TEACHING OPEN INNOVATION AT THE UNIVERSITIES IN LATVIA

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Abstract

Change of innovation paradigm in society leads to new tendencies in business and related education. Recently the education paradigm has also changed and innovation came into education with introducing active learning, problem-based learning and a new type of pedagogy – innovation pedagogy.

Open innovation topic is centred to the working life, and its teaching is practice based, requiring wide range of knowledge and skills from the open innovation teachers.

The research question – are the universities and their academic staff ready to adapt to the change and which competences are necessary to successfully teach open innovation? The research aim is to summarize information on faculty skills for teaching innovation, to study the situation and tendencies in teaching open innovation in the higher education (HE) institutions in Latvia and to make conclusions and proposals on the necessary improvements.

The theoretical part is based on traditional constructivism pedagogy, active learning methodology and the latest innovation pedagogy research results of Turku University of Applied Sciences. Content analysis method has been used to identify the necessary skills for open innovation. The article tackles a problem of teaching open innovation in Latvia. Curricula of six HE institutions in Latvia have been reviewed and the faculty members interviewed on teaching open innovation. Analysis of results shows that awareness and skills of faculty must be enhanced.

Based on former studies on innovation skills, active learning methods and innovation teaching, as well as personal research experience and teaching innovation management, a set of open innovation teachers' competences is proposed.

Keywords: open innovation, innovation pedagogy, active learning, higher education, faculty skills

1. INTRODUCTION

Since introduction of the open innovation concept by H. Chesbrough in 2003 in his book Open Innovation, and presentation of new innovation paradigm in the book Open Innovation: Researching a New Paradigm in 2006, the business and education world have reacted differently. The research on the forecast of the mid0term and ling-term market requirements and future profession, shows that open innovation related skills are of great importance (Ekonomikas ministrija, 2013). Large companies dealing with innovation as a part of their everyday work have rapidly incorporated the benefits of open innovation in their business models. At the same time, universities providing innovation knowledge and skills for potential businessmen and researchers have not been able to adapt to the new innovation paradigm so well.

Open innovation is a paradigm that assumes that firm can and should use external ideas as well as internal ideas, and internal and external paths to market as they look to advance their technology. Open innovation is a use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation (Chesbrough, 2006). Open innovation is definitely a collaborative innovation – for successful results involving innovation players from whole ecosystem. In the new paradigm innovations have to consider the entire ecosystem by broadening their lens to develop a clearer view of their full set of dependencies, focusing to the innovation execution outcome, but at the same time co-innovating and adopting it to other innovators' and customer needs (Adler, 2012).

Universities have a double trouble – besides changing the subject (innovation) paradigm, also the education is facing a paradigm shift - moving from subject-centred studies to student-centred studies. In the new education paradigm, a human with its welfare, competence and willingness to learn is in the centre (Anspaks, 2003). However, the paradigm change in education always goes slowly and cannot catch the other changes (Belickis, 1994). Adaptation to the new education

paradigm requires development of innovative approaches, methodologies, teaching methods.

In 2009 Juha Kettonen came up with a new concept of innovation pedagogy (Innovaatiopedagogiikka in Finnish) (Kettonen, 2009). Innovation pedagogy is a specific learning approach which defines in a new way how knowledge is assimilated, produced and used in a manner that can create innovations (Putkonen, et.al., 2010). Innovation pedagogy as such is an innovation in education – as it is based on a set of pedagogic approaches, and ensures production of innovative product – competitive graduates with knowledge and skills required in the market, able to innovate and create new values and markets. The novelty of innovation pedagogy lies in the principle that knowledge should be accumulated and applied simultaneously - creating innovations already while studying (Putkonen, et.al., 2010). Innovation pedagogy is based on a new outlook on learning and utilizes new combinations of traditional methods in a new manner.

In innovation pedagogy social aspects and related skills on working and learning in multidisciplinary teams are very important (Penttila and Kairisto-Mertanen, 2013). These are conditions of real life situations where people with different background competences joining in the team to solve community problems. This aspect is very similar also to paradigm of Open Innovation.

