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IMPLEMENTATION OF SOME METHODOLOGICAL MATTERS FROM E-LEARNING INTO "MATERIAL SCIENCE AND TECHNOLOGY" FIELD

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Abstract: *The present paper is an application of Gardner's methodology for training about the science of materials and the technology of materials. It deals with the possibilities of effective training in an Internet environment (e-learning). The accent is set over the advantages and the disadvantages of e-learning and an approach to modernize the tutorial contents of the subject "Science of Materials and Technology of Materials".*

Key words: *Gardner's methodology, e-learning, material science and technology*

1. INTRODUCTION

The influence of information technologies and the stored in Internet data grew incredibly during the last years. Besides the development of tools for storing and transfer of data, the need of information grows continuously. The global network revolutionized the world of computers and communications. Internet becomes a mechanism not only for a worldwide distribution of information but also in a tool for interaction of people and also for improvement of methods for distribution of knowledge and training [1].

E-learning has its proven future and it will continue to develop and become more and more significant in the domain of higher education. E-learning is especially suitable for teaching various contemporary developing methods, machines and technologies being a serious training aid for their mastering. Its key purpose is to reduce significantly the time for learning via submitting specialized and actual information.

E-learning may take lots of forms, namely: 'news-groups', conferences or groups for exchange of news and announcements, using e-books and other e-devices.

The substantial progress in e-learning is doubtlessly motivated by the bunch of advantages that it provides. Nevertheless computers will eliminate completely neither the teachers and the lecturers nor the various forms of teaching. That is why it is important to reveal outline the advantages of e-learning and on this base to combine them with traditional methods. The strong aspects of e-learning are the effective training of a globally distributed audience and also the reduced expenses for issuing and distribution. Besides e-learning provides also individualized advises, something that printed materials are unable to do. It can respond to specific needs. At the same time synchronous e-learning allows the self-estimate of the speed of learning [4].

In spite of its undoubted advantages e-learning has also some disadvantages. Preliminary investment to apply e-learning is bigger. It is necessary to establish whether the existing technological infrastructure is capable of realizing the goals of learning, whether the additional technological outlay will be justified and whether there will be a compatibility between the software and the hardware [3].

I. OUR EXPERIENCE

The first steps in e–learning in Bulgaria started about seven years ago. In implementation of the topics in the field of "Material science and technology" was attached to the idea that e-learning is a part of the information society. In elaborating the site Casting Area (www.castingarea.com) 6 years ago was incorporated the "Education" directory within very specialized information instantly accessible to all students (fig.1). In this site, except for "Education" section, there is information about different studies in the specialized area, forthcoming conferences and other important events, information about world renown production companies, materials and equipment suppliers, useful links, etc.

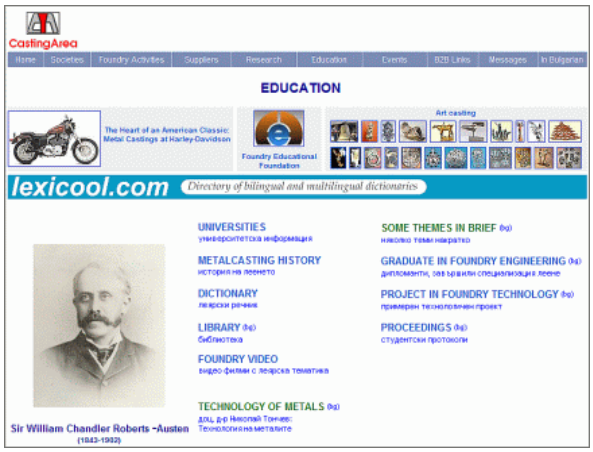

Fig.1. Screen of CastingArea - Education

Education directory includes information for Universities with foundry departments, metal casting history, specialized glossary, library (specialized literature in the field accessible for the students), educational specialized video, some topics in brief (description of the most laboratory works), templates of casting technology project and other students' works, and Technology of metals course. This course contains: texts, diagrams, figures and charts. According to the Gardner's methodology, this e–learning material is in the "visual" group.

II. METHODS OF LEARNING FORMULATED BY H. GARDNER

1. Visual

E-learning technology includes technical objects, multimedia, diagrams and presentation, simulation use of different colors to fix basic characteristics of the objects learned.

In this area here are presented some examples for "Deep Drawing" process - a very spread method for plastic deformation of metal products like: cans, fire extinguishers, propane tanks, deodorants etc. In the fig.2 is shown a diagram studied by the students in 1983. Next diagram in fig.3 shows the same process as it is studied today.

