies continue to evolve and slight variations in the countries where they apply, it has basic principles that really define what sustainable construction means: location and construction, energy efficiency, water efficiency, quality of inputs, indoor air quality, optimization of operating costs, reduction of household and toxic waste.

One of the most important, however, is the principle of Sustainable Development. This Principle requires each generation to satisfy their needs without depriving future generations of the opportunity to satisfy their needs, which is a high form of humanism. The principle of Sustainable Development is addressed and sets requirements for the current generation. It affects all generations of inhabitants of the planet from the time of its adoption and application. In this aspect, it is universal and generally valid for
the human species. Moreover, referring to the attitude or rather the regularity of satisfying needs - human activities, the principle of Sustainable Development does not make any difference and does not create conditions for political forms of governance of societies, of religion and of faith. Observing it is an objective necessity inherent in the human being and guaranteeing its survival in the future.

2.3. Characteristics of green buildings.

The concept of a “green” building is a sustainable approach. This sustainable approach focuses on managing our needs with the resources available without affecting the needs of the future. Ideal green buildings are a building project that can save most of the natural atmosphere. Development and exploitation can stimulate a healthy atmosphere for all interested parties and will not disturb the earth, water, resources and energy in and around the building. This is often the definition of “green” buildings (Fig.3).

What makes a Green Building?

Many countries have experience and a positive result has been achieved in implementing the practice of setting up an environmental management system and green building. Eco-labels apply to products, eco-friendly construction projects are realized within the framework of “sustainable development and green construction”. As a result of these “pilot” projects, environmental principles and standards have been formulated in different countries and a “sustainable construction” tactic.

For example, according to documents approved by the British government, “sustainable construction” is construction that respects the principles of:

- Effective use of energy, water and other alternative resources;
- maintaining a healthy economy that guarantees quality of life while preserving the quality of the environment;
- minimizing damage to the environment and biodiversity and the danger to human health;
- optimal use of non-renewable resources.

Within the framework of “sustainable construction” the concepts of “ecology”, “eco-city” and “eco-creativity” appear in different countries. For example, the term “Green Building”, which appears, means a building that fits into the environment and interacts with it safely. The environmental requirements are as follows:

- optimal use of daylight and sunshine;
- natural ventilation;
- energy saving;
- reuse of excess heat;
- improved insulation;
- use of local renewable materials;
- minimal use of non-recyclable materials;
- use of materials with reduced emissions of dangerous substances in the environment
- Using renewable energy, such as solar energy;
- Use of sustainable building materials to construct the building;
- Measures to reduce pollution and reduce waste, and hence the possibility of reuse of materials and employment;
- Good air quality indoors;
- Using materials that are non-toxic, ethical and preserve ecological balance;

2.4. Guidelines and barriers for sustainable construction.

At the beginning of the 21st century, the concept of sustainable development is increasingly being accepted by the construction industry and increasingly influencing the design, construction, management, market and real estate trade (Fig.4). Knowledge of green building procedures is a must for organizations that offer construction, building maintenance and real estate management. Certified and evaluated “green buildings” are constantly growing.

However, this breakthrough does not lead to massive application of the principles of sustainability in the well-developed traditional building industry. Difficulties come not only from an economic and financial point of view, but there is a need to rethink many things in the sector: designing new class of construction plans, changing construction processes and maintaining new market mechanisms. Difficulties of financial nature are related to green materials prices, certification costs, and so on. Factors influencing these processes can be divided into guidelines or factors with positive effects and factors - barriers such as financial and research factors.

Positive effects are:

- Rapid development of the systems for assessment and certification against the requirements for sustainable construction.
- Conducting targeted government policies from countries.
- Existence of public and private initiatives.
- Continuous striving of professionals in the construction industry to improve their skills and to apply good practices;
- Significant advances in green building technologies.

The construction sector is gradually embracing the idea of building sustainable buildings as an investment linked to ecology and efficiency and part of the overall concept of sustainable development. Discussions and events are organized to familiarize the public with this initiative, with concepts such as building sustainability and energy efficiency. All this is tied to the EU directive until 2020 to achieve the following targets [5]:

- to reduce electricity consumption by 20%,
- 20% of electricity production to come from renewables
- 20% reduce greenhouse gas emissions [6].

