# SDGs and GIGAKU Education

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hree years have passed since the Sustainable Development Goals (SDGs) were adopted as the core of the 2030 Agenda for Sustainable Development by the UN Summit on Sustainable Development in September 2015. The international community has made a commitment to take action toward achieving the SDGs. Science, technology and innovation (STI) has been regarded as among the most important measures in such efforts.

The 2030 Agenda articulates mechanisms of periodical review and follow-up on implementation toward achieving the SDGs, and the High Level Political Forum on Sustainable Development (HLPF) is organized each year under the auspices of the UN Economic and Social Council (ECOSOC). Recognizing the important role of STI for achieving the SDGs, the STI Forum is held annually at UN Headquarters, and the outcomes of its discussions are reported to the HLPF every year.

Prior to such reviews at the global level, the UN Economic and Social Commission for Asia and Pacific (ESCAP) reviews progress towards achieving the SDGs at the regional level. ESCAP organizes the Asia-Pacific Forum on Sustainable Development (APFSD) in March every year. In addition, Member States in the region have also developed their own implementation mechanisms for achieving SDGs, reflecting their national circumstances.

Japan has also committed to a wide range of actions toward achieving the SDGs. The SDGs Promotion Headquarters was established in 2015, which is chaired by the Prime Minister and comprises all of the members of the cabinet. The SDGs Round Table Meeting was established to reflect voices from a wide range of stakeholders. The SDGs Implementation Guiding Principles were formulated in December 2016 to provide an overall framework and set priority areas. The SDGs Action Plan was also decided in December 2017, which specifies the three priority areas, namely, (a) Society 5.0 in support of STI, (b) Local revitalization and (c) Health and gender balance. In priority area (a), the Keidanren (Japan Business Federation) has revised its Charter of Corporate Behavior and is calling for each company to take action toward addressing sustainability.

It is clear from these developments that STI plays a crucial role in mobilizing knowledge, science and technologies for sustainability. It is extremely important to train future generations who will engage in the fields of science and technology in the years to come.

# Collaboration Equals Future of Education: Uncertainty and Opportunity in the Disruptive Technology Era

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Facing with the current trend in the world that sees the shift from common to the new digital technologies of the industry 4.0 era, the drastic change of technology is causing the new dynamics in desired skills of the real-sectors as well. Today's businesses around the world are having more turbulent time and unpredictable scenarios where some jobs are fading out, new jobs are emerging, unemployment rate is getting higher, and business turn-over is much faster than in the past. As a consequence, the desired skills of the workforce may change quickly and unimaginably, as evidenced by the increasing preference for a set of certain soft skills over hard technical skills.

Today, technology is a key enabler that drives disruptive changes of the society, such as the way people communicate, transport, deliver goods, and receive and analyze information, all of which leading to dramatical changes in the way of living. Education is one aspect that receives such a big impact from this phenomenon. The current way education is offered may not be relevant and responsive to the volatile and challenging circumstances of the changing human resource demands. Workplaces which normally recruit new talents based on academic records may have to play a new and crucial role in helping to train the new workforce for the country and the world, too.

Western Digital (Thailand) Co., Ltd. is a world class provider of wide-range electronic data storage devices such as Hard Disk Drive and Non-volatile Storage. As a large firm of more than 70,000 employees world-wide with a strong belief in collaboration as the future of education, WD has been involved in Cooperative Education (Co-op) for more than 10 years since 2007.
More than 200 students a year on average from local and overseas universities have participated in the co-op program at WD. Almost 2,000 students have created more than 900 projects in both technical and non-technical areas.

WD also runs another program called 'Research Collaboration' in which the company works with researchers from universities and government institutes to conduct collaborative research and development projects related to WD's processes and products, especially in science and engineering areas.

The research projects under this Research Collaboration program are usually led by professors or Master's or Ph.D. students who always bring Cooperative and Work-Integrated Education students to participate in the team. This kind of collaboration creates a systematic work system in which the students could learn from actual research activities. As of mid 2018, WD has worked with 9 government institutes and more than 20 universities, involving more than 300 researchers and covering more than 200 research projects.

