Virtual Laboratory For Pneumatic And Electropneumatic As A tool For Increasing Efficiency Of Teaching Technical Academic Fields

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Abstract: *Purpose of the Virtual laboratory for pneumatic and electropneumatic systems is to teach principles of preparation pneumatic and electropneumatic systems of management and for the systems output verification by the simulation. Student, who will experience education in this type of laboratory, acquire needed skills and know method of creating various management systems (pneumatic, electropneumatic, electric).*

Key words: *Virtual laboratory, teach, pneumatic systems, electropneumatic systems*

Introduction

On Production Devices and Systems Department, Production systems and Applied Mechanics Institute, Material Science and Technology Faculty, STU Bratislava is solving granted task KEGA in years 2007-2009: „***Creation and building of virtual laboratory for pneumatic and electropneumatic managing systems***".

Purpose of the Project is to build virtual laboratory for pneumatic and electropneumatic systems and to prepare suitable teaching system supporting setting and stabilization of Key and Career Authority, which are expected nowadays from Technology Universities Graduates from Employers.

In the article are presented goals of this granted task and expected asset.

1. Social need for creation of virtual laboratories and establish suitable education system to technical fields of study.

In Concept of Universities Development in 21.th century we can find:

"Europe needs that kind of special preparation, which is not divided to small specific groups and departments, but which allows everyone to understand their work , and also handle and improve the work... Universities institutes have to train students to be informed and motivated, who are able to think creative and critically, analyse and find solutions for problems, apply and get social responsibility".

If this goals must be reached, it is necessary recreate Schedule and use only education forms and methods, which allow to come over cognitive managing of science and career, to developed students key authority. These get special importance not only for self development, but also importance in life study to increase Technology Universities graduates employment.

Important demand from potential employers is „right" ratio between career authorities (high rank of career knowledges and actual field trends overview) and key authorities.

- **Career authorities**, assure to handle work tasks.
- **Key authorities,** wide range abilities, for example ability to make a decision, to solve problems, to work in team, to speak foreign language, to learn, work with informations, ...

Key authorities are understand like a universal abilities complex over the specific career knowledges and abilities scope. That are expression of personal skills to behave according to the situation [2]. Special knowledges are certainly necessary and key authorities helps to use them in practise.

Identified abilities, which are related to **engineer career abilities**:
- needed habits and skills by experimental and laboratory works,
- methodical procedure by technical problem solution,
- to know how to combine knowledges with skills and abilities for practicall usage;
- social responsibility (graduate is aware of social, moral, legal, economic and environmental context of his work and consequences of his activity) [1].

Nowadays brings need for superior and higher education assured computer literacy, communication skills, also in foreign languages, self-activity and responsibility, ability to cooperate and creativity of solving problems.

Work in virtual laboratory develop and establish computer literacy, so important and more needed for future, and definitely will support getting other key and career authorities our Technology University graduates.

Key and career authorities represents important and relevant integrated category for educational goals, which follow from qualification requirements and assumes for application of our graduates on the labour market and general life.

Most preferred from employers are demands for ability to solve problems, make a decisions and keep responsibility, cultivated verbal and written communication, ability to work in team and lead team. They welcome some experience in the field in any case, at least some students part time jobs.

2. Project Targets

Target of the project is to create virtual laboratory of pneumatic and electropneumatic management systems. This laboratory will be used for education of pneumatic and electropneumatic management systems creating principles and simulation of these systems. With building of this virtual laboratory we pursue better quality and attractively several fields of study in Production Devices and Systems (Mechanics and Automation, Automata Theory,...). Graduated students in this laboratory, get needed skills and know method of creating various management systems (pneumatic, electropneumatic, electric), and they will be more competitive on the labour market.

In virtual laboratory can students create virtual pneumatic or electropneumatic managing system to manage assigned device and verify its reliable function with simulation.