Knowing that innovation is a driving force of economy, innovation management is important topic for university students – both business and technologies. However, to provide innovation studies according to the new innovation paradigm, the universities would require an army of skilled academic staff. Also A.Putkonen mentioned, that one of the most interesting objects to study would be specifying the factors of the innovation competence more closely (Putkonen, et.al., 2010). What are the competences that should be provided to the students and what are the competences, possessed by the academic staff?

The paper consists of three chapters: 1. Introduction; 2. Innovation pedagogy - combination of traditions and novelties, including summary of research on the major directions of innovation pedagogy: innovative learning methods and procedures, innovation competences and ability to participate in innovation process; 3.Teaching of open innovation in Latvia, providing analysis of survey carried out in six Latvian higher education institutions on their experience teaching open innovation. The paper concludes with conclusions, questions for discussion and some recommendations for further activities in teaching open innovation.

2. INNOVATION PEDAGOGY – COMBINATION OF TRADITIONS AND NOVELTIES

According to the definition (Putkonen, et.al. 2010), innovation pedagogy is a learning approach that defines in a new way how knowledge is adopted, produced and applied in a manner that generates innovations. Innovation pedagogy is a purposive teaching and learning approach that utilizes academic staff innovation competences and ensures students' active involvement in innovation processes. Innovation pedagogy aims to generate readiness to innovate in students by integrating teaching, research and development as well as cooperation with working life players.

The core idea in the application of innovation pedagogy is to bridge the gap between the educational context and working life (Penttila and Kairisto-Mertanen, 2013). Taking into account its collaborative component, innovation pedagogy is directed to teach and learn open innovation.

Innovation pedagogy refers to three major directions: innovative learning methods and procedures, innovation competences and ability to participate in innovation process.

2.1. INNOVATIVE LEARNING METHODS

Learning is a driving force which creates innovation: new things and new activities do not emerge themselves, but by operating in the learning cycle (Bessant, 2003). Accordingly, innovation methods and procedures should be related to full learning cycle – experimenting, experiencing,

reflecting, conceptualizing or being actively involved in the learning process. Although theory of the learning cycle is well-known and traditional, study of innovation brings new challenges for teachers in its pedagogic application. The most important aspect of the learning cycle is the basic principle of constructivism – learning by doing and construction of knowledge (Dewey, 1988).

Basically , the learning cycle consists of four elements, which all are crucial for learning and involvement in innovation: concrete experience or experiencing (learning from specific experiences, relating to people, being sensitive to feelings and people), reflective observation or reflecting (carefully observing before making judgments, viewing issues from different perspectives, looking for the meaning of things), abstract conceptualization or thinking (logically analysing ideas, planning systematically, acting on an intellectual understanding of a situation) and active experimentation or doing (showing ability to get things done, taking risks, influencing people and events through action) (Kolb and Fry, 1975).

During reflection students learn from experience and construct new knowledge. The role of reflection in the learning is crucial (Biggs, 2003), as it is important part of full learning by doing and construction of new knowledge. Also, from the innovation theory, a targeted and structured reflection or feedback is important for any innovation process. The academic staff should use their pedagogic competences to initiate reflection, to teach how to reflect. There is a strong correlation between the learning cycle and the innovator's behavioural skills: associating, questioning, observing, networking, experimenting (Dyer, et.al., 2011). Open innovation teachers should be able to implement the full learning cycle, ensuring that students acquire the innovator's basic skills.

All the learning cycle elements are closely related to the basic principle of the active learning – learning by doing and active engagement in the learning process. In active learning process learners are actively engaged in the learning process, rather than "passively" absorbing lectures. Active learning involves also traditional learning methods like reading, writing and speaking, but its form is discussion, problem solving, teamwork, experimenting, reflection, analysis, synthesis, and evaluation (Bonwell and Eison, 1991).

