

# Innovation Pedagogy in the Era of Industrial Revolution

## 4.0

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**Abstract:** According to several surveys and strategies global wide, universities should significantly adjust their processes to meet human capacity requirements of the Industrial Revolution 4.0. Challenges of the new industrial era are diverse. In this paper, the focus is set to enhancing the innovation capacity of students and to the changing role of universities in the society. As a potential option, Innovation pedagogy learning approach is presented for the framework for the change. Examples of Innovation pedagogy from Finland and South-East Asia act as showcases on making strategies alive in practice and hopefully pave the way for next steps or giant leaps in reforming higher education.

**Keywords:** innovation competences, innovation pedagogy, the role of universities

### 1. INTRODUCTION

European Commission organized in Brussels (Belgium) on January 2019 a “Forum on the Future of Learning”. The main discussions focused on key issues that education and training will be facing in Europe and beyond until 2030, including the challenges associated to demographics; inclusion and citizenship; technological change and the future of work; digitalization of society; environmental concerns; and investments, reforms and governance [1]. As a participant of the Forum, I witnessed lots of talks especially about the role and status of lecturers and educators: i.e. effective learning community covers representatives of several other professions in addition to teachers and lecturers.

World Economic Forum 2016 released a very comprehensive and foresighted report “The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution” which is the result of an extensive survey of Chief Human Resource Officers and other senior talent and strategy executives of leading global employers, representing more than 13 million employees across 9 broad industry sectors in 15 major developed and emerging economies and regional economic areas [2]. It defines 9 technological drivers of change as well as 9 core demographic and socio-economic drivers of change. Technological drivers of change call for diverse digital skills and deep knowledge on new core areas like mobile internet and cloud technology, big data, new energy technologies and internet of things.

All these topics have to be embedded into contents of degree programmes. In Europe and especially in Nordic countries, three partially interrelated demographic and socio-economic drivers of change are well-presented in

public debate and acting as political battlefronts in national parliamentary elections: climate change, migration and inactive/active ratio caused by ageing population. Digitalization provides useful tools and independency for learning but solving of all forthcoming societal challenges need competences that are strongly highlighted in the WEF 2016 survey: e.g cognitive abilities such as creativity, logical reasoning and problem sensitivity as well as social skills such as persuasion, emotional intelligence and teaching others. These are strong signals to all educational organizations.

### 2. EXPECTATIONS FOR UNIVERSITIES' ROLE IN THE SOCIETY

From the university perspective, another very interesting and less-noticed result from the WEF 2016 survey deals with the future workforce strategies of industries. Top three strategies covered: (1) invest in reskilling current employees; (2) support mobility and job rotation; and (3) collaborate, educational institutions. These positive cries for help set to universities both challenges and opportunities and somewhat renews their role in the society. The old – rather straight-forward role of universities as a “short-term knowledge factories” or more positively thinking “knowledge hatcheries” - does not state anymore and they have to adapt their services and strategies to this new era of life-long-learning.

Free science has to be autonomous and independent also in the future but universities have to abandon their ivory towers in education and research. Triple-helix innovation model [3] between the academia, industry and government has been already successfully utilized in many

countries. Furthermore, when tackling global societal problems, even more important is to release the potential of quadruple-helix innovation model [4] where also citizens and media are actively included into joint innovation platforms.

During last decades, lots of regional infrastructure has been set up to enable and smoothen especially research cooperation between universities and external stakeholders, e.g. Science parks and Technology transfer offices [5]. From the educational perspective, it is obvious that universities need to set up new and more effective processes to reach better qualifications of graduates and to provide re-training of companies' personnel in the spirit of life-long-learning.

Education is a slow process to solve socio-economic or technological challenges: in a linear education model a learner studies on average 9 years in basic education, 2-4 secondary in education and finally 4-6 years in higher education (in doctorate level a couple of years more). Therefore, I see at least three core capabilities for higher education organizations to succeed in the future: (1) an ability to anticipate forthcoming changes in needed competences in their region/globally; (2) make needed changes into the learning strategies, national and unit-level curricula and implementation plans; and (3) position themselves mentally and physically into center of the society; i.e. learners and staff of educational organizations should be active players in the society.

### **3. LOGICAL LEARNING PATH: CASE FINLAND**

Adoption to the Industrial Revolution 4.0 (and forthcoming development versions) does not cover only the present cohorts in higher education neither existing labor force. From the learners' perspective, there has to be a logical learning path from the elementary school until higher education. In this respect, we can use Finland as a case study. Even though Finland has been performing really well in several global educational surveys - e.g. Programme for International Student Assessment PISA [6] in basic education and Universitas [7] in higher education – Finnish experts and politicians have seen great need to adjust Finnish education system to better meet in the global frontline the requirements of forthcoming era:

#### **3.1 Basic education**

In Finland, basic education is totally free of charge for all children. Finland has recently launched a new national core curriculum for basic education in stages: grades 1-6 started implementation already in 2016 and after that one grade per year has joined to this reform so that 9th grade will adopt it in 2019. The new core curriculum places an emphasis on transversal competences in instruction. A changing society demands more and more transversal skills and competences. Therefore, it is important that each

subject promotes transversal competences. The aims set for transversal competences include: (1) thinking and learning to learn; (2) cultural competence, interaction and self-expression; (3) taking care of oneself and managing daily life; (4) multiliteracy; (5) ICT competence; (6) working life competence and entrepreneurship; and (7) participation, involvement and building a sustainable future [8].