Later on our Institute, in the real laboratory for pneumatic and electropneumatic management systems, students will implement only connections of manage circuits, which were already optimalized and successfully simulated in virtual laboratory. With this laboratory students get opportunity to design many projects, in which are used pneumatic and electropneumatic management systems and also to be prepared for real problems solving in future work. They get experience important for employers. Technical authority and so-called key authority of our students will highly develop and improve.

„Virtual laboratory“, will be based mainly on computer modelling and simulation of pneumatic and electropneumatic management systems, and also less on work in real laboratory.

In the project will be prepared study materials (instructions, work standards, examples,...) : also on internet, which allow effective work conditions in laboratory and will be base for another knowledges and abilities development of our graduates.

This instructions will be used like additional study for daily and external students to get knowledges and skills by pneumatic and electropneumatic management systems design for several industry devices.

All solving group members already have experiences with preparing materials for e-learning, and also study materials for classic education forms.

Experiences related to creating this kind of education will be implemented to the external study by the e-learning.

3. E-learning

E-learning is effective applying of Information Technologies in education process.

E-learning like advanced education form open many new opportunities. This form can be used for all levels of formal education and also in life study.

If we look on e-learning like effective applying of Information Technologies in education process, than it seem like new opportunities, which we can use in education. Classic education with teacher is executed from beginning of history and for some fields of study will be not substituted in future. But education only with teacher has also many insufficient. E-learning is trying to eliminate these insufficiencies and that is why is optimal solution for complex education process.

Combining classic education and e-learning is possible to make from education interesting, address, individual and interactive process integrated to every-day life. Also for fields, where personal contact with teacher is needed, is possible to electronic „pre-teach„ students, who can come later to teacher already with many informations and questions. Than teacher can focus only on interesting or difficult parts of the study and make higher efficiency of education.

E-learning bring many communication tools from e-mail to videoconferences, which allow teachers to pay attention individually to student. E-learning give to teachers efficient tools to change their own knowledges, experiences and skills easily and fast into the form, which is immediately available for students.

E-learning is solution assigned for education, but for education in whole context. That's why it is not strictly assigned only for students education, but in general information share and hand over method also in life-study, what is necessary for technicians. Unlike classic information systems, concerned with information share and possibility find needed informations in the right time, e-learning highly emphasize also in way of informations hand over. Nowadays is not enough to get correct information in the right moment, it is also necessary to fully understand the information and put it to context. E-learning brings and support exactly these abilities.

4. Expected Project asset

Expected individual asset of this project we can see as follows:
- Education Process Improvement,
- Education Process will be more attractive for students,
- Students will improve technical skills and abilities,
- All connections will be simulate in virtual laboratory before physical creation and only correct connection will be create in real laboratory,
- Low cost for real laboratory maintenance in consequence of not created incorrect connections,
- In virtual laboratory can work more students in one time,
- Access to virtual laboratory for students is through the internet, what can use daily and external students to make given project related to this issue,
- Work in virtual laboratory establish and developed specialists career authorities,
- Work and cooperation in the virtual and in the real laboratory helps to get new authorities, establish and developed key authorities required by employers,
- Increase competitiveness of our graduates on labour market.

With creating of mentioned laboratory we respond to increasing of european labour market demands, and also to rapidly developed industry (mostly automotive and electrical engineering) in Slovakia, which employers require from Technical Universities graduates.

We expect higher interest about our graduates following increasing of their value on the labour market. We are trying to adjust education to future employers of our graduates demands. Work in this laboratory helps students to increase their key and professional authorities:
- Team work,
- Team Leadership,
- Self-Activity Ability,
- Solving emergency situations,
- Communication,
- Work with several technical devices,
- Acquire creative technical work methodology,
- Work results presentations
- …

Conclusion

Present economic situation in Slovakia and Europe, where we can find complex pneumatic, electropneumatic electronic management systems and data processing, require to prepare specialist in this field. Our graduates competitiveness on present european labour market increase. This task is for us, teachers, important and responsible for complex preparation of Technology Universities graduates for career and future life.

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