Also, after 2020, all newly built buildings should have almost zero energy consumption. For public buildings this is already mandatory after 2018 [7].

The directive obliges governments to also adopt an appropriate regulatory act that will ensure the achievement of these objectives and will introduce the assessment criteria The Bulgarian Standard

![Image](46x491 to 285x614)

![Image](306x496 to 553x619)

Fig.3 The future of our 21st century seems more promising and healthier thanks to green building. It will reduce the risk and impact of climate change on our planet.

Fig.4 The green building a powerful way to reduce carbon emissions and mitigate climate change.
for Sustainable Construction is under development. Meanwhile, Bulgaria is applying three of the world-wide recognized standards for sustainable buildings: the American LEED, the British BREEAM and the German DNGB. More and more investors are paying attention to the advantages of "green" buildings and the return of their investments, albeit in a longer term.

The World Council for Sustainable Construction (WorldGBC) presents an international report on sustainable construction practices, bringing together the best examples of practice and research. The report demonstrates the benefits of sustainable buildings globally and is geared towards market leaders in this area. The new detailed report highlights the advantages of sustainable buildings explored and received by different stakeholders throughout the building's lifecycle [8].

3. Improving the professional skills in green constructions through online training

The Erasmus+ project (No 2017-1-LV01-KA202-035483) is being developed by an international team of 5 partners from 4 countries. The project analyzes the latest trends in the rapidly developing construction sector and its needs for workers with appropriate skills in the green sector.

The questions we are asking today are: Are the construction sector workers sufficiently qualified for modern requirements? Do our modules and training programs meet these requirements?

Since VET in Europe is driven by demand, the incentives for regulatory adaptation are usually derived from the economy itself. It can be concluded that qualifications are in principle responsive and guided by the needs of the labor market. Therefore, a specific VET strategy is needed to achieve the 20-20-20 targets.

In addition to the issue of high demand for construction workers in the industry, this project aims to examine whether construction workers have the necessary qualifications for green building and energy renovation of buildings.

This finding applies both to the field of the energy efficiency and renewable energies and to green building. In the partner countries of our project there is a wide range of specific curricula for training our target group, some of which can be successfully adapted to ongoing changes in work organization in the green construction sector. Moreover, as only minimum standards are provided in training regulations, it is always possible to update a specific curriculum with certain modules in order for the training to respond to innovative developments in the green construction sector. If these opportunities are not enough and because of one or another administrative obstacle they cannot be implemented for a sector. If these opportunities are not enough and because of one or another administrative obstacle they cannot be implemented for a partner from our project, the only solution should be to create and accredit new curricula.

The educational product to be created under this project is 4 interactive multimedia modules. The modules must meet the established and latest needs of the construction labor market in line with the new EU Green Skills program.

Based on a survey and analysis of labor market needs in the green skills of construction workers and an analysis of the needs of environmental skills training programs, the project team identified the content of the modules for improving green building competences at a special meeting with all participants in the project.

On the basis of the studies and analyzes carried out in the four European countries by the international project consortium, unanimous agreement was reached: developing the following 4 modules for e-learning in the next phase of the project:

- Materials for green construction.
- Energy efficiency and green technology.
- Passive house technology.
- Glossary "Green construction" - foreign language (Bulgarian, German, Hungarian, Latvian).

3.1 Analisys of the WEB wesded distance learning environment

The study in to the project analyzes two platforms Learning Management System (LMS), MOODLE and The Blackboard Learning System (i.e., WebCT) (Fig. 5).

The analysis showed preference for the MOODLE system:

- According to the full description, this platform allows it to be adapted to many operating systems (Windows, Linux, Sun and UNIX) and software environment (MySQL, Postgre SQL, MS-SQL Server, Oracle and Access).

- MOODLE can be installed on an institutional server and allows creation and maintenance of courses of different categories stored in a portal page catalog. This can cover a wide range of themes and themes.

- MOODLE supports more services than other courses. The teacher organizes the modules so students can use them. The order is flexible and editing is possible at any time. Available modules are: Assignment, Choice, Forum, Journal, Resource, Quiz and Survey that meet the needs of our project.

