**Preparing entrepreneurial modules and student involvement: introducing an alternative approach to engineering education**

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Abstract

Innovation pedagogy, the process of constantly improving you know-how, in turn leading to further know-how, new ideas or practices (Putkonen, Kairisto-Mertanen & Penttilä 2010) was applied to the traditional syllabus of automotive engineering and logistics in 2007 in order to provide students a better understanding of business practices and in particular in running your own business as well as encouraging entrepreneurship. Traditionally the syllabus included in addition to technical studies also business and finance lectures. Now a new and unique approach in Finland was applied encouraging student engagement and simultaneously also developing and enhancing engineering education.

The syllabus of the engineering studies was revised to include an entire entrepreneur module divided over the length of the studies. Students in each intake group of the automotive engineering and logistics degree programme and specialization study line where given the task to form an enterprise selling and producing goods and services. During the first year students were taught the legal, financial and administrative procedures of how to start up a business. Each intake group also had to make a business plan and choose the legal status of the business to be set up e.g. a co-op, partnership or limited company. Students were also required to set up the enterprise. The legal status of the companies is mostly a co-operative, due to the ease in the set up procedures and the low initial capital requirements.

The modules were divided into the following areas, entrepreneurship and enterprise economics, Managerial duties, Marketing and sales promotion and International interaction, each covering one academic year. The first intake of students attending the new syllabus was in autumn 2008. Since then nine companies have been set up: all of them profit making and all with a differing business idea. Students better understand the requirements of an employer, the requirements of setting up their own companies and the need for structured strategic and financial planning.

The new syllabus has enhanced student co-operation and adhesion within a degree program and intake year. Furthermore, technically competent students are better equipped to understand their future employer’s profitability, cost effectiveness, marketing and customer relation strategies. All in all an overall understanding of the needs, structure and demands of an enterprise are gained thus providing better tools to adapt to a rapidly changing business environment.

1. Introduction

The strategy of the Turku University of Applied Science (hereafter TUAS) states that entrepreneurship and internationalization form an integral part of the syllabus. TUAS applies multidisciplinary and customer orientation based innovation pedagogy and encourages flexible syllabus structures and accreditation methods to enable entrepreneurship, R&D and service activities to be part of the education process. Innovation pedagogy, the process of constantly improving you know-how, in turn leading to further know-how, new ideas or practices (Putkonen, Kairisto-Mertanen & Penttilä, 2010) was applied to the traditional syllabus of automotive engineering and logistics in 2007 in order to provide students a better understanding of business practices and in particular in running your own business as well as encouraging entrepreneurship. Traditionally the syllabus included in addition to technical studies also business and finance lectures. Now a new and unique approach in Finland was applied encouraging student engagement and simultaneously also developing and enhancing engineering education.

A driving force behind these changes was also the need for students to understand the functioning and financial realities of business organizations and the environments they operate in as well as the prerequisites of entrepreneurship. Furthermore, most business enterprises which operate in the filed automotive engineering and logistics are service companies, thus the customer service, satisfaction and after sales activities are important for successful enterprises. Thus a new entrepreneurship module was constructed spanning throughout the entire four year course of study. The syllabus itself was set up in 2007.The first intake of students who studied under this new syllabus began their studies during the autumn of 2008. Prior to the start of the syllabus all partner companies as well associates were contacted and informed that a change in the syllabus was taking place and that students would most likely contact them throughout their studies and ask for assignments or work to be undertaken as part of their studies.

Students in each intake group of the automotive engineering and logistics degree program and specialization study line where were offered this course. Thus each year three groups one from each specialization study line took this course. The specialization study lines within the automotive engineering and logistics degree program are: car technology, transportation technology and car inspection. There are three mentor tutors, one for each specialization study line. The mentor tutors have been the same teachers since the change in the syllabus was implemented. The student groups meet regularly with the mentors, at the start of the studies every three weeks. These meetings are held as official management group meetings, where any problems encountered and the next steps to be taken are discussed, agreed upon and the tasks divided between group members. Written minutes of the meetings are kept. The measures and activities are then gone through at the next meeting. The mentors attend all these meetings at the start of the year and help and guide the students. Once the student group becomes self-sufficient, the mentor involvement in the meetings reduces. Each teacher is thus able to mentor all student intake groups within a specialization line, as the mentor time requires once the studies proceed.