According to innovation pedagogy, learning has several features. It applies knowledge, it is multidisciplinary and communal, it involves research activities, crosses boundaries, focuses on the problem and finally – it is not abstract – it is working life centred (Putkonen, et.al., 2010). It is obvious that innovation pedagogy is built on traditional constructivism theory, but the novelty of it lays in the specific, open innovation related features. Especially the open innovation features – research and development, creating new values, internal and external cooperation, and combination with traditional pedagogic methods - bring the novelty to innovation pedagogy.

In general, there are four broad categories of learning strategies (Learning strategies, 2014) that one might use in an active learning. These can be individual activities, paired activities, informal small groups and cooperative student projects. According to those strategies, every teacher can choose relevant strategy or set of strategies in order to reach the intended learning objectives, both pedagogical and topical. Intended learning objectives, or outcomes are defined, listing a set of skills students will gain during learning process. Therefore, before choosing innovation pedagogy methods, it is important to list the innovation competences.

2.2. INNOVATION COMPETENCES

When speaking about innovation competences, we usually think of the competences necessary for people involved in innovation processes to perform innovation. In education context, these are competences, included in the intended learning objectives – knowledge, skills and experiential practice what the teachers intend to teach and students should acquire during the study process. However, it is important to list also the competences of the teachers, teaching innovation – knowledge and experience on innovation plus the specific innovation pedagogy competences. Combining knowledge related to innovation activities on one hand and pedagogy on the other offers the much needed theoretical foundation for improving expertise-based competitiveness. In addition

to the central role of the learner, innovation pedagogy promotes practical activities such as creating, constructing and cumulating knowledge. Innovation pedagogy also embraces the concept of knowledge as being largely based on intuition and tacit knowledge (Penttila, et.al.2013). This way, operation with innovation pedagogy requires special competences of innovation teachers. The innovation teachers should possess a set of competences – innovation skills and innovation pedagogy competences.

According to the OECD study (OECD, 2011), the skills for innovation and research can be divided into five categories: basic skills, academic skills, technical skills, generic skills, soft skills and leadership skills. Assuming that basic skills are usually acquired already during secondary education, the academic skills are integrated in the study curricula, acquiring other skills is responsibility and depend on the initiative of the teachers and their pedagogic skills. Technical skills are the skills and knowledge of linking academic skills to practice. These skills can be acquired by active leaning in real practice-based environment. Generic skills, like problem solving, creative thinking, ability to learn and ability to manage complexity, can be acquired by training – using specific methodologies, targeted to train these particular skills. Also acquiring of the soft skills, like team work, motivation building, communication, violation and initiative, receptiveness for innovation, ability to manage emotions and behaviour during interaction, as well as multicultural openness, should be integrated in the teaching methodology. A special attention and methods are necessary for acquiring leadership skills, like team building and steering, coaching and mentoring, lobbying and negotiating, co-ordinating, as well as ethics and charisma.

As it is defined in the OECD study, there are different skills and knowledge necessary in different stages of innovation process. At the beginning stage, most important are skills to identify, collect and filter the ideas for innovation; ability to interpret data, evaluate the viability of new ideas, and knowledge about application of intellectual property protection mechanism.

According to the research results un Turku University of Applied Sciences (TUAS), innovation competences are learning outcomes that refer to knowledge, skills and attitudes needed for the innovation activities to be successful. Following the European Qualifications Framework (EQF, 2014), and as a result of research and development work by TUAS, three categories of innovation competences were defined (Penttila, et.al.2013):

1) Individual innovation competences,
2) Interpersonal innovation competences,
3) Networking innovation competences.

A summary of the innovation competences, defined by TUAS is presented in the Table 1.

Table 1

Innovation competences (TUAS)

• Innovation competences category	• Innovation competences
• Individual innovation competences	• independent thinking and decision-making • target-oriented and tenacious actions • creative problem-solving and development of working methods • self-assessment and development of own skills and learning methods
• Interpersonal innovation competences	• ability to co-operate in a diversified team or working community • ability to take the initiative and to work responsibly according to the targets of the community • ability to work in research and development projects by applying and combining knowledge and methods of different fields • ability to work along the principles of ethics and social responsibility • ability to work in interactive communication situations
• Networking innovation competences	• ability to create and maintain working connections • ability to work in networks; ability to co-operate in a multidisciplinary and multicultural environment • ability to communicate and interact in an international • environment

The learning and teaching process in university should be organized in the way that ensures the development of all types of the innovation competences. From pedagogic point of view, in order to ensure students personal and professional growth, the teachers should choose the correct active learning strategies to ensure acquiring the innovation related skills.