- The available course formats (Weekly, Themes, and Social) provide templates to set the course, making it easier for teachers to design work.

- There are capabilities for uploading files from different formats that allow the use of materials from previous regular courses and easy extension of existing courses. A link to the web directory that contains the files can also be given.

- MOODLE supports multiple languages with the ability to add extra languages.

As far as functionality is concerned, there is no predominance. The Moodle organization for learning content is more transparent and built-in constructivist style. Blackboard seems to require prior training for instructors and students, while Moodle is intuitive and easy to use. These aspects also confirm our preference for using our Moodle development as an Learning Management System (Fig. 6).
3.2. Methodological concept for the development of learning modules

The structure of the training course and the learning modules in the system MOODLE is selected to have consistency and consistency in the learning process between the modules (Fig.7). Initial is the "Green Building Materials" (first module) training, which goes on to the topics covered in the second module "Energy Efficiency and Green Building Technologies". At the third stage of the training are the topics associated with "Passive House" and the contemporary European standards related to the construction of such homes.

The aim of this course is to improve vocational education and training in the field of green building and to enhance professional skills in the field of environmental construction. The goal is to change students' approach to wise use and management of energy resources and create a sense of environmental responsibility - which is a prerequisite for providing a green future for future generations.

The training on WEB-based interactive modules is related to creating and improving conditions for acquiring, expanding and developing interests, personal competences, professional qualification to increase competitiveness for employment, professional career and individual development of the beneficiaries of the target group of construction workers.

In the times of constant change we live in, times of new inventions and developments, happening faster than ever before, we are forced to (almost daily) adapt and continue to learn new things throughout our lives. The learning process itself and the learning technologies used also change. This is particularly relevant today with the introduction of ICT and digitization in the learning process. Learning is not a matter solely for school classes, lectures and exams. Contemporary learning especially in vocational education needs to adapt quickly to changes in the environment that surrounds us. Progress is so fast that things are constantly changing. This applies both to new materials that appear in construction and new inventions and developments, happening faster than ever before, we are forced to (almost daily) adapt and continue to learn new things.

The desire and motivation to learn new things and to participate in different educational programs is strictly individual to each person. Employers (developers), however, consider 'lifelong learning' as one of the most important opportunities to increase the qualifications of their employees. If they want to be successful on the market, they need to hire people who are capable and willing to acquire new information, develop independently, participate in different educational programs (including e-learning) and, respectively, successfully to apply everything they have learned in their work. Their desire is to do intensive courses and, possibly, through WEB-based modules to allow more rationally accumulated up-to-date databases and knowledge in the specific field.

With our interactive WEB based learning modules, we have endeavored to give learners a new approach to:

- the principles of sustainable development,
- new ecological building materials,
- energy and resource efficiency;
- environmental Protection.

The emphasis is placed on the interactions in the "environment - building - inhabitants" chain, through the construction of "passive homes".

Conclusion

It can be foreseen that the construction workers deficit in Europe beyond 2020 will increase if energy efficiency programs and activities continue at the same pace. As the employment rate of the professionally qualified citizens in the western part of the EU can only be increased to a limited extent, account should also be taken of the migration trend of construction workers from Eastern European countries to Western Europe. This trend is intensifying and will become dominant in the coming years. Therefore, the comparison of knowledge and skills of builders in both parts of Europe is of paramount importance. Success can be achieved only by creating unified programs and criteria based on modern learning technologies! This is all the more necessary because of the fact that a unified system for recognition of professional qualifications in individual professions has been adopted in Europe, including in the construction industry. That is why the adoption of uniform criteria for knowledge and professional skills, especially in the field of green construction, is of particular importance today in the VET.

Therefore, within the framework of the European Skills Initiative, of which our project is also a part of, aims to propose measures and actions to overcome the quantitative and qualitative shortcomings in the training and qualification of workers in the construction sector and especially in the area of the green construction sector.

Our project is also one of the first steps to develop a concept for staff development for construction workers based on the latest e-learning technologies - WEB-based training qualification modules in the field of energy efficiency and green constructions technologies.

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Reference