University Teachers' Conceptions of Entrepreneurial Learning within Engineering Education

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Abstract

The aim of the present study is to identify university teachers' conceptions of entrepreneurial learning within engineering education. The research question is formed as follows: What are university teacher's conceptions of entrepreneurial learning within engineering education? The data was collected from engineering teachers working for five different faculties in TTK University of Applied Sciences and with different professional expertise and seniority. Using semi-structured in-depth interviews. The study conducted will adopt a content analysis research approach. Results indicate for three qualitatively different ways of perceiving entrepreneurial learning within engineering education. The teachers understand entrepreneurial learning within engineering education as 1) unnecessary concept, 2) important, useful and difficult to reach, and 3) integrated part of engineering studies. In the light of these results author will focus what could be done in order to develop teachers' conceptual understanding about entrepreneurial learning and entrepreneurial mind-set. Study results contribute to better understanding of engineering teachers' conceptions of entrepreneurial learning and therefore allow school management and policy creators to understand the need for development of the staff, as well as give input to the teacher training about entrepreneurial learning and mind-set.

1. Introduction

Today's labour market needs people who have capabilities for effective and appropriate action within unfamiliar and constantly changing circumstances and change in the workplace (Barnett, 2004; Stephenson, 1992; Tynjälä, 2010; Tynjälä and Gijbels, 2012). Therefore, developing entrepreneurial skills and mind-set has become a special goal for higher education, highlighting above mentioned challenges. Even more, research conducted by Allen, Van Der Velden and his colleagues (2009) brings out concerning issues about higher education, as being a poor contributor to graduates entrepreneurial skills, and indicates that teachers are considered to be a weak link in introducing real changes to the experience of students on the ground, including entrepreneurship education (McCoshan, Witte and Westerheijden, 2010). Recent research on the tertiary level shows that the gap between the knowledge needed at work and skills provided through formal education is often weak (Stenström, 2006; Tynjälä et al., 2006; Tynjälä, 2008). There is evidence that teachers do not know enough about the aims, content and work methods of entrepreneurial learning, since the teaching does not apply enough work methods specifically geared to entrepreneurial learning (Seikkula-Leino, 2007). Therefore, successful implementation of entrepreneurial mind-set ultimately depends on teachers' competencies as well as on the teaching methods that are applied in their classrooms, i.e. conceptions and approaches to teaching and learning. There have been more teacher trainings with the aim that the teachers would start supporting the entrepreneurial thinking of students, but it hasn't been researched a lot how do the teachers start using the knowledge gained in the trainings. The efficiency evaluations have only recently come to Finnish training landscape. Based on the Finnish example it can be argued that there are not enough trainers, who have a practical entrepreneurship experience (Seikkula-Leino et al., 2015). According to Robinson et al. (2016) we need to move away from entrepreneurship education as being teacher-centred to being more student-centred and focused on lifelong learning practices.

Conceptions of teaching are seen as means the teachers' view of teaching, i.e. conception or way of understanding teaching; "Different conceptions of teaching therefore are representing different awareness of the phenomenon of teaching, constituted as experiential relationship between the teacher and the phenomenon" (Åkerlind, 2007: 23). Åkerlind (2008) and Marton and Booth (1997) also suggest that in order to develop teachers' conceptions of teaching one has to understand teachers' conceptions that represent their epistemological stance and how conceptual development occurs (replacement of system of beliefs with another) to enhance teachers' understanding of teaching and learning. Consequently, this might lead to changes in conceptions to learning that teachers' acquire in actual teaching-learning situations.

Previously have been a lot of researches on teachers and teaching but little has been studied about engineering teachers' conceptions of entrepreneurial learning within engineering education. The aim of the present study is to identify university teachers' conceptions of entrepreneurial learning within engineering education. Therefore, the research question is formed as follows: What are university teacher's conceptions of entrepreneurial learning within engineering education?

In the next section, we begin with the theoretical background by describing previous studies of entrepreneurial learning and the teaching conceptions. The methodology and data are discussed in the third section. The results are presented in the fourth section. And finally, the implications of our findings are discussed.