The aim of this syllabus change was to encourage entrepreneurship among the students and to familiarize participants of the different legal business entities through student involvement. The requirements of the course also highlighted the need for multidisciplinary know-how in order to run a successful business as well as the need for co-operation and communication skills. Students gained, whether or not deciding to set up their own businesses upon graduation or not, an insight into and hands on experience of in the functioning and need of a business organization and therefore improved working life skills.

* 1. **Course units of the entrepreneurship module**

The entrepreneurship module spans throughout the four year study period. Each year the module contains specific course units, aimed at achieving certain aspects of setting up and running an enterprise. The first year of studies contains a course unit called Entrepreneurship and Enterprise economics for which 4 study credits are obtained. First year students are taught the legal, financial and administrative procedures of how to start up a business as well as the basic business operations (Kinkki & Isokangas, 2009) The main areas covered are entrepreneurship, the operational processes in a company, interest groups, factors of economic success, monitoring a company's financial activities, financing, logistics, risk management, the central legislation regulating business operations, the basics of marketing, establishing a company and strategic planning as well as personnel management.

At the end of the first year each intake group has to set up a company, which includes a business plan and the choice the legal status of the business to be set up e.g. a co-op, partnership or limited company. At the end of the study year and course unit each group had to register their chosen company format, apply for a business name and submit business rules which include for example the names of the members of the board of directors, managing director and auditor. Registration has been refused on few occasions as the name chosen for the company has already been registered, or the authorities deem the rules not to be detailed enough. Students, when faced with these problems are mentored by a law lecturer, who has previously had his own solicitor’s office. Students can also turn to him for help with contractual issues. VAT status also has to be applied for and liability insurance arranged for during the first year.

The legal status of the companies set up since 2008 is mostly a co-operative, due to the ease in the set up procedures and the low initial capital requirements (here after co-op or co-operative). To obtain the four first year study credits students have to complete the registration and the setup of the company including the business plan and company rules, and also write a written report on the activities undertaken.

The second year of studies covers managerial studies, also 4 study credits. Topics covered during this year are recruitment of personnel, industrial relations legislation, personnel management, giving both positive and negative feedback to personnel as well as motivation and development of personnel. During this year members of the co-operative are required to organize their activities and decide upon the responsibilities and tasks of each participant and also start putting their business plan into practice. For example a managing director and personnel manager are chosen as well as a sales manager. The co-operatives also undertake their own bookkeeping and tax payments and fill in and file their own tax return. The co-operatives are also responsible to calculate and pay their VAT payments. To obtain the second year four study credits students have to run the company, take exams on the theoretical topics covered and also write written reports on the activities undertaken.

During the third year four study credits are obtained for a course unit called Marketing and Sales promotion covering areas such as new client acquisition, marketing, differing customer groups and their need, maintaining customer loyalty. One of the co-operatives has set up its own webpage to promote, market and sell its services ([www.autoteku.net](http://www.autoteku.net)). The co-operative members are during the third year of their studies expected to carry out the marketing plan formulated as part of their business plan during the first year of studies and to actively sell their products to the surrounding business environment. In order to obtain the third year four study credits students have to run the company, take exams on the theoretical topics covered and also write written reports on the activities undertaken as they did during the second year of studies.

The first intake taking this new syllabus, which begun their studies in 2008 is currently undertaking their fourth and final year of studies. The syllabus for the final year contains a course unit of two study credits called International interaction. During this year a field trip to Europe is planned and prepared financed by the activities carried out during the first years of the co-operatives operation. One of the co-operatives of the first student intake year to study under this new syllabus has planned an excursion to Germany where they will visit Mercedes-Benz GmbH and also an automotive teaching establishment. The other student group is planning and undertaking an excursion to the Czech Republic, where they will visit Skoda and a higher education establishment where car engineering is taught. Students are, in order to obtain the fourth year study credits, required to make a detailed travel plan and the travel arrangements as well write a report about their excursion. The aim among the co-operatives is to sell these reports to magazines or newspapers and thus obtain additional revenues.

In order to receive all credits, a total of 14 credits in all, students have to actively participate in the business set up during the first year, successfully register and set up and run their company, pass all their exams and written assignments. Since the change in the syllabus nine co-operative have been set up, three of which will reach the end of their syllabus during the autumn of year 2011.