#### **3.2 Secondary Education**

The Reform of vocational upper secondary education by 2018 has a set of novelties. The current supply-oriented approach will be refocused into a demand-driven approach. Education will be competence-based and customer-oriented: Each student will be offered the possibility to design an individually appropriate path to finishing an entire qualification or a supplementary skill set. The primary importance is on what the student learns and is able to do. Digital learning environments and new approaches to pedagogy (e.g. modern simulators) will have a larger role in the future of learning. Learning in the workplace will be increased [9].

Furthermore, in Finland the basic education (covering grades 1-9) has been traditionally free of charge for every child. Now, in the very new programme of Finnish Government "Inclusive and competent Finland - a socially, economically and ecologically sustainable society" which was submitted to Parliament in the form of a Government statement on 6 June 2019 there is a strong statement that also secondary education would be totally free of charge for every child (nowadays secondary education itself is free of charge but students have to pay for their books etc. learning materials): "We will raise the minimum school leaving age to 18 years... We will also carry out a study on non-fee-paying upper secondary education and a reduction in learning material costs and, based on that, take the appropriate measures to implement upper secondary education that is genuinely free of charge" [10].

#### **3.3 Higher education**

For equal rights and possibilities for everybody to use their personal potential, higher education is in Finland free for European Union citizens (except books, personal computer and other studies-related personal items). The Finnish higher education system consists of universities and universities of applied sciences. Higher education institutions are autonomous actors that are responsible for the content of their education and research as well as the development of their own activities [11].

The vision for the Finnish Higher Education and Research in 2030 formulates a future scenario which enables the development of a high-quality, effective and internationally competitive higher education system in Finland by the year 2030. One of the core aims in this vision is that over 50% of all young people complete a higher education degree. The rising need for STEM proficiency is now embedded into the intake process of

universities: most of student intake is based on secondary education matriculation exam results and no matter which discipline a candidate is heading, the grade of mathematics has always a great weight.

#### **4. INNOVATION PEDAGOGY IN A NUTSHELL**

In Finland, all universities may have unique priorities to reach commonly agreed aims. Turku University of Applied Sciences (TUAS), one of the biggest universities in Finland, has defined in its' 2015 launched strategy the Innovation pedagogy for the joint and official learning approach of the whole university. Innovation pedagogy, also known as Innopeda®, responds to the current pressure for change and bridges the gap between studies and working life [12]. It is a learning approach that has been actively developed by TUAS in international context since 2011 and roots are some years older. Based on observations and anticipatory work of TUAS' personnel, there was an increasing need for new types of societal innovations. Creation of innovations ask for certain type of competences which were entitled as innovation competences.

In 2011, there was not available any valid definition for innovation competences and therefore TUAS started a series of international research and development activities to define the elements of innovation competences. Finally, in 2017 and after a couple of previous versions, an international consortium managed to launch a five-dimensional innovation competences model enriched with psychometrically validated tool for assessing innovation competences [13]. FINCODA (Framework for Innovation Competences Development and Assessment) model measures an individual's capacity on five dimensions which are shown to have strong links with innovation and come together to create a model of innovation that encompasses the entire innovative process from idea generation through to implementation.

Main dimensions are Creativity (ability to think beyond tradition to generate or adapt meaningful alternatives), Critical Thinking (ability to deconstruct and analyze ideas), Initiative (ability to make decisions or carry out actions to operationalize your ideas as well as mobilize and manage those who have to implement the ideas), Team work (ability to work efficiently with others in a group) and Networking (ability to involve internal/external stakeholders).

When targeting innovation competences, there are essential cornerstones in the core of implementation of the Innovation pedagogy: Working-life orientation, Flexible curricula, Multidisciplinarity, Renewing teacher and student roles, Activating learning and teaching methods, Integration between studies and applied RDI activities, Versatile and development-oriented assessment, Entrepreneurship and Internationalization [14]. These cornerstones guide lecturers and degree program managers

from the curriculum planning process via implementation of studies until the assessment of learning outcomes.

As we see from the short descriptions of different educational levels in Finland, even though Innovation pedagogy is a special learning approach which has been developed and defined in Turku University of Applied Sciences, the core nature of it is present in the educational strategies in all major education and training levels in Finland.