In order to use the active learning strategies, meeting the open innovation skills, teachers should possess a range of the pedagogic skills themselves, and should be able to deliver them through active teaching in classes. Besides, knowing that innovation is target and result oriented, teaching on open innovation should provide clear performance expectations – learning aims and objectives, learning procedure, expected outcomes, assessment system.

Usually, when teaching in the class, the level, former learning experience of students and their expectations are different. That requires creative flexibility from a teacher – ability to adapt to different levels, experience and knowledge on innovation of the learners, ability to apply different methods for different types of students to maintain learning motivation for all of them.

According to the innovation pedagogy principles the pedagogic skills of the open innovation teachers can be divided into innovation competences, which are more related to the subject area of open innovation, and innovation learning and teaching methods and procedures, that ensure acquiring the necessary generic, soft and leadership skills for open innovation (Putkonen, et.al., 2010). Teaching and learning of open innovation generic, soft and leadership skills are based in active learning, and refer to the active learning strategies: individual activities, paired activities, informal small groups, cooperative student projects.

From the pedagogic viewpoint, the open innovation teachers should possess personal skills, active teaching skills and be aware of several methodologies how to apply active teaching in practice to reach to intended learning outcomes, targeted to acquiring innovation skills for students.

Regarding personal competences, necessary for teaching open innovation, the teachers should possess and be able to demonstrate the **active teaching skills.** Firstly, teachers should have ability to motivate students for active learning and to involve all students in active learning process. Secondly, the teachers should be able to and motivate students for new experiments and gaining new experiences, ensure learning form from experience, questioning and reflection. The teachers should have ability to require students' feedback and promote their analytical skills, managing discussion. And thirdly, teachers have to possess ability to recognize students' learning methods and habits and to teach students how to learn fast. Teachers have to be able to monitor the learning process for each individual student and also for a student group in whole.

Besides active teaching skills, the open innovation teachers would be able to operate **active teaching and learning methodologies** and to apply them in practice. These skills can be classified according to the four broad categories of active learning: individual activities, paired activities, informal small groups, and cooperative student projects. These are the methods the teachers have chosen to reach the learning outcomes. These can be methods commonly known, as well as individual methods, based on active leaning principles and applied in the study process.

The open innovation teachers would need also specific **personal skills,** including their own behavioural skills, social skills, cognitive skills and organisational skills. Also the open innovation teachers should continuously work on their self-development, deepen their knowledge, and adapt teaching to new findings and theories

Summary of the personal competences of open innovation teacher is available in the Table 2.

Table 2

Personal competences for open innovation teacher

• Competences related to open innovation topic	• all subject areas of open innovation • passion on the subject – open innovation
• Behavioural skills	• positive thinking and attitude • tolerance and emphatic skills • honesty and fairness • respect for diversity • flexibility • punctuality and self-discipline • creativity and ability to view issues form different viewpoints • motivation and ability to motivate, • initiative • inspiration skills and charisma
• Social skills	• observation skills • good communication and networking skills • openness • ability to listen • ability to speak in front of a big audience • presentation skills • appreciation of cultural differences (especially for work with international students) • negotiation skills
• Cognitive skills	• curiosity • experimentation skills • ability to learn from experience • logical and analytic skills • critical thinking • ability for constructive solutions • continuous learning and self-development • research skills • internal motivation for research • continuous deepening innovation and pedagogic knowledge, following the research results and new findings • adaptation of teaching to new findings and theories
• Organisation skills	• accuracy • ability for implementation plans • leadership skills
• Methodological skills	• ability to set learning targets and learning outcomes • ability to keep to the education standards • knowledge and ability to use diverse teaching methods to reach intended learning outcomes • ability to different approaches for students from different cultures/knowledge base/characters
• Active teaching skills	• managing discussion • involvement of all students in active learning process motivating students for new experiments and gaining new experiences • ensure learning form from experience • questioning • reflection - ability to require students feedback and analysis • ability to motivate students for active learning • ability to recognize students'' learning methods and habits • ability to teach students how to learn fast • ability to monitor learning process
• Knowledge and ability to use active learning strategies	• individual activities (e.g. individual tasks to reach intended learning outcomes, based on observations, data analysis, structured interviews, case studies, etc.) • paired activities (e.g. role plays, peer review) • informal small groups (e.g. focus group discussion, structured discussion, team work, creative thinking – brainstorming etc.) • cooperative student projects (e.g. learning business simulation games, development of research or business projects, etc.)