2. Advantages and challenges of the student involved entrepreneurial modules

The introduction of the entrepreneurial module has resulted in student adhesion and co-operation already from the start of the course as the long term goal and reward of the overseas excursion is clear throughout the entire syllabus. The importance of all the functions of an organization are highlighted as well as the importance of pricing their goods correctly, profitability and obtaining a client contract. Students negotiate their own agreements, and are motivated to meet deadlines set out. They are also entirely responsible for the book-keeping of the company and its tax returns, and therefore obtain an understanding of the finances and financial position of a company, as well as the different factors affecting it.

Challenges faced during the teaching of the new syllabus are the organization of the theory session. If all three study lines car technology, transportation technology and car inspection within the automotive engineering and logistics degree program are thought at the same time and as one group, the amount of students is large but the number of hours covering a specific topic are greater than when each study line is thought separately. During separate theory sessions students obtain more individual coaching, but the number of hours covering a specific topic is smaller. A balance between these two is yet to be determined, both approaches having been tried.

Another challenge is the lack of facilities and equipment for students to carry out their business enterprise activities in. For example problems were faced with obtaining the right equipment and facilities to change winter tyres to summer ones. Furthermore, the teaching environment has been planned to cater for traditional class room teaching and students thus have no specific space allocated to them. Mentor attended business meetings are varyingly held in a class room cafeteria or entrance hall to the TUAS. Business is carried out using mobile phones and lap tops, thus not tying students to a specific place, which on the other hand can be seen as an advantage.

A challenge faced by the student co-operations is the amount spent by each individual participant i.e. the direct degree of student involvement in the project. Tutors face the challenge of motivating students and co-operations face the challenge of differing student resource input. A number of co-operations have solved this by allocating the profits made by the co-operation in a direct proportion of the work carried out. In this case student s with a high degree of involvement cover their entire excursion costs with profits from the co-operation, whereas students with a lesser involvement degree have to finance part of the trip themselves.

Finally, a further issue to be addressed is the future of these co-operatives upon the graduation of its founders. Students themselves propose, that the co-operatives could be sold to new student intake groups, which in turn would require a rethink of the syllabus and is thus now a viable option. Another possibility is that the co-operatives are run down their business wound up. Alternatively all remaining profits of the co-operative after the excursion are divided between participants and the co-operative is then taken over by one of the founding members, who will carry on its activities as an entrepreneur.

3. Conclusion

The new syllabus introduced to students during the autumn 2008 intake has enhanced student involvement, co-operation and adhesion within a degree program and intake year within the automotive engineering and logistics degree program. Students understand the importance of team work, continuous communication between and within teams, and in particular the importance and advantages of multi-disciplinary teams. Hands-on experience is gained as to the set up requirements, the actual set up of and the needs of a business organization and the task arrangement within it. An overall understanding of the environment and the interest groups of a company is also obtained. The importance of the customer, customer satisfaction and after sales service as part of running a successful business is highlighted by this syllabus change. Furthermore, students gain throughout theirs studies valuable hands on experience through dealing with their own co-operatives customers, customer complaints as well as after sales activities. Throughout the studies the clear goal of the overseas excursion motivates students in their activities, and also increases the amount of commitment participants have to tasks at hand.

The need for continuous co-operation and communication is highlighted by this study method. Furthermore, technically competent students are better equipped to understand their future employer’s profitability, cost effectiveness, marketing and customer relation strategies. All in all an overall understanding of the needs, structure and demands of an enterprise are gained thus providing graduates with better tools to adapt to a rapidly changing multidisciplinary business environment either as entrepreneurs or as employees.

A number of issues, such as the organization of the theoretical teaching in a way that it most benefits learning have been faced and are being worked with. The allocation of profits among students has also been an issue, which has party been addressed by the co-operatives themselves: The degree of student involvement in the co-operation relating directly to the benefits received. The automotive engineering and logistics department has produced 9 profit making student run business organizations since the autumn of 2008. The future of the co-operatives, whose founding members conclude their studies has not yet been decided upon. If the co-operatives activities are run down, they will have been a successful tool in teaching entrepreneurship, in particular running a customer service organization. They have also enhanced student involvement in engineering education and most importantly given graduates hands on business experience; which again helps them in understanding the needs of the business organizations they are employed by in the future. However, in the best case scenario, the TUAS automotive engineering and logistics department has helped set up long running profitable and successful entrepreneur run business outfits.

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