

# METHODOLOGICAL ASPECTS OF A SUSTAINABLE DEVELOPMENT TRAINING IN THE HIGHER EDUCATION IN BULGARIA

Assoc. Prof. Pandev G., PhD., Eng.,

Faculty of Applied Mechanics – University of Chemical Technology and Metallurgy, Sofia, Bulgaria  
gpep@uctm.edu

**Abstract:** Learning different aspects of the international quality standards turned into an urgent necessity in the students' training, which gives them a possibility quickly to adapt to the practice during their professional realization as specialists. Generally, the preparation of the students of quality management in our country is well accepted in the different educational institutions and is conformable to their specific features. As a disadvantage it may be shown the fact, that the students' training is limited only to the knowledge for quality management receiving. It may achieve a wider range, including a preparation for environment standards (ISO 14000), for safety (ISO 18000) and for quality, which basic principles further the management of this combination and, in the long run, for one sustainable development.

The purpose of the present article is to be worked-out and presented the basic methodological aspects for sustainable development training in the higher education, which will give an opportunity to the students to receive wider knowledge in this field.

With the help of the basic methodological aspects, has been worked-out a concrete model syllabus for sustainable development training of the students from the higher technical schools in our country.

**Keywords:** ASPECTS, TRAINING, SUSTAINABLE DEVELOPMENT, HIGHER EDUCATION,

## 1. Introduction

Learning different aspects of the international quality standards turned into an urgent necessity in the students' training, which gives them a possibility quickly to adopt to the practice during their professional realization as specialists. Generally, the preparation of the students of quality management in our country, is well accepted in the different educational institutions and is conformable to their specific features. This training has been still restricted only in receiving knowledge for quality management [1, 2, and 3].

In recent years, in a number of European universities is being quickly introduced sustainable development training of students. Here the question is about training according to the environment standards (ISO 14000), for safety (ISO 18000) and for quality, the combination of which corresponds to the needs of production enterprises their articles to answer to the complex conditions for high quality and environment protection. All these demands, staked on the very stage of the development of the relevant article (product) and executed in the process of its production, form prerequisites for one sustainable development.

The purpose of the present article is to be worked-out and presented the basic methodological aspects for steady development training in the higher education, which will give an opportunity to the students to receive wider knowledge in this field. In order to achieve this aim, a correspondent syllabus is necessary.

## 2. Character of the sustainable development training

Sustainable development training's introducing in the higher education aims at both making the student acquainted with the basic normative documents and developing habits needed for working-out high quality products, minimum production expenses and maximum corresponding to the demands for environment protection.

In the present article are worked-out the basic methodological aspects of such students' training in specialties, connected with the machine-building production [4].

## Basic methodological aspects

1. Training for production technologies' choice, constituent elements and appropriate materials, which to allow the recycling of the products after the term expiration of working.
2. Training on determination of the effect of the already produced article on the environment during its whole term of working.
3. Learning all laws and standards, connected with the environment protection, which have connection with the article being produced, and their correspondent application from its development stage to its going out of production.
4. Receiving the knowledge, necessary in connection with suppliers, trades and customers, who to be informed and made literate enough, in order to the trade and exploitation of the article to be relevant to the staked on it demands for environment protection.
5. Learning and determining the expenses, connected with the environment protection during the term of article's exploitation.
6. Training on determining the influence of the energy and fluids used on the environment during the time of the whole exploitation cycle.
7. Creating habits for presenting a new product and emphasis on innovations, used in its working-out, in order to protect the environment.

The presented basic methodological aspects of the sustainable development training for students from machine-building specialties, suppose working-out a syllabus with a concrete matter [5].

## 3. Sustainable development training syllabus

The offered syllabus for training students from machine-building specialties consists of the next modules (Fig. 1):

1. Industrial production and eco-development. Instruments and methods for sustainable development of the industrial production.
3. "Clean" technologies and innovations.
4. Science and communications.
5. Project of an article (product).
6. Production experience in an industrial enterprise.

Each of the modules shown, has its own aim, and the first four modules have a number of disciplines, being learnt, too. After taking an examination in them, the students receive the needed knowledge and a level of competency and they can go on to a next module.

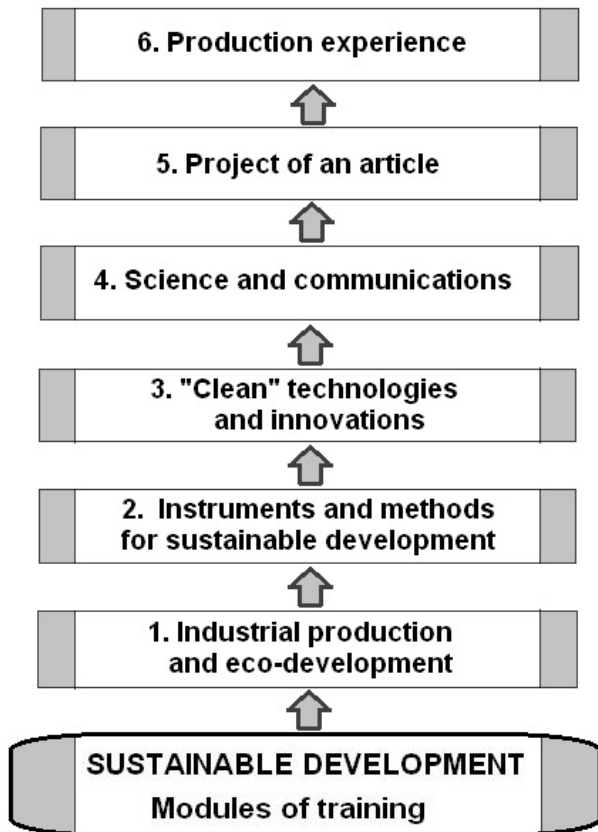


Fig.1. Sustainable development training syllabus

#### Module 1. Industrial production and eco-developments

Aim:

- Achieving the necessary scientific and organizational competency for realization industrial production, corresponding to the sustainable development requirements;
- Knowledge according to legislation requirements for ecological production;
- Made acknowledged with new technologies and their connection with the innovations;
- Enlargement of the culture on environment protection;
- Determining the place of the industrial enterprise in the conditions of a global competition.