2. Theoretical background

Entrepreneurial learning is experiential in nature and applies learning principles through hands-on action in rich contexts, as well as utilising interactive social learning with and from others (Pittaway and Cope, 2007). Therefore, entrepreneurship education programmes are often based on the ideas of experiential learning theories (Kolb, 1984) or socio-constructivist learning theories (Tynjälä, 1999). The main goal during these projects is to create real-life learning environments where unexpected events can occur (Cope, 2003, Pittaway and Cope, 2007; Gibb, 2008). Entrepreneurial learning has been described as being about unplanned and unpredictable events, the creation of new and non-existing ideas, as well as about freedom instead of restrictions. Pittaway and Cope (2007) add that entrepreneurial learning includes learning by coping, experimenting, problem solving and learning from one's own mistakes; and that overcoming opportunities and difficulties are crucial for entrepreneurial learning. Gibb (2008) states that learning entrepreneurship in an educational context is about:

> "[...] behaviours, skills and attributes applied individually and/or collectively to help individuals and organisations of all kinds to create, cope with, and enjoy change and innovation involving higher levels of uncertainty and complexity as a means of achieving personal fulfilment and organisational effectiveness. Entrepreneurship education is the process by which these behaviours are practiced and supported."

Therefore, the aim of entrepreneurship education is not only to be the engine of economic growth through the creation of jobs and new ventures, but also to develop individuals who understand entrepreneurial processes and have entrepreneurial skills and ways of thinking.

Entrepreneurial skill-set includes variety of skills and knowledge, such as, problem solving, negotiating, selling, making proposals, thinking strategically, networking, managing business situations holistically, making decisions intuitively and creatively in the face of uncertainty (Gibb, 2005, 2008; Cope, 2005; Pittaway and Cope, 2007; Fayolle and Gailly, 2008), being effective on a personal level (Gibb, 2005, 2008), and becoming more resilient to failures (Sarasvathy, 2001) and other. Learning these kinds of skills requires combining theoretical and practical knowledge, ethical values, and acquiring life-long learning skills (Rugacia et al., 2000; Tynjälä, 2008; Tynjälä and Gijbels, 2012). In other words, it means being out of comfort zone, coping with emotional overload as well as flow of information and managing people and communication.

This kind of learning requires support from outside, i.e. from the group members, family, teachers/facilitators/mentors, company representatives, etc. Teachers are not seen as providers of knowledge but as co-learners and role models who support students' learning. They become experts who consider teaching as a problem-solving context in which they must come to understand the meaning of students' ideas rather than just correct them (Lampert, 2001; Hmelo-Silver and Barrows, 2006). Even more, according to Kyrö (2005), the teachers, who are facilitators in this kind of learning, have to provide freedom and create opportunities to enhance students' creativity, allowing the learners to decide how they learn or act. Teachers also have to provide time for reflection and evaluation, which are an essential part of the learning processes (Kolb, 1984; Kyrö, 2005; Pittaway and Cope, 2007; Tynjälä, 2008).

Some people still argue that it is not possible to teach entrepreneurship. For them, entrepreneurship is a matter of personality and psychological characteristics. One of the arguments that have been advanced is that talent and temperament cannot be taught

(Thompson, 2004). But one could argue that this is true for many professions and professional situations. Nobody will dispute the fact that medicine, law, or engineering can be taught and yet there are doctors, lawyers and engineers who are talented and others who are not (Hindle, 2007). A similar argument can be made for entrepreneurship and entrepreneurs. Various studies have shown that it is possible to develop entrepreneurial behaviour in universities (Harte and Stewart, 2012) if there is a favourable environment created and the suitable teaching conceptions are used.

Conceptions of teaching are seen as teachers' views of teaching – that is, their conception or way of understanding teaching. Teaching conceptions influence approaches to teaching and student approaches to learning and the learning outcomes (Kember, 1997; Richardson, 2005). Regarding teaching conceptions, Kember (1997) talks about teacher-centred conceptions (presenting subject matter as content to be memorised) and learning-oriented or student-centred conceptions (encouraging students to reflect on subject matter). Concerning entrepreneurship presage in the teaching context, several studies on teaching conceptions and approaches (e.g. Postareff et al., 2007, 2008; Remmik and Karm, 2013) generally rely on Kember's (1997) interpretation. For instance, Postareff and Lindblom-Ylänne (2008) have analysed university teachers' descriptions of their teaching process and have found that their descriptions can be divided into two approaches – content-centred and learning-centred teaching. The content-centred approach (or teacher-centred approach) means focusing on communicating defined bodies of content or knowledge, and the learning-centred approach (or student-centred approach) means focusing on the students' learning (Kember, 1997).