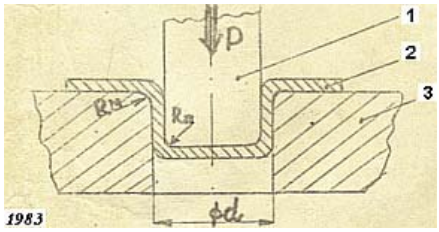

Fig.2. Old scheme of deep drawing

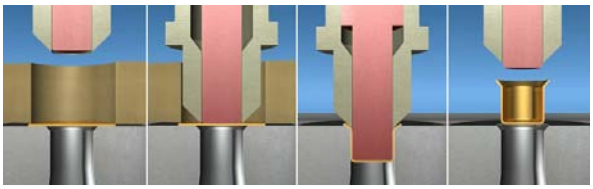

Fig.3. New scheme of deep drawing

2. Audio

E-learning technology inclides presentation of the lecture in audio format, and implementation of flow audio and video conferences.

3. Verbal

E-learning technology comprises presentation of the lectures in a written format and implementation of sound files, use of key words in the students' team work, video conference etc.

4. Simulation

Carrying out of experiments through simulation programs is the technology here. Charpy Test is a very suitable example of simulation. The educational process starts with the simple diagram showing the essence of the process (fig.4). It is known, the Sharpy hammer collides into the sample and depending on its resistance, the hammer deviates more or less.

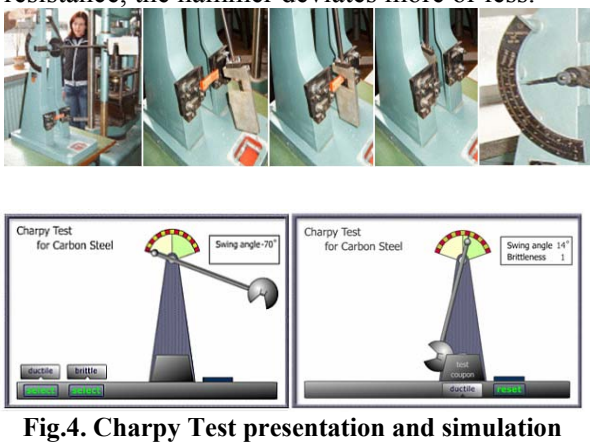

Fig.4. Charpy Test presentation and simulation

5. Logical

E-learning includes terms of reference, simulations, games. The presentation includes a good example of a logical approach to education.

The aim of this simulation is to convert approximately 250 tons of hot metal and scrap it into steel. This is achieved by blowing oxygen into the melt to cause a decarbonization in the melt which lowers the carbon content to between 0.01 wt% and 0.4 wt%. Results are measured by the total time, the total cost and the steel composition. There are 4 different grades and 2 different user levels from which to choose.

The execution of the task includes the choice of a processing mode: hot metal, liquid cast iron 200 t (at the average 75 % of all the metal in the converter varying within the range of 65-90%)

- Steel Scrap 30 t (Light scrap 10000 kg, Heavy scrap 20000),
- Lime 5000 kg;
- The output liquid-cast-iron temperature 1300^{o}C after 5-10 minutes becomes 1400-1450^{o} C
- Gas Flow rate (N2, nitrogen, fed from the bottom) 0.1 Nm3/min/ton
- temperature of the obtained steel 1630-1650 ^{o}C
- Carbon contents percentage in the output cast iron ~4 %;
- Carbon contents |in the obtained steel 0.1-0.16 %;

The obtained steel contains:

- Liquid cast iron: at the average 75 % of all the metal in the converter varying within the range 65-90%;
- Pressure of the fed oxygen 1.5 MPascals;
- Intensity of oxygen feeding from 350-450 m3/min up to 600-800 m3/min (sometimes up to 1000 m3/min);
- The distance between the nozzle and the level of the liquid metal is equal to 2-2.5 m for the first 3-4 minutes and afterwards to 1.2-1.6 m;
- Blowing stops for about 20-25 minutes;

The performance for the task and the respective version is tied to an economical argumentation which defines the rationality of the prescribed regime.

6. Internal Communication

Elaboration of enough number of learning, self control of knowledge is the technology here.

7.External Communication

E-learning technology comprises team activities: discussion forums, games and simulations with large number of participants, and video-conference.

CONCLUSION

E – Learning advantages This new method suggests**:**

- flexibility of education accessible at any time and from every location;
- realization through information and communication technologies and the Internet.
- performance through remote, present or mixed form of education;
- more attractive way of lectures presentation.

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ПРИЛОЖЕНИЕ НА МЕТОДИЧЕСКИ ВЪПРОСИ ОТ ЕЛЕКТРОННОТО ОБУЧЕНИЕ В ОБЛАСТТА НА „МАТЕРИАЛОЗНАНИЕТО И ТЕХНОЛОГИЯТА НА МАТЕРИАЛИТЕ”

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БЪЛГАРИЯ

Клучови думи*: Методология на Гарднер, електронно обучение, Материалознание*