Disciplines being learnt:

1. Eco-management
  - Law and environment;
  - Industrial production and ecology;
  - Sociology of the industrial production;
  - Products and systems for sustainable industrial production and indicators for its sustainable development;
  - Management, oriented to production, corresponding to the ecological requirements.
2. Eco marketing
  - Competition and environment;
  - Trade communication;
  - Industrial ownership;
  - Laws, standards, normals, etc.;
  - Forthcoming introducing of new regulations;
  - Eco-labels.
3. Production treatment after the term of exploitation
  - Eco-toxicology;
  - Recycling of the production and materials;
  - Throwing-out the recycled products;
  - Economic effect of the recycling;
  - Treatment and valuation of the waste matter.

In this module of training are included meetings and discussions with specialists from the industrial production, experts on standardization and visits of industrial enterprises, too.

#### Module 2. Instruments and methods for sustainable development of the industrial production

This module could provisionally be divided into two parts. Each of them has an aim and correspondingly forming it disciplines.

*The first part's* of the module aim:

- Giving the parameters for environment protection and the safety in the stage of the task for working-out the article;
- Ways of determining the exploitation term of the article;
- Clearing-up and concrete formulation of the criteria for ecology in the working-out stage;
- Presenting of an eco-plan for choosing materials, way of transportation and treatment of the waste matter;
- Research the effect of the ready product on the environment and the consumption of energy during its whole exploitation cycle;
- Using different methodological means of working-out of ecological products: computer software;
- Presenting the optimal way of recycling.

Disciplines being learnt in this part of the module:

1. Exploitation term of the articles
  - Analysis of the possible term for exploitation of the article;
  - Quality assessment of the article in the exploitation term;
  - Indicators for determining the achieving the staked ecological parameters from the article in the exploitation term.
2. Quality assessment
  - Functional analysis;
  - Evaluation of the article in a connection with the achieving of the parameters staked;
  - Experiment plan.
3. Means for working-out of eco-articles
  - Using of appropriate computer software;
  - Safety and ergonomy of the article being worked-out.
4. Used energy and fluids
  - Sources of renewed energy;
  - Managing energy consumption;
  - Energetic calculations.

*The second part's* of the module aim:

- Practical acknowledgment with CAD software products for working-out of the articles, choosing materials, determining the exploitation term: CATIA, FUSIMAT, PLM-Catia, etc.;
- Training on using different inter discipline connections at working-out the articles;
- Acknowledging with the methodological approaches at working-out different variants eco-articles: with "a continuing exploitation term and weak spreading-out" and "a short exploitation term and great spreading-out";
- Acknowledging with the methods and approaches at working-out of already produced similar eco-articles.

In the second part of the module have been learnt the computer software and have been worked-out projects in different fields of the machine-building: auto building, electrical equipment, electronic articles, aeronautics, shipbuilding, etc.

In the task of each of the projects are staked requirements the article to be relevant to certain ecological demands at using innovation technologies.

#### Module 3. "Clean" technologies and innovations

Aim:

- Deepening the students' knowledge and widening their competences in the sphere of technologies;
- Discovery of new and innovative technologies;

- Analysis of advantages and disadvantages of the technologies, used until now.

Disciplines being learnt:

1. Technology of production
  - In the machine-building;
  - In the electro technical production;
  - In the automation;
  - Production processes: founding, welding, etc.;
  - Surfaces treatment;
  - Metrological control.
2. Technical servicing
  - During the exploitation cycle;
  - Current and planned technical servicing;
  - Integration of the technical servicing from the very stage of working-out the article.

#### Module 4. Science and communications

Aim:

- Deepening the knowledge in using the scientific methods and approaches at working-out the articles;
- Argumentation of the choice of the production technology and the choice of the most
- appropriate materials;
- Using of existing and working-out new documentation for the article;
- Training in a team at working-out articles with ecological requirements.

For execution of the aims shown, the students study:

- Applies science: physics-chemical and mechanical qualities of the materials, technologies for treatment of different kinds of materials, etc.
- Communications: the ways of integration in teams on working-out similar projects.

#### Module 5. Project of an article (product)

The teaching staff, with the participation of production enterprises, offers to the students to work-out a project for an article, with included requirements for environment protection. It is necessary to be ensured adequateness of the project with the aims of the sustainable development training.

#### Module 6. Production experience in an industrial enterprise

The training of the students has to finish with a practical experience in an industrial enterprise not less than one semester. During the practice, the students work-out their personal project, or take part in a team on working-out another concrete project for an article. The requirement is to be ensured to the students a correspondence between the aims of the sustainable training and the content of the production practice in the enterprise. At the end of the practice, the students present a written report and go in for an oral defense.

## 4. Conclusions

1. There are worked-out the basic methodological aspects of students' training on sustainable development in the universities in Bulgaria. These aspects are for the students from the machine-building specialties of the universities.
2. On their foundation, a syllabus for sustainable development training has been worked-out, which consists of six independent modules. For each module has been shown the aim, which has to be reached and have been shown the disciplines, or the ways, in which it to be realized.
3. The worked-out basic methodological aspects could be used successfully at training students from another specialties of the higher education, too, as for them to be offered the existing, corresponding to them, syllabus.

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