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Matching Automation Technology Education with the Green Transition Needs

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Abstract: More experts are needed to the Finnish automation sector, while many current experts are retiring and younger generations are smaller. The green transition requires new contents in engineer education. Efficient and attractive online teaching and learning, together with increasing collaboration with companies and other universities help to overcome these challenges. In this article some successful education practices and development projects concerning the green transition related automation in energy and process technology sectors are presented.

Keywords: automation education, energy technology, green transition, online learning, process technology

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1 Green transition effects in industries

In the Finnish higher education, universities offer more scientific study programs, while universities of applied sciences stick to more praxis-oriented studies. With limited funding, all universities have streamlined their operations by concentrating on most generic study contents. Companies are complaining about the lack of potential applicants especially in traditional sectors, such as in mechanical, process, electrical and automation technology. The green transition can be supported by automation and IT technology, and these elements should be included in some way in the education of many study fields.

More persons are retiring than coming to the Finnish employee market because of the decreased younger generations. The green transition asks for more experts also in the traditional sectors. Based on the studies of a consulting company for Engineers Finland [1], the green transition affects energy and process industries, and construction with increasing employment and new application fields. In the energy sector, the utilization of different renewable energy sources requires new production methods and more efficiency, and also more flexibility and control logic in electricity networks. In the process industries, the capture of carbon dioxide, production of green hydrogen and their usage for the production of synthetic fuels and other chemicals set new demands. In addition, more sector coupling in heat recovery and in power storing is needed. Automation technology is involved in all these activities.

2 Requirements for education

Industrial engineers are facing at more complicated tasks and systems, and no one cannot manage whole application fields alone. Developed transversal skills, also called meta skills, including continuous learning, communication, teamwork and resilience are identified for responding to the green transition needs. [1]

Concerning energy technology, the required skills in the green transition respect can be divided into three categories: 1. Core skills including mathematical and scientific first principles, 2. System thinking skills covering energy production methods, energy system management and value chains, 3. Complementary skills comprising data processing, visualization, coding and programming. [1]

Regarding process technology, the required skills can be classified in the next way: 1. Core skills discussing material production, properties and recycling, and energy sources, production and storing, 2. System thinking skills dealing with sector coupling, material life-cycle management and utilization of side-streams, 3. Complementary skills consisting of digitalization, safety, modelling, circular economy, environmental impact assessment and footprint calculations. [1]

3 Aims at more flexible arrangements

At South-Eastern Finland University of Applied Sciences (Xamk), automation and process technology are studied inside the Energy Technology Degree, and this has led to rather generic energy studies like in about ten other universities of applied sciences in Finland.

In order to ensure enough automation professionals for the green transition, still more flexibility in study

arrangements is urgently needed in the higher education of technology in Finland. Companies and educational institutes should collaborate more in matching study contents, and in giving chances to students. Educational institutes should collaborate with each other in extending their study offerings. These collaboration needs are also referred in [1].

4 Results in automation education

Flexibility from online teaching and learning

Since 2009 Xamk in Kotka has been educating energy engineers using blended learning methods, and starting a new degree group every second year. The basic framework has been including annually ten weekends contact learning at the university, and ten weeks with webinar evenings. Some traditional lab sessions have been replaced by remote labs. Moodle was chosen as a platform which has turned out to be a successful choice with its open-source code and feasible updates.

In a governmentally financed project, called Osku 2025, for life-long learning in technology, in 2021-2022, online learning materials were developed for public and degree education use and published in eOsku [2]. A successful concept, based on company needs, covered four 2-hour automation webinars with interactive exercises and automated exams. 40-70 persons, both professionals and students, were participating in the webinar sessions, and afterwards several persons have studied the materials with recordings, and passed the exams. The webinars and materials are dealing with the next green transition related automation technology topics: 1. Safety automation in process industries, 2. Data Acquisition and analysis of process data, 3. Utilization of advanced control methods, 4. Opportunities of quality-related measurements. In addition, the platform eOsku provides with other interesting study materials for the green transition, such as Smart electrical networks, Industrial process control systems and networks, Cloud services and Leadership.

The online learning materials should be developed and targeted for chosen groups. The materials should be wrapped in clear, limited packages, and they should include varying interactive exercises for self-study testing. The materials should be interesting and visually attractive which work-intensive.

Support from collaboration

Companies are needed to give real working life feelings to students. Traditionally, these contacts take place in internships, in thesis projects, and finally in recruiting. Most working students have realistic understanding about the automation and energy sector, while newcomers need chances to get informed on processes, applications and industry practices.

In recent years, the study offerings of universities have extended. More courses are available online, and this gives students more chances to specialization. Since 2011 LUT University has been running an online course on wind and solar technology together with Xamk. Since 2008 Xamk runs a course on renewables every April in Stralsund, Germany, together with Stralsund and international colleagues. Some sessions have been organized online. The main focus lies on hydrogen technology and its sector coupling.

A governmentally financed project, called Jatkot, started in February 2023 is aiming at the development of tighter and more systematic collaboration between the educational institutes and companies. In the project, two universities of applied sciences and one vocational school will be developing and testing a tighter collaboration model of master, bachelor and professional education with companies. The piloted technology fields will be in construction and automation. Some other project initiatives dealing with the collaboration of companies and educational institutes are in the development phase.

5 Conclusions

In the future, higher education has to be organized with decreasing funding. However, more experts are also needed in the automation sector due to the green transition needs in energy and process technology. Increasing online teaching and learning enable in a flexible and realistic way life-long learning, current life-styles and living standards. Sophisticated learning and communication platforms make it easier but the collaboration with companies and other universities is urgently needed.

References

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