Different entrepreneurship education definitions and categorizations used in the research literature. One of the most used categories seems to be the one presented by Gibb (2005) which is: learning through, learning for, and learning about entrepreneurship. Hytti and O'Gorman (2004) quoted Gibb (1996) by defining "learn to understand entrepreneurship, learn to become entrepreneurial, learn to become an entrepreneur". Quite similarly, Pittaway and Edwards (2012) describe entrepreneurship education as being "about", "for", "through" or "embedded" / "in". There, "about" approaches are mainly practices to raise students' awareness and share knowledge, and it is content or subject driven. "For" is when students are engaged in tasks, project-based methods are used, and learning is experiential and students are learning key skills and competencies. "For" involve providing tools for coping with concrete tasks of entrepreneurship (Robinson et al., 2016). In "through" approaches, students learn through doing, they run real companies and practise actual entrepreneurship. "Embedded" or "in" is where educational practice, mainly for non-business students, is embedded within courses focused on other disciplines or subjects, they learn entrepreneurship within their discipline, and the aim is mostly to raise awareness and experience of entrepreneurship. According to Pittaway and Edwards (2012), it is also still the most widely used. In their analysis of the three types of courses ("about", "for" and "through"), they find that it is the "through" type that has the most potential to produce entrepreneurs and entrepreneurial persons, because they get students to copy and simulate what entrepreneurs do. Therefore, higher education institutions should provide more "through" courses if they would like get more entrepreneurial students (Robinson et al., 2016).

Examples of question-based definition are the following, by Fayolle and Gailly (2008): according to them, entrepreneurship education is to answer questions such as why (objectives, goals), what (contents, theories), for whom (targets, audiences), how (methods, pedagogies), and for what results (evaluation, assessment)? The last example is by Walter and Dohse (2012). They

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divided entrepreneurship education into two categories, reflective modes and active modes, based on Kolb's (1984) model of experiential learning. Reflective modes contain techniques in which students acquire knowledge through reflective observation, and the objectives are changing knowledge and appreciation. Active modes, on the other hand, are about methods in which students gain knowledge through active experimentation, and by using them, understanding, skills, and attitudes are supposed to change. Table 1 summarizes the most commonly referred entrepreneurship education approaches and categories ("about", "through", "for" and "embedded" conception) through different dimensions (aim, process, outcomes etc.)

Table 1. Different approaches and categories to conceptualising entrepreneurship education

Dimension	"About" (to understand entrepreneurship)	"For" (to become an entrepreneur)	"Through" (to become entrepreneurial)	"Embedded" (non-business students to raise awareness of entrepreneurship)
Aim / outcomes	To understand nature of entrepreneurship	To become entrepreneur	To become entrepreneurial	To raise awareness and experience of entrepreneurship
Teaching and learning process	Traditional learning; Theoretical concepts; Knowledge about entrepreneurship; Local vs. global issues, etc.	Causation, step by step business planning; Design thinking; Lean canvas; Initiating new ventures within the existing organisations, etc.	Active learning (by doing); Knowledge of personal resources; Specific task /projects within organizational framework; Challenges and problems in students' everyday lives, etc.	Active learning (by doing); Specific tasks related with field of study /project-based tasks; Challenges and problems in students everyday lives, etc.
Outcomes (value creation)	Summaries, essays, reports, mind-maps.	Business plan; New businesses in different fields.	Realized projects; Problem solved; Social events, pitching, fundraising etc.	Summaries, essays, reports, mind-maps; Realized projects; Problem solved.
Learning theory	Behaviorist, cognitivist.	Social-constructivist, (experiential and action learning).	Social-constructivist, (experiential and action learning).	Cognitivist and constructivist.
Environment requires	Teacher, company visits.	Team-based learning opportunities, mentors, entrepreneurs.	Team-based learning opportunities, supervisors, entrepreneurs.	Teacher, company visits, team-based learning.
How to assess?	Tests, essay writing, comparing, mind-mapping.	Supervision, coaching, mentoring, self-assessment and peer-assessment feedback, etc.	Presentations, monitoring, argumentation, re-evaluation, feedback, peer-evaluation, etc.	Entrepreneurs could be engaged in the assessment process. Tests, essay writing, comparing, mind-mapping. Argumentation, re-evaluation, feedback, peer-evaluation, etc.
Teacher's role	Transfer the knowledge.	To be a co-learner, role model, tutor, and facilitator of learning rather than simply as a transmitter		
Learner's role	Passive, receptive; Learn theory and provide answers during the exam.	To be an active and responsible participant of the learning processes		