#### **5. IMPLEMENTATIONS OF INNOVATION PEDAGOGY IN SOUTH-EAST ASIA**

From the Asian perspective, it may sound marginal or distant to hear what kind of learning processes are adopted in Finnish higher education. Namely, I do well remember a concern coming from the audience in the ICFIE 2014 conference in Yogyakarta after my key note presentation: this all sounds so good but I just doubt whether this could work in Indonesia? Now I can tell you that yes, it works. Namely, Turku University of Applied Sciences TUAS has been active during last five years in providing expertise to support South-East Asian University sector's actors (e.g. universities, ministries, resource and training centers) to renew their pedagogical strategies and practices to meet the priorities set e.g. by SEAMEO and WEF 2016. Following project examples show that a low-threshold way for active adoption of even quadruple-helix model is available in all universities and without heavy and expensive structures:

##### **5.1 INDOPED Project**

A recently-ended and therefore comprehensively evaluated development project "Modernizing Indonesian Higher Education with Tested European Pedagogical Practices INDOPED" was a 3,5-years European Commission funded project in 2015-2019 [15]. In INDOPED, 5 Indonesian universities tested student-centered active learning methods with the mentoring support from 5 European Universities. Over 100 Indonesian lecturers engaged several thousand higher education students in pedagogical pilots in wide range of faculties, e.g. business, languages and arts, agriculture and medicine. Furthermore, SEAMOLEC as a full INDOPED project partner enabled us to reach around 2000 South-East Asian educational experts in various live dissemination events.

The results of the INDOPED project are encouraging and undeniable. The objective external evaluators state that "INDOPED project has brought student-centered innovation-oriented teaching methods to Indonesia, which do not only provide the teachers with new pedagogy skills but also allow the university teachers and administrators to reflect upon their teaching and see the relations between the goal they try to achieve, i.e. preparing their students to enter the workforce in Industrial Revolution 4.0 era, and the strategies they apply to achieve the goal" [16].

## 5.2 SAUNAC Project

In Vietnam, TUAS is coordinating joint efforts of 6 Vietnamese Universities and 5 European Universities in developing modern “Smart Sustainable Vietnamese Cities SSSVC” study module. The SSSVC module is implemented in a blended-learning way by including online, onsite and project learning enriched with fruitful stakeholder cooperation [17]. This European Commission funded operation has already now provided lots of discipline-related expertise as well as understanding on active-learning and key generic competences. Furthermore, as a joint course for several universities from different corners of Vietnam, SSSVC is a very resource-efficient way of organizing higher education and still catching the spirit of smart specialization of the regions [18]. Participating Vietnamese universities have started to utilize the power of students and there are lots of inspiring stories on successful learning assignments, e.g. in raising awareness of citizens in waste separation and recycling of waste in households as well as in proposing improvement of urban flooding management tools.

## 5.3 SEASAC Project

Another ongoing modernization operation is “South-East Asian Sales Competition SEASAC” - funded by the European Commission - which includes universities from Thailand, Indonesia, Austria, Finland and the UK. Additionally, SEAMOLEC as a full partner and Indonesian Ministry for Research, Technology and Higher Education as an Associate Partner provide more expertise and credibility to the international consortium. Concrete tangible output in the SEASAC project will be a South-East Asian Sales Competition concept, consisting of International Business-to-Business (B2B) Sales Course and South-East Asian Sales Competition Finals event [19].

These pedagogical novelties engage companies to the university-level B2B Sales education in its all phases: planning, implementation and assessment of students’ performance. In addition to Indonesia and Thailand, SEASAC concept will attract universities from other South-East Asian countries during the implementation of the project and thereby offer a great platform for all 11 SEA countries’ universities to prepare their students for the global businesses. There will be a call for the South-East Asian Sales Competition 2021 and guidance for applying to this event will be announced on late spring 2020 in [www.seasac.eu](http://www.seasac.eu) website.

## 6. CONCLUSION

Industrial Revolution 4.0 is a joint challenge for universities and societies globally. Existing public strategies transmit same signals and recommendations as WEF 2016, e.g. EU Agenda for Higher Education [20] highlights importance of generic skills and universities’ role in regional innovation processes; Adopting the 21st

Century Curriculum is one of the core priorities in the Southeast Asian Ministers of Education Organization SEAMEO’s vision 2015-2035 [21]; Indonesian Ministry for Research, Technology and Higher Education released in 2017 results from a wide survey on learning in public Indonesian universities (6000 lecturers and 47000 students were as respondents) and solving real-life problems as part of the studies was one of the core messages to universities.

These strategies and surveys should act as signposts for all education providers and in practice we need lots of systematic and hard work. My role as a global practitioner and advisor has taught me that showing trust (e.g. from ministries to universities; from lecturers to students) leads to new kind of cooperation (e.g. between lecturers and students; between universities and companies, public organizations and NGOs) which increases trust and joint understanding between all stakeholders. This kind of positive snowball effect pays off thus paves the way for the new era in education.

I would like to thank European Commission for the financial aid from the Erasmus+ Capacity Building in the Field of Higher Education programme to INDOPED, SEASAC and SAUNAC projects. I want also to express my gratitude to my superiors in Turku University of Applied Sciences and my South-East Asian and European colleagues for enabling me to actualize my passion as a competences’ enhancer also in South-East Asia. Finally, in Indonesia, the support from the Ministry of Research, Technology and Higher Education, has been inspiring and valuable.

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