Relationships Among Economy, Industry, Vocational Education and Training and Higher Engineering Education

The Trefort Project Editorial

https://doi.org/10.3991/ijep.v10i5.16747

Istvan Simonics
Óbuda University, Budapest, Hungary
simonics.istvan@tmpk.uni-obuda.hu

It is a great pleasure to contribute some words to the debate about Engineering Education as well as to broaden the discussion about the future evolution of this discipline.

Thanks to the International Journal of Engineering Pedagogy (iJEP) and its editor in-chief, Matthias Utesch, as well as to the collaboration between the IGIP (International Society for Engineering Pedagogy), we have received a possibility to collect the best papers of our 9th Trefort Ágoston Conference on Vocational Education and Training and Technical Teacher Training at Óbuda University (ÓE) Electrical Engineering Faculty in Budapest, in Hungary. The Conference was organized as an IGIP Regional Conference for the third time. Before introducing the articles, I summarize the main important elements influencing the Higher Engineering Education in Hungary.

The Fourth Industrial Revolution unfolds, companies are seeking to harness new and emerging technologies to reach higher levels of efficiency of production and consumption, expand into new markets, and compete on new products for a global consumer base composed increasingly of digital natives. Yet, in order to harness the transformative potential of the Fourth Industrial Revolution, business leaders across all industries and regions will increasingly be called upon to formulate a comprehensive workforce strategy ready to meet the challenges of this new era of accelerating change and innovation. The World Economic Forum stated in the Agenda that 'Skills growing in prominence include analytical thinking and active learning as well as skills such as technology design, highlighting the growing demand for various forms of technology competency. However, proficiency in new technologies is only one part of the 2022 skills equation. "Human" skills such as creativity, originality and initiative, critical thinking, persuasion and negotiation will likewise retain or increase their value, as will attention to detail, resilience, flexibility and complex problem-solving.' There are several requirements for qualified engineers: they have to be creative, critical thinking, complex program solvers, and have to have competencies of cognitive flexibility, high level communication, team work and application of foreign languages.

At our university, we have recognized several problems according to SWOT analyses. Not enough number of students would like to select STEM faculties. The rate of early school leaving (ESL) is too high in STEM area. Requests of Labor market have not appeared in Training curricula. The candidate students do not know the future carrier and the content they have to learn. In secondary schools, the development of basic

competencies and STEM subjects is not effective e.g. teaching Math is not practice oriented, this is why the results of students on PISA tests are weaker. The preparation for higher education is not enough, which leads to ESL by the end of the first year in higher education.

Based on analyses, the needs of engineer higher education and industry are the following:

1. Highly qualified pupils as an input from secondary schools with strong competencies of Maths and basic STEM subjects for learning the engineering knowledge.
2. Committed students who know well the selected profession and are able to meet the requirements.
3. High quality STEM education with balanced theoretical bases and practice.
4. Relevant knowledge of the Labor Market supported by the company practical training.
5. Application of a foreign language at high level.
6. Higher number of technical education with reducing the rate of early school leaving.

The national industry looks for qualified, talented labor force which has futureproof competencies. Because of this, it is strategically important to provide adequately prepared students as an input on STEM areas and improve the success of students. To solve these problems, the government made important steps. It is emphasized to make cooperation between public education and higher education. To bring closer the demands of industry to higher education, the dual higher education, where the scientific semesters and practical works in companies are alternating, is increased.

In the analyzing process, we could recognize two main problems. The knowledge level of students arriving from secondary education to higher education is not balanced and, in several cases, not enough. There are no possibilities to make up for the lacking basic and STEM knowledge and competences in higher education. Compared to secondary education, the requirements are growing dramatically in higher education, and students do not have the learning methodology technics with which they could overcome this problem. The other problem is that the identity to the selected profession has not evolved in secondary education by starting higher education, and the motivation is not enough when the rate of charging is increased. We have to find the way to reform engineering higher education and to give good answers to solve the recognized problems.

As we demonstrated, the quality of knowledge of secondary education pupils is an important input for engineering higher education. The vocational secondary schools can provide the majority of starting engineering studies at technical universities. The technical teacher training prepares the vocational teachers for secondary vocational schools. The quality of technical teacher training, the adequacy of curricula to the professional needs can be key questions for the future of engineering education. The practice of vocational teacher students is a basic element of their studies. These practices are organized in secondary vocational schools. But realizing these practices needs a mentor teacher. Mentor teachers can support the preparation process of our engineering teacher students in secondary vocational schools by coaching their teaching practice,

and they also help their trainee colleagues in the first two years at the beginning of their career.

Trefort Ágoston Conference on Vocational Education and Training and Technical Teacher Training at Óbuda University Electrical Engineering Faculty in Budapest, in Hungary gives the possibility for researchers, educators from universities, teachers from secondary vocational schools and PhD students from Doctoral Schools to present their results in researches or demonstrate best practices in Vocational Education and Training and Technical Teacher Training. In this Trefort Project, we selected 6 presentations and asked the authors to submit their articles for a Special issue of the International Journal of Engineering Pedagogy (iJEP).

Istvan Simonics and Andrea Hetzl analyzed the status of natural scientific education and its relationship with exam systems. Tamas Kersanszki and Laszlo Nádai examined the position of STEM Higher Education Courses in the Labor Market. Ildiko Holik and Istvan Daniel Sanda demonstrated the possibilities of improving communication skills in the training of engineering students. Ibolya Tomory summarized the cooperative methods and development of social competence in training of technical teachers. Tamas Kopeczi-Bocz introduced the learning portfolios and proactive learning in Higher Education Pedagogy. Ildiko Holik and Istvan Daniel Sanda showed the research results of character Strengths and virtues of Mentor Teachers.

Istvan Simonics
Budapest, July 2020

Istvan Simonics *is an Associate Professor and the General Manager of Ágoston Trefort Centre for Engineering Education in Kálmán Kandó Faculty of Electrical Engineering at Óbuda University. He is a member of the Executive Committee of the International Society for Engineering Pedagogy (IGIP) and a member of the Editorial Board of iJEP Journal.*