Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 206 (2015) 278 – 283

Procedia
Social and Behavioral Sciences

XV International Conference "Linguistic and Cultural Studies: Traditions and Innovations", LKTI 2015, 9-11 November 2015, Tomsk, Russia

Increase of Engineering Students Training Level

Sergey Lavrinenko*, Stanislav Yankovsky, Vladimir Gubin, Kirill Larionov

National Research Tomsk Polytechnic University, 30 Lenin Avenue, Tomsk, 634050, Russia

Abstract

The article considers the problem of the widespread introduction of computer technology in the training of students in technical areas. This leads to a significant deterioration in the quality of practical training. Implementation in the educational process of the laboratory complex, which represents a real model of the power plant, has led to improved academic achievement in core subject areas. This equipment allowed the students to gain practical skills for different types of works with the equipment on the basis of the University, and also helped to increase the interest of students in carrying out the laboratory and practical work.

Peer-review under responsibility of the Scientific Committee of LKTI 2015.

Keywords: Laboratory complex; performance enhancement; technical training; laboratory and practical work.

1. Introduction

In modern conditions of society development the rapid development of computer technologies and their application in all spheres of human activity takes place. It's not a secret for anybody that in recent years the information technologies are being introduced in the education system (Arbelaitz, et al., 2015). A particularly significant role they acquire in higher education. This applies not only to universities providing training in the Humanities, but also to technical universities. Increasingly, computer technology is used not only as a tool for creating text files and presentations, but also as a platform for creating and carrying out laboratory and practical tasks.

* Corresponding author.
E-mail address: serg86@tpu.ru (S. Lavrinenko).

Peer-review under responsibility of the Scientific Committee of LKTI 2015.
doi:10.1016/j.sbspro.2015.10.025

1.1. Reasons

There are a number of objective reasons, among which are:

- Accessibility
- Compactness
- Speed of installation
- Safety
- Versatility
- A huge number of software
- Quick reinstalling and settings

The above reasons are even more advantageous in comparison with often outdated material and technical base. It is much easier to buy a computer with the software than, for example, to create student laboratories equipped with bulky and expensive equipment. Implementing the practical part of the training process for future specialists in some areas can be not only time consuming, but also very dangerous. For example, this applies to students of the field 14.05.02 "Nuclear power plants: Design, operation and engineering". For laboratory and practical classes on this profile, it is much safer to use computer models and simulators for nuclear power plants, for emergencies which will not lead to a real threat to the life and health of others.

1.2. Practical skills

In addition, the acquisition of practical skills of working with actual installations and equipment should be carried out during educational, industrial and pre-diploma practical training. In fact, and this is not always possible, since there is no opportunity to study the features of a structure, modes of operation, emergency on energized equipment. The entire practical training program is brought to trips and further examination of the technical documentation. In rare cases it is possible to study the constituent elements of the equipment, if the training period will coincide with the maintenance. Then students have the opportunity to see the equipment disassembled and participate in troubleshooting under the supervision.

This raises a serious problem of providing engineering students with a practical training which is based on computer models.

2. Methodology of research

2.1. Laboratory complex

In our opinion, to improve their technical skills students need a direct work with the current technological equipment (Abramenko & Mishunina, 2014). For this purpose the laboratory equipment, including a complete list of the main equipment of thermal power plant (Fig. 1), was designed and installed at the Department of Nuclear and Thermal Power Stations at the Institute of Power Engineering of Tomsk Polytechnic University.

The given diagram shows almost full compliance of the laboratory with existing thermal stations.

The laboratory provides a full set of heat exchangers and mechanical equipment of thermal power station: a steam boiler, a steam turbine, steam-water heat exchangers (heaters, a deaerator, a condenser, an expander, the first and second lift pumps, valves, steam- and water lines, and water-treatment system). Steam is supplied to the laboratory by the collector and then distributed to station equipment. The equipment is unique because it is miniature. The length of station heat exchangers is measured in meters, from 5 to 7 meters. Here, by the design, the plants made exchangers of small size to be able to place them in the existing premises (Fig. 2). All other processes are the same as at a real power station. Students have the opportunity to try themselves in all positions – from an auxiliary operator to a shift engineer.