Although the main purpose of WD in doing co-op and Research Collaboration is to develop quality human capital both in terms of their hard and soft skills from very early stage to be ready for real working environment, it turns out that the Return on Investment (ROI) of the projects created by these students are more than 300% in financial perspective. Many projects have a big financial impact, such as cost saving resulting from a smarter work flow, an easier work process, and, more importantly, better quality of life for employees in a long run.

As for the recruitment benefit, this co-op has been found to be the best method for WD to get the best fit persons to be hired as employees. During the co-op term, this is the best time that the students could sharpen their hard and technical skills, nurture their soft skills, express their interests, showcase their talent, and bring out all of their potentials for the work projects given to them. This co-op term is the best chance for the students and the company to get to know each other before making decision to work together.

To move forward, it is recommended that WD and other companies have to change the way they are dealing with education to be even more proactive and directive into the specific areas of knowledge. This trend has already been influential at many big hi-tech companies, such as Google and IBM where they are already arranging specific education programs and hiring employees without fussy consideration on qualifications. The trend the world is seeing us that performing well academically may not be desirable anymore whereas students with 'new smart' traits possessing characteristics of 'new culture way' can be the asset that any business will be looking for instead.

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**Engineering Education at the Zurich University of Applied Sciences (ZHAW-SoE) Switzerland, Present Status and Future Challenges**

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Established back in 1874 as the Winterthur Technical University, the ZHAW School of Engineering (ZHAW-SoE) is a centre of education steeped in tradition. Today, it is one of eight departments of the ZHAW Zurich University of Applied Sciences. The ZHAW School of Engineering emphasizes topics, which will be relevant in the future. 13 institutes and centres guarantee high quality in education and applied research & development. We provide a scientifically based education (8 Bachelor programs and a Master program), with strong practical elements such as project work in cooperation with industrial partners and an interdisciplinary approach. The model "Universities of Applied Sciences" is seen as a success and is well recognized in the higher education system in Switzerland.

Based on a brief overview of the Swiss education system, the current state of the engineering education at the ZHAW-SoE will be outlined. Specific elements of the curriculum and the students profile before entering the University of Applied Sciences, believed as "success factors" are highlighted. Further, some main results of our project "Qualification Graduates" are briefly discussed. Here we look e.g. at competences / skills of our students and how these match with the needs of the students, industry and society.

Finally, also on the basis of the findings of the "Qualification Graduates" project, international developments, future challenges and demands for the industry are outlined.

The conclusions focus on the typical "next generation engineer profile" and, how the School of Engineering responds with the structure and content of the curricula to the expected developments and needs of the society. The current approach combining pre-study industrial experience with the practical orientated and scientific education at the ZHAW - SoE is regarded as very successful. Thus, no drastic changes in the education structure for engineers at the SoE are expected, but of course, we will constantly optimize the education of our future engineers.

# Distinctive Feature of GIGAKU Engineering Education Based on SDGs

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Nagaoka University of Technology (NUT) aims to promote advancement in technologies particularly focusing on a contribution to the welfare of the earth-friendly human society. NUT has been providing a unique education for a new generation of engineers in interdisciplinary technologies through regional and international collaboration. The word "GIGAKU", which stands for "Gijyutsu-Kagaku" in Japanese, was proposed by Dr. Masamitsu Kawakami, who served as the first president of NUT from 1977 to 1983. President Kawakami insisted that modern engineering should combine both seed- and need-oriented technologies stemming from *originality*. He also emphasized that both students and faculty staffs should recognize the necessity of *vitality* to overcome difficulties and *services* to society. Our university motto "VOS" comes from the first letters of these three words. GIGAKU is therefore a substantial fusion of science and technology with creativity and innovation. The GIGAKU Engineering program has been always improved with the times for producing engineers equal to the demand of the 21st society and industry.

Our new engineering program has recently embraced the challenge of promoting the "GIGAKU SDG (sustainable development goal) Institute" program accredited as a UNESCO Chair Program, in which inter-university and industry-academia-government collaboration are indispensable for the modern engineer education. NUT is the ninth to be qualified in Japan, and is the first adopted engineering university in Japan. Our unique engineering education based on SDGs will be briefly introduced.