Source: adapted from Béchard and Grégoire, 2005; Hytti and O'Gorman, 2004; Mwasalwiba, 2010; Gibb, 1993; Pittaway and Edwards, 2012; Täks et al., 2014

The present article combines many of the approaches and dimensions described in Table 1. However, in this study, entrepreneurship education is mainly conceptualised following the approach by Vesalainen and Strömmer (1998), Remes (2003), Seikkula-Leino (2007) and Täks et al. (2014). That is, entrepreneurship education as a method, practice, and content of teaching. As seen (see Table 1), the variety of ways of categorising entrepreneurship education is wide. Furthermore, the phenomenon is wide-ranging, and so a holistic and multi-voiced approach is needed. Referring to Gibb (2000), entrepreneurship can be seen and stimulated by a large variety of ways of communicating, doing, feeling, learning, and seeing things. In the results paragraph, it is analysed which conceptions the teachers involved in the study use in their everyday worklife.

3. Research methodology

3.1. Study design

The study was designed to answer research questions targeted towards explaining what are university teacher's conceptions of entrepreneurial learning within engineering education. The interview plan was designed so that it would be possible to identify the entrepreneurship teaching conceptual understandings. While making the interview plan the conceptions in Table 1 were taken into consideration. The conceptions are mainly based on Béchard and Grégoire (2005) "about", "through" and "for" conceptions and it was combined with teacher-centred and student-centred teaching conceptions according to Kember (1997), Postareff and Lindblom-Ylänne (2008). In earlier studies the technology university teacher's conceptions regarding entrepreneurial learning through "about", "for", "through" and "embedded" conceptions by the knowledge of author haven't been studied.

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The data for the study was collected via in-depth interviews conducted individually with the lecturers during three months. The duration of one interview was 50 minutes on average. The interview guidelines (Appendix 1) for were prepared beforehand and discussed between the researchers in detail to ensure consistency and smooth flow as well as an appropriate depth of the interviews, which is necessary for content analysis research. The interviews were audio recorded and then transcribed. The transcripts were read several times by researcher, the results were compared and discussed after the focus was identified.

3.2. Sample

The data was collected from part-time and full-time permanent engineering teachers working for five different faculties in TTK University of Applied Sciences and with different professional expertise and seniority using in-depth interviews (N=25). Overview of the individual in-depth interviews sample is on the table 2. The study conducted will adopt a content analysis research approach.

The sample was formed so that it would represent the actual demographical situation of university teachers. University teachers were selected to the sample based on their position, gender, age and length of teaching. In addition to representing the demographical situation, there are also teachers who teach various subjects and use different teaching methods. 92% of the respondents currently work or have previously worked in the field, related to the

subject they teach. Mostly lecturers working in universities are at the same time also related to private sector. As it is a university of applied science it is important that the lecturers have a practical experience in the field they teach. 8% of the respondents have previously been or are currently entrepreneurs. The sample is supposed to provide a true insight on the university teachers' conceptual understandings of the entrepreneurship education.

The sample participants are described in table 2. Interviewees teachers to teach the following subjects: Micro – and Macro Economics, Basics of Accounting, Customer Relations Management, Transport Economics, Basics of Logistics, Inventory Management, Supply Chain Management, Physics, Mathematics, Statistics, Car Electrical Equipment, Car Theory and Testing, History of Clothing and Textile Products, Product Development, Sewing Technology, Engineering Materials, Theoretical Mechanics, Construction Economics and Entrepreneurship, Construction, Engineering Geodesy, History of Architecture and Building, Organisation of Construction and Course Project, Architectural Composition, Basics of Ecology, Basics of Environmental Protection, Types of Waste and Basics of Waste Treatment and Basics of Geodesy and Practice.

