

HOW TO FOSTER YOUNG SCIENTISTS' ENTREPRENEURIAL SPIRIT?

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ABSTRACT

Education in general is considered an encouraging element of entrepreneurial intention and behavior. However, most of entrepreneurship courses are designed for students who have already taken some courses in economics, business or finances and have no feedback from the real business world. This research focuses on STEM (Science, Technology, Engineering and Mathematics) courses students who have no knowledge on those areas. In this paper we will provide an analysis of two reference courses provided by two institutions (Lund Business School and EMLYON) in order to understand why these institutions had such a good reputation in entrepreneurship education and if, in fact, they had a special attention to STEM students. The European project SCIENT aims to do an in-depth analysis of successful entrepreneurship programs, creating a (non-exhaustive) list of Universities/Business Schools offering scientific entrepreneurship programs considered as best practice examples. The research method used was the interview. We concluded that there is a widespread perception that STEM students/researchers/experts share certain characteristics that should be treated differently. Providing this target with high quality courses and exposing them to a highly motivating entrepreneurial curriculum are of great importance in enhancing and fostering the academic entrepreneurship in STEM courses in future. Furthermore, it was possible to observe that the institutions visited in France and Sweden are well known by their excellence in the field of entrepreneurship, aiming to “build global entrepreneurs” as their main purpose. Both universities put a great effort in the implementation of a real entrepreneurship culture. In this paper we have focused on the initial phase of the project - the diagnosis phase. At this point, it was necessary to list the main obstacles currently faced by European STEM PhDs wishing to become entrepreneurs and to investigate some entrepreneurship programs considered as best practice examples for STEM students. Considering the complexity of the subject, and despite we have focused only in two university examples, the paper gives a contribution to entrepreneurial spirit, competence and behavior of STEM students. Furthermore, it allow us to understand why these institutions had a good reputation in entrepreneurship education and how these programs are conducted.

Key words: Entrepreneurship Education, STEM students, SCIENT project, Entrepreneurship Programs. Lund University, EMYLON.

INTRODUCTION

Any society it is vital to support all people with ‘entrepreneurial mind-sets’, not just the entrepreneurs, as they each have the potential to inspire others to start a business (Kelley et al, 2010). Also, Ratten et al. (2007) found out that international entrepreneurship is driven by

internal resources and capabilities and this has implication for market performance. Kelley et al (2010) argue that any educational training should assist people not just to develop skills to start a business but also to be skilled for acting entrepreneurially in whatever role they take in life. Although this perspective is wide, it retains the critical thinking of modern entrepreneurship education and training programs essential whether countries are to create an increasing pool of people who are willing to behave entrepreneurially.

Entrepreneurship education and training is growing rapidly in universities and colleges throughout the world (Dana, 1993; Dana, 2001; Martin et al., 2013) and it should be to ‘develop entrepreneurial capacities and mind-sets’ that benefit economies by promoting creativity, innovation and self-employment (European Commission, 2008). It is now well-recognized that education and training opportunities play a key role in stimulating future entrepreneurs and in developing the skills for the creation of new businesses (Henry et al, 2003). Furthermore, and according to Dana and Dana (2005) entrepreneurship education is vital in developing universities, which are more positioned to the international community (Dana and Dana, 2005).

In an exploratory study, Moroz et al (2008) have analyzed knowledge transfer performance of public research universities. According these authors, commercialization performance indicate that huge differences exist between a small percentage of high performing universities, and the remaining bulk of under-performers. They argue that high performing universities attract resources (human and financial resources), with a much stronger pull than lower performing universities. In this context, Moroz et al. (2010) have examined the attitudes and perceptions of academics who are directly involved in the field of entrepreneurship education programs and they found out that significant advantages from collaboration between university spin out and entrepreneurship education. For these authors, university spin out becomes a progressively important part of the commercialization process, those individuals with understanding and knowledge in both applied research and entrepreneurial process will advance cumulative value.

In 2014 around 5 million young people (under 25) were unemployed in the EU-28 area, which represents an unemployment rate of 21.7% and is more than twice as high as the adult unemployment rate (9.0%). Additionally, 7.5 million young Europeans between 15 and 24 are neither in employment, nor in education or training, and in the last four years, the overall employment rates for young people fell three times as much as for adults.