Implementing innovative learning methods, highly skilled academic staff provides innovation competences to the students. However, the specific part or novelty of innovation pedagogy is simultaneous accumulation and application of innovation knowledge and skills. In order to create innovations already while studying, the students should train their skills by applying them in real innovation process already during the study process.

2.3. ABILITY TO PARTICIPATE IN INNOVATION PROCESS.

There are several pre-requisites to provide students with the skills and ability to participate in the innovation processes. Firstly, the innovation teachers should be professionals, who are participating in innovation processes themselves, and have gained the tacit knowledge - experience based knowledge on this topic. Secondly, the study process should be organized in a way that students learn the ability to participate in the innovation process as a part of studies. In another words, there should be organized either practical works, or study practice (internship), or development of students own business.

When innovation pedagogy is applied, it is essential to give the students several opportunities to engage themselves in different kinds of hatcheries during their studies (Putkonen, et.al., 2010).

In the case of Latvia, where innovation pedagogy is not popular yet, teaching innovation usually is done in professional study programs. In the professional study program internship is a compulsory part of the study process. It is up to the university program management to organize how students can gain practical experience in innovation during the internship. For example, those HE institutions, having students' business incubators, and who have them integrated in the study process, already have solved part of the problem. In business incubator students go through innovation process by developing their new business. Participation in business incubator can be organised as compulsory part of study process, but it can also be voluntary. In that case, students require a special study practice, where they are supposed to go through innovation process – develop a project, a business plan, a new product. In order to learn ability of participation in innovation process, students have to go through whole learning cycle – perform experiments, gain experience, reflect on their good and bad experience and conceptualize the conclusions. This way the students are involved in active learning according to the best principles of constructivism theories.

In order to organise active learning for participation in innovation processes, the innovation teachers should implement their own pedagogic and innovation knowledge, experience and skills, as well as creativity to gain the best results.

3. TEACHING OF OPEN INNOVATION IN LATVIA

In order to clarify, how mature are the innovation teachers for teaching innovation and what are the methods currently used for teaching innovation in Latvia, a small survey was carried out, by questioning academic staff members of six HE institutions in Latvia, having Innovation course in their curricula.

The criteria of the choice of the HE institutions were - running business programs with innovation courses, accessibility, availability and interest for the interview. The respondents were faculty responsible for innovation courses or/and teaching them. Because of limited resources, not all HE institutions in Latvia, teaching innovation, were covered. This is a research limitation, which might not bring highly valid results. However, the interviews showed the tendencies and potential directions for development. The interview questions originate from the EU project **"**The European Academic Network for Open Innovation" (OI-NET, 2014). The interview is on-line and all the respondents provided answers to the same questions. As the interviews were carried out in the framework of a project, the time limit for answering the questions was one month, and in Latvia it was organised in May 2014.

A summary of the interview questions on teaching open innovation in six universities/higher education institutions (HEI) of Latvia are available in the Table 3.