Table 2. Overview of the individual in-depth interviews sample

	Population		Sample
	Quantity	Share, %	Quantity
Position			
Professors	8	7.0	2
Associate Professor	10	8.8	2
Lecturers	96	84.2	21
Total	**114**	**100**	**25**
Gender			
Men	68	59.7	15
Women	46	40.3	10
Total	**114**	**100**	**25**
Working experience			
Until 5 years	45	39.5	10
6–10 years	47	41.2	10
11–15 years	3	2.6	1
16 and more years	19	16.7	4
Total	**114**	**100**	**25**
Year of birth			
1980 – ...	23	20.2	5
1970–1979	15	13.2	3
1960–1969	27	23.7	6
... – 1959	49	43.0	11
Total	**114**	**100**	**25**

Source: Compiled by the author

3.3. Data analysis

The study conducted will adopt a content analysis research approach. Content analysis is a method that may be used in an inductive or deductive way (Elo and Kyngäs, 2005). By Elo et al. (2005) said when it is not enough former knowledge about the phenomenon or if this

knowledge is fragmented, the inductive approach is recommended. Analysis processes are represented as three main phases: preparation, organizing and reporting. The key feature of all content analysis is that the many words of the text are classified into much smaller content categories (Weber, 1990; Burnard, 1996). Inductive approach was used and both the manifest content and the latent content were analysed.

Analysis process includes open coding, creating categories and abstraction. Open coding means that notes and headings are written in the text while reading it. The headings are collected from the margins on to coding sheets (Cole, 1988; Downe-Wamboldt, 1992; Dey 1993) and categories are freely generated at this stage (Burnard, 1991). After this open coding, the lists of categories are grouped under higher order headings (McCain, 1988; Burnard, 1991). Abstraction means formulating a general description of the research topic through generating categories (Robson, 1993; Burnard, 1996). Each category is named using content-characteristic words. Subcategories with similar events and incidents are grouped together as categories and those categories are grouped as main categories (Dey, 1993; Robson, 1993; Kyngäs and Vanhanen, 1999). The results are described contents of the categories, i.e. the meanings of the categories. The content of the categories is described through subcategories (Marshall and Rossman, 1995).

4. Results

From the interviews three sub-categories and five important generic categories were identified, which explain the university teachers' conceptions of entrepreneurial learning within engineering education (Table 3). The interview plan was designed based on the theory chapter and the entrepreneurship education design. The categories were formed based on analysing the received data. These five important generic categories were named as follows: 1) understanding of the entrepreneurship, 2) teaching purpose and teaching principles, 3) teacher-student interaction, 4) importance in curricula and 5) attitude toward entrepreneurship. According to Table 1 the sub-categories 1 and 2 show the teachers using "about" conception and in case of sub-category 3, they use the "through" and "embedded" conceptions.

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Table 3. Categories of engineering university teachers' conceptions of entrepreneurial learning within engineering education

Main category	Generic category	Sub–category 1	Sub–category 2	Sub–category 3
Engineering teachers' conceptions of entrepreneurial learning	1. Understanding of the entrepreneurship	Unclear understanding of the entrepreneurship (6)	Entrepreneurship is a tool for earning money (11)	Entrepreneurship means different activities (8)
	2. Teaching purpose and teaching principles	Learning is teacher centered (7)	Learning is teacher centered. Important is professional knowledge (12)	The teachers have supportive function (using active learning methods) (6)
	3. Teacher – student interaction	Teacher -> Scholar (7)	Teacher <-> Student (12)	Teacher <-> Student <-> Student (6)
	4. Importance of including entrepreneurial learning in curricula	Entrepreneurship is not so important (5)	Entrepreneurship is important (13)	Entrepreneurship is very important (7)
	5. Attitude toward entrepreneurship	Unnecessary concept (5)	Important, useful and difficult to reach (16)	Useful and reachable concept (4)

Source: Compiled by the author based on interviews

Category 1: Teacher understanding of the entrepreneurship

University teachers' understandings of the entrepreneurship are very different. Understanding of entrepreneurship was unclear for six teachers because they didn't understand what is the difference between entrepreneurship and entrepreneurial. Each teacher expressed their opinion about entrepreneurship, but they actually talked about entrepreneurial topic. These understandings can be categorized almost to the fullest regarding the "about" conceptions, but not fully, because the teachers' understandings weren't completely clear. The following are excerpts from the interviews:

"Takes initiative and finds solutions." (male, interview)

"Entrepreneurial means entrepreneurship. Entrepreneurship does not have to benefit." (female, interview)

"Entrepreneurship means that you must do something to make a living." (female, interview)

Eleven teachers understand that entrepreneurship is a tool for earning money. Their perception is that the company makes a profit and entrepreneurs earn money for living. This approach is corresponding to the "for" conception described in Table 1. The following are excerpts from the interviews:

"Everyday activities to make profit." (female, interview)

"We know how to do things in order to get the money. Related to earning money." (female, interview)

