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ON USING REMOTE LABS FOR ENGINEERING EDUCATION

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Abstract: *Distance learning is becoming increasingly popular in engineering education, especially in environments where the physical presence of students in laboratories or workshops is often limited. Incorporating distance laboratories into educational programs opens up new opportunities for learning and experimentation, making the educational process more flexible and accessible.*

This abstract highlights the importance of integrating distance learning and laboratory work into engineering education, identifying this area as strategically important for the development of modern educational standards and the training of qualified specialists capable of working effectively in a changing technological landscape.

Keywords: *remote experiment, distant engineering education, LabVIEW, new educational technologies, distance laboratories, measuring technologies, hardware systems.*

I. INTRODUCTION

In recent years, distance education has become a significant part of curriculum in many fields, including engineering education. The evolution of information technology and telecommunications has opened new horizons for teaching methods that can radically change traditional approaches to engineering education. Access to remote laboratories allows students to conduct experiments and hands-on assignments from the comfort of their home or office, significantly expanding opportunities for learning and skill development. [1]

One of the key advantages of distance learning is its accessibility. Students anywhere in the world have the opportunity to receive quality education, access to which may previously have been limited due to geographic, financial or personal reasons. Distance laboratories offer unique opportunities for hands-on work that require specialized equipment and materials, thereby making engineering education more inclusive.

Integrating advanced technologies such as virtual and augmented reality, cloud, artificial intelligence, and the Internet of Things (IoT) into distance learning learning experiences helps create more effective and interactive learning environments. Such technologies make it possible to recreate complex engineering processes and experiments in a virtual format, giving students the opportunity for trial and error without risking equipment or safety.

Continuous evaluation and adaptation of curricula is necessary to ensure that distance engineering education meets both academic and professional standards. Teachers need to develop new techniques and approaches that can motivate and engage students and provide a deep understanding of the subject despite the lack of face-to-face contact.

Ultimately, distance learning and the introduction of distance laboratories in engineering education represent an innovative approach that can significantly improve the level and quality of engineering education. They offer both significant opportunities to expand access to education and challenges that require thoughtful solutions in pedagogy and technology.

Paper is organized as follows. Section II describes fundamental advantages of a distance learning laboratory. Section III describes the role of distance learning experiment in modern engineering education. Section IV presents experimental results showing results of structural diagrams. Finally, Section V presents conclusion.

II. RELATED WORK

Also, virtual measuring technologies make it possible to combine measuring systems with telecommunication networks, thereby providing the possibility of remote access to measuring and control equipment. Such integration makes it possible to connect a large number of different measuring and control devices remote from each other into a single system.

It is very important to promote distance technologies in laboratory workshops and in a training experiment in order to increase efficiency and reduce material costs for training in the field of engineering education.

At the same time, the following fundamental advantages of a distance learning laboratory are achieved:

- round-the-clock automatic operation;
- individualization and improvement of the quality of education;
- availability of a remote laboratory from any geographical point.

III. METHODOLOGY

The role of distance learning experiment in modern engineering education: The introduction of new information technologies is the most important factor in improving the efficiency and quality of the educational process. A special place in engineering education is occupied by laboratory and practical classes. In recent years, distance learning has been intensively developing in higher education. For a long time, the main obstacle to the use of distance learning in engineering and secondary technical specialties in technical universities and technical schools was the impossibility of conducting remote laboratory workshops based on traditional teaching technologies and obsolete instrumentation. The successful development of the technology of virtual measuring instruments and modern means of telecommunications make it possible to effectively carry out a remote experiment from almost any geographical point. [8]

IV. EXPERIMENTAL RESULTS

Technology of remote automated experiment through local and global information networks:

1. Improved Accessibility: Distance programs provide learning opportunities for a wider range of students, including those who are located in remote areas or are unable to study in a traditional setting due to personal circumstances.

2. Technology Integration: The use of advanced technologies such as virtual reality, Internet of Things, and cloud computing enables the creation of realistic and interactive learning environments that can significantly enhance the quality of engineering education.

3. Development of practical skills: Distance laboratories provide students with the opportunity to conduct experiments and apply theoretical knowledge in practice, which is critical to the preparation of qualified engineers.

4. Prepare for Future Challenges: Distance learning prepares students for future careers in a global and ever-changing technological environment. The main components of the above structural diagrams are:

- remote users;
- the Internet;
- main server;
- remote laboratories;
- LAN of the university;
- computer centers and computer classes of the university. [9]

V. CONCLUSION

Distance learning and the use of distance laboratories in engineering education represent significant steps towards modernizing the educational environment and expanding its accessibility. These innovative approaches not only improve the flexibility and accessibility of education, but also develop students' critical thinking and practical skills.

Going forward, to maintain and expand the success of distance engineering education, institutions must focus on improving the quality of distance content, delivery methods, and student support systems. It is also important to continue to develop and implement innovative learning tools that can provide deep and effective learning.

In conclusion, distance learning and distance laboratories play a strategic role in the education of future engineers. This not only helps improve educational processes, but is also a response to modern challenges in the field of engineering education, opening up new perspectives and opportunities for learning.

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