Table 3

Summary interview questions about teaching Open innovation

Title of the course (in the original language; in English if available)
Type of the class (mandatory or optional)
Number of hours (in total; per week)
Number of hours within the course specifically dedicated to the teaching of Open Innovation
ECTS credits
Average number of students per class
Type of qualification (e.g. Economics, Engineering, etc.)
Year when the course has been introduced for the first time
Year when Open Innovation has been introduced within the course
Language(s) used for teaching
Background knowledge or prerequisite (*if required*)
Learning objectives & course topics
References and readings on Open Innovation used for teaching
Method of instruction (e.g. lectures, cases, on field training, etc.)
Is there any practical aspect of teaching innovation integrated into the course
Is there any information on the course/programme posted on the internet?
Notes and other information

Firstly, all institutions reviewed selected the courses on innovation. Two of the six institutions teach innovation only in bachelor programs, three – both in bachelor and masters programs, one – only in master's program. During the interview, it was recognized that teaching innovation management and innovation practical applications is more efficient on Master's level, when the students are more business mature, and have got some practical experience. Then their perception for innovation topics is much higher.

In three of the interviewed institutions, there was identified only one course on innovation, in one university – four courses, in one – five courses, and in one – 7 courses. In those HE institutions, having four or more courses in the curricula, there is more than one teacher on innovation.

The courses on innovation were launched earliest on 2006 (one institution), others from 2008 to 2014. The topic of open innovation has been taught starting from 2011 to 2014.

In all six institutions, the innovation subject is taught to business, administration or economics students. Only in one university it was taught also to the students of engineering sciences.

In all interviewed institutions, the classes are organized in a form of lectures. In some cases, students have to do practical works and assignments related to innovation. Regarding teaching open innovation, only three of the respondent institutions use group work in the classes. Also, there is no major study practice on the innovation topic at any of the interviewed institutions.

The results were analysed also in the scope of proportion of open innovation related topics in each course on innovation. Study load of all innovation courses is evaluated with 3 ECTS.

Unfortunately, only three institutions mentioned open innovation topic as a part of the innovation course, composing from 2% to 26 % of the course content. Only in one of the interviewed institutions, there is a course, the title of which contains a term ”open innovation”. This course is developed within EU project “E-Learning Innovation Management course for Vocational Training” (2011-2012) (E-IM, 2010). The course content includes theory on open innovation, and the students are encouraged to use active learning methods to link the theory to their working life practice. During the course, the students have to provide feedback on the achievement of their learning objectives (in a form of tests), they have to do dozens of exercises to strengthen their knowledge and apply it in practice for development of new products and new ideas, as well as on the basis of the theory and practical experience gained in the course, they have to develop an innovation plan for their company. This course is a good example teaching open innovation, involving students in innovation process.

From the interviews in the HE institutions in Latvia, it is obvious that the training of graduates to participate in the innovation processes is not satisfactory. The main efforts are concentrated to lecturing and providing general comprehension of innovation and open innovation. In order to develop innovative specialists in universities, the study curricula, the qualification of the academic personnel and the content of the innovation courses have to be reviewed and innovation pedagogy should be introduced.

4. CONCLUSIONS AND RECOMMENDATIONS

1. Answering to the research question – are the universities and their academic staff ready to adapt to the change and which competences are necessary to successfully teach open innovation, the authors conclude, that not all universities are aware and ready to adapt. The competences necessary for teaching open innovation are summarized.
2. Open innovation concept is new for HE institutions in Latvia. They do not appreciate the role of open innovation course as an essential part of curricula. Promotion of open innovation in Latvia is mainly organized with support of EU education and research projects.
3. The innovation teachers do not have enough knowledge and skills for teaching open innovation. Only few teachers use active teaching methods, particularly a group work. Innovation pedagogy in a new, perspective branch of pedagogy based on traditional constructive pedagogy principles in combination with innovative pedagogic approaches. Currently in Latvia it is not popular among pedagogy and innovation professionals.
4. Teachers’ skills necessary for teaching innovation (in particular, open innovation) are summarized and presented for discussion. The set of open innovation skills should be approbated in a wider research, in cooperation with innovation and pedagogy professionals.
5. In order to teach open innovation, universities should improve their study curricula, and motivate teachers to develop innovative, active teaching methods. Teaching open innovation requires new, innovative teaching methods, based on constructivism theory. Innovation teaching methods should be active teaching methods, corresponding to full learning style, including experiment, experience, reflection and conceptualization.

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