Nine teachers understand that entrepreneurship means different activities, which are related to personal characteristics. These teachers think that entrepreneurial student needs different personality qualities, for example self-confidence, courage, risk taking, communication skills etc. This kind of approach corresponds to the "through" and "embedded" conception described in Table 1. The following are excerpts from the interviews:

"Starting with things and seeking opportunities." (female, interview)

"Realization of some activity. Personality traits are very important." (female, interview)

"Finding solution for technical problems, doing something. For entrepreneurial person self-confidence and courage are important. Entrepreneurial mind-set can't be taught. It is my opinion." (male, interview)

The understandings of university teachers varied greatly. In different materials various definitions of entrepreneurship is given, which is also the cause of different opinions and understandings among the researched university teachers. The university teachers whose understanding about entrepreneurship is not clear (sub-category 1) can also create confusion to the students and therefore lead them to a wrong direction.

Category 2: Teaching purpose and teaching principles

University teachers teaching purpose and teaching principles can be divided into two main categories: learning is teacher-cantered and student-centred where teachers have supportive function.

Current research showed that 19 teachers use behaviourist teaching (teacher-centred approach) concept where learning is teacher-centred (sub-category 1 and 2). Teacher is the transferor of factual knowledge and they use classical teaching methods, for example lectures and exercises. Mostly they are exercises from the study books and are mostly not connected to solving real-life situations. For the teachers it is important to develop mainly the content of the subject. 12 teachers from 19 considered important professional knowledge, which is related with taught specialty. According to the theory chapter the understandings can be

categorized to "about" conception (learning to understand entrepreneurship). As most of the technology university teachers understand entrepreneurial learning through "about" conception, then they can't support the entrepreneurial skills and mind-set of the students. The following is excerpt from the interviews:

> "Teaching is giving (transfer of knowledge). I explain and I will try to check how they have understood." (female, interview)

Current research showed that six teachers (sub-category 3) have a supportive function towards the students and they are mainly using active learning methods in everyday practice. The teachers are constantly developing the methodology of subject and teaching. For the teacher it is important that students cope successfully at work. These teachers use social-constructivist teaching approach. These six teachers who use social-constructivist teaching approach (student-centred approach) try to develop students different social skills. These university teachers' understandings can be categorized to the "through" and "embedded" conception and they help to nourish the students' entrepreneurial skills and mind-set. The following is excerpt from the interviews:

> "Teaching is a process not only transfer of knowledge. Communication with students. Facilitate the students and creating interest." (female, interview)

The majority of the university teachers have a teacher-centred approach to their daily teaching activities. Unfortunately with this mind-set it is difficult to develop the entrepreneurial skills of the students. Those teachers who base their teaching to student-centred approach, support the development of social skills among students and therefore are contributing to the development of the entrepreneurial skills.

Category 3: Teacher – student interaction

Most of the teachers (19) mainly use in their everyday practice the teacher centred approach. 7 of them use classical lectures (Teacher –> Student model) and 12 teachers try to integrate some interactive activities into to lectures (Teacher <–> Student model), for example discussions and group work. The following is excerpt from the interviews:

> "Mostly I give lectures and in the seminars we solve practical tasks. I take the tasks from books and have also made some of my own based on my experience. The students solve the tasks in the lectures and at home mostly individually." (male, interview)

Less of the teachers (6) use in their everyday practice the student cantered teaching approach (Teacher <–> Student <–> Student model). These teachers mainly use active learning methods, for example: group work, presentations, discussions, problem solving, case study etc. The following is excerpt from the interviews:

> "I consider it essential that students express their opinion, have discussions and know how to find solutions to problems in new situations. That's why I use a bit of a problem-based learning." (female, interview)

Unfortunately only a small amount of university teachers are using the student centred teaching approach (socio-constructivist approach) and therefore the contribution of the teachers is limited to developing the entrepreneurial skills and mind-set of the students.

Category 4: Importance in curricula

Less of the teachers (5) thought that entrepreneurship topic is not so important in engineering curricula. They think the students of the engineering disciplines need mostly knowledge of technical expertise. The following is excerpt from the interviews:

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"Specialized technical expertise ensure the student a good job. The student can learn other skills later in life." (male, interview)

Most of the teachers (20) thought that entrepreneurship topic is important (13 teachers) or very important (7 teachers) in engineering curricula. They think the student in addition to professional skills also needs generic skills because for the teacher the students' successful coping at work is important. The following is excerpt from the interviews:

"I think the communication skills and ability to find solutions to a variety of situations is very important." (female, interview)

It became clear that a lot of university teachers find entrepreneurship as an important topic of the curriculum. However, they lack the will or the necessary skills to support the entrepreneurial skills in their subject. Some teachers mentioned that they add new tasks and try to use the new methods in teaching in the future, but they are not very sure how well the students' entrepreneurial mind-set are supported by those activities.

Category 5: Attitude toward entrepreneurship

For five teachers (sub-category 1) the entrepreneurship is not so important in engineering curricula. Most important are major subjects and subject knowledge. We can say that the entrepreneurial learning is unnecessary concept for them. Therefore, these teachers do not develop student's entrepreneurial attitudes and mind-set in their subjects.

For 16 teachers (sub-category 2) the entrepreneurship is important, useful but difficult to reach - Entrepreneurship is important for students but the teachers do not know how to develop an entrepreneurial mind-set. They think the entrepreneurial mind-set should be developed by a separate entrepreneurship course. Most of the teachers considered the generic skills important, but did not develop them in their subjects. The following is excerpt from the interviews:

"Entrepreneurship is certainly important, but I do not know how to teach the entrepreneurial mind-set in my subject." (female, interview)

For four teachers (sub-category 3) the entrepreneurship is useful and reachable concept - teachers understand that students also need generic skills for work and are trying to develop the generic skills in their subject. These university teachers' understandings can be categorized to the "through" and "embedded" conception and they help to nourish the students' entrepreneurial skills and mind-set.

"I consider it essential that students express their opinion, have discussions and know how to find solutions to problems in new situations. That's why I use a bit of a problem-based learning." (female, interview)

The majority of university teachers find entrepreneurship as an important part in engineering student's curriculum and they find that developing the entrepreneurial skills there should be a separate subject for entrepreneurship. These teachers are not ready to support their students in developing entrepreneurial skills. Results indicate three qualitatively different ways of perceiving entrepreneurial learning within engineering education. The teachers understand entrepreneurial learning within engineering education as 1) unnecessary concept, 2) important, useful but difficult to reach, and 3) an integrated part of engineering studies. In the light of these results authors will focus on what could be done in order to develop teachers' conceptual understanding.

5. Conclusion and discussion

This paper has identified university teachers' conceptions of entrepreneurial learning within engineering education. According to the research question, results highlight that there is lack of awareness on entrepreneurship learning goals and entrepreneurial mind-set among engineering teachers. Due to this lack of awareness teachers have difficulties to understand possibilities that entrepreneurial learning offers - for the students' future professional careers as well as for their own personal development. While some of the teachers apply teaching techniques that support developing generic skills, it often seems to remain unconscious and random. The study results showed that the lecturers perceived the components of the teaching context holistically; however, they had different viewpoints on the objectives, assessment, learning environment and teaching, which as a result does not fully support the development of the students' entrepreneurial skills, starting their own company or academic career, as described by Fayolle and Gailly (2008).

Current study showed that the teacher's understandings differ a lot about both entrepreneurship and entrepreneurship education. One of the reasons might be that in theory there are many definitions available, what creates confusion. There are many definitions of entrepreneurship education, but actually none of them seems to have established its role as "the one". Therefore, many researchers argue that a clear, accepted, and established definition of entrepreneurship education is missing (Gibb, 2000; Bennett, 2006; Fayolle and Gailly, 2008; Matlay and Carey, 2007; Jones and Iredale, 2010; Draycott and Rae, 2011), and have presented more or less unique versions of their own. On the other hand, the older generation of the university teachers in the engineering field have an outdated understandings about teaching methods and this is limiting their activities. These teachers often are not interested in entrepreneurial topics and thus they are not open to change the teaching methods or integrate entrepreneurial activities to their classes. Only two of the 25 teachers have experience in entrepreneurship.

The study brought out the need to raise engineering teachers' awareness on entrepreneurial leaning and support their competence development for more systematic application of entrepreneurial learning. Entrepreneurial learning is often based on the ideas of experiential learning theories (Kolb, 1984) or socio-constructivist learning theories (Tynjälä, 1999). The main goal during entrepreneurial learning is to create real-life learning environments where unexpected events can occur (Cope, 2003; Pittaway and Cope, 2007; Gibb, 2008). According to Kolb (1984) the experience based theory should be used while teaching, to develop the entrepreneurial skills of students. When most of university teachers are using the classical methods of teaching, therefore in such a situation it is difficult to develop student's entrepreneurial mind-set.

The study results contribute to better understanding of engineering teachers' conceptions of entrepreneurial learning and therefore allow school management and policy creators to understand the need for development of the staff as well as give input to the teacher training (addressing integration of entrepreneurial learning into engineering curricula in more systematic way). In order for entrepreneurship to be more supported through the engineering curriculums a national system is necessary. It is not enough that only some schools and some teachers deal with this subject. In 2016, the European Commission put together a document describing entrepreneurial competences, in addition also the national policy for entrepreneurship education is being drawn in Estonia. Earlier the technology university

conceptions about the entrepreneurial learning according to "about", "through", "for" and "embedded" conceptions (Béchard and Grégoire, 2005) combined with teacher-centred and student-centred teaching conceptions according to Kember (1997), Postareff and Lindblom-Ylänne (2008) according to the knowledge of author haven't been studied before. This current study is focused on the study of engineering teachers' learning and teaching conceptions and attempted to fill the gap in this area. According to Robinson et al. (2016) and Täks et al. (2014) the "through" conception should be used within the entrepreneurship course for the engineering students, as it is a socio-constructivist learning and teaching approach and the teacher needs to take the co-learner, role model, tutor and facilitator roles during the study process. It can be argued that this paper contributes to the theory through these findings:

- A number of university teachers within the engineering field do not have the knowledge about the methodology for supporting the entrepreneurial skills and mind-set within their subject;
- University teachers need pedagogical support and trainings in order to support the entrepreneurial skills and mind-set of students;
- Developing entrepreneurial skills is an interdisciplinary process and it should be systematically supported in all engineering curricula subjects;
- In order to support entrepreneurial skills, there is a need for a more general policy to support the development of entrepreneurial skills and mind-set in all schools and all levels of studying;
- While teaching, the "through" conception and socio-constructivist teaching conception should be used.

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The limitation of this study is that the study was only carried out among in the one university, and the results thus cannot be generalised for all Estonian university lecturers. However, it is possible to use the method of the study (interview plan in appendix 1) in different universities, in order to find out the university teachers conceptions about entrepreneurship education in those universities.

Only a few studies have been carried out about the development of the entrepreneurial mind-set in engineering curriculums. In the future, it should be researched how engineering teachers could use the entrepreneurial skill developing activities in their specialised subjects. In the future, it is planned to continue the study of this topic: how university teachers influence students' entrepreneurial mind-set and how to integrate entrepreneurship into the engineering curriculum in more efficient way. Based on Ruskovaara (2014), we need more in-depth studies – the examples, practices, methods, and content used in entrepreneurship education requires a more profound approach. To make the best use of the aforementioned findings and measure entrepreneurship education in higher education, studies related to student learning in entrepreneurship education also need to be conducted.

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Appendix 1

The interview guidelines

	Participants general view exploration:
Intro	How long have you been teacher? Where? How did you end up teaching? What happened? Do you have any previous experience in business? What kind of experience?
Key concepts	What is entrepreneurship to you? How do you understand it? What is Entrepreneurial Learning to you? How do you understand it? Do you consider yourself entrepreneurial person
Key concept trial	How do you understand generic knowledge and skill development in higher education? What have they done in their teaching that supports generic skills development?
	Questions about the teachers approaches to teaching (teacher responses):
1	What is teaching to you? What means teaching to you? How would you describe it?
2	Has anything changed in your practice recently? What exactly? Why?
3	What are the obstacles that you have experienced while teaching (any kinds, not only connected to students)? How you have challenged these obstacles? What have you done? Why?
4	How often you feel that you give less than 100% of yourself to teaching? What are the reasons for it?
5	What changes have you planned for your future teaching in the light of new university teacher competence model? How?
6	What do you think about students? How is your relationship with the students? Please describe it.
7	How do you use your experience from previous work life (or from cooperation with companies) in your teaching? What have you actually done to bring this expertise to the students?
8	What kind of skills do you think students need in their work-life in the future?
9	How do you assess/evaluate students' performance? What kind of methods you actually use? Or what do you do? What do you evaluate? How are you evaluation and learning goals related? Etc.
10	What reflection means to you? How do you use it in your work?
11	Do you consider yourself good teacher? Why?
12	Do you consider yourself entrepreneurial? What way? Why?

Source: Compiled by the author based on literature