There are more than 180.000 STEM (Science, Technology, Engineering and Mathematics) students (about 36%) in EU universities (EUROSTAT, 2010). Not all of these students will get an academic/research position and sign a contract with a research unit. They will most probably have to go abroad (this is the case of Portugal) or start to think about creating their own job.

This particular target group should be provided with “entrepreneurship experiential elements”, which have potential to complement the research, thus an adequate entrepreneurship training program should cover the whole life-cycle of business and is sensitive towards to PhD process of doctoral students to whom the program is directed (Thursby et al., 2009).

Given the importance of entrepreneurship to surpass the problem of unemployment of this target (STEM students), the project SCIENT will be implemented in order to develop an innovative entrepreneurship program for PhD STEM students/graduates, developing their transversal skills and providing them with a new professional path.

SCIENT will enhance scientific entrepreneurship by focusing on young researchers. The goal is to make doctoral students and *graduates aware of their career options* and aware about the

possibility of using their research findings and starting their own company, avoiding that they limit their prospects by considering only an academic/researcher career.

The SCIENT Project has the following objectives:

1. Develop transversal skills (both hard and soft skills) for PhD STEM students/graduates and creating new professional paths for these individuals;
2. Identify the obstacles that PhD students/graduates face in transferring their research findings into business ideas;
3. Support and stimulate the exchange of knowledge between HEI and enterprises across the countries involved;
4. Develop and test of a pre-accelerator program for universities, research and entrepreneurship centers, accelerators and incubators;
5. Transfer best practices from North EU countries to South EU countries;
6. Open up new learning opportunities through the practical application of entrepreneurial skills (start-ups, spin-offs, products, prototypes).

To put in progress such an ambitious program, a consortium of 15 organizations from 8 countries: Cyprus, Malta, Italy, Portugal, Spain, Lithuania, Germany and United Kingdom was created. The project includes: Universities with relevant experience on entrepreneurship education field for higher education students (European University Cyprus, University of Beira Interior, Kaunas University of Technology, and University of Gloucestershire); SMEs with experience in research and consulting work on entrepreneurship (GrantXpert, Paragon); a Science and technological park (Parkurbis) and an accelerator (Chrysalis Leap) providing vital input during the development of our training content; two Northern EU partners (despite UoG in UK), from Germany (ISOB, responsible for the Evaluation and Quality Assurance), a cluster of companies (SPS, which provided support and development to start-ups on a daily level), aiming to transfer best practices from these countries to Southern EU partners; one media partner (SigmaLive), responsible for the dissemination and exploitation activities; and a Business Angel Network, (CYBAN) to understand the perspective of the investor.

Through an in-depth analysis of existing entrepreneurship programs, accelerators, science/technological hubs and incubators in the EU and beyond, SCIENT will identify the existing gap in South EU countries, as well as the best practices from North EU countries and develop a new, top-quality pre-accelerator program for PhD STEM students/graduates. This will be the final output of this project.

In this paper we will focus on the initial phase of the project - the diagnosis phase. At this point, it was necessary to list the main obstacles currently faced by European STEM PhDs wishing to become entrepreneurs and to investigate some entrepreneurship programs considered as best practice examples for STEM students. This research allowed us to find some European institutions of reference, such as the University of Lünd (Sten K. Johnson Centre for Entrepreneurship), in Sweden, and the EMLYON, in France. These two organizations were then visited by the team from University of Beira Interior (Portugal), and two interviews were carried out in order to find more about entrepreneurship education in these organizations. This study applied a qualitative method and in this way, tries to contribute for a comprehensive approach (Dana and Dumez, 2015) about how entrepreneurship education programs contribute for develop a young scientists' entrepreneurial spirit.

ENTREPRENEURSHIP EDUCATION AND STEM STUDENTS

Education in general is considered an encouraging element of entrepreneurial intention and behavior. Several studies suggest that the level of education increases the probability of an individual to be involved in entrepreneurship activities (Belcourt, 1987; Dana, 1993; Estrin, Mickiewicz and Stephan, 2013). In turn, entrepreneurship education could increase the awareness, knowledge and skills required to start a new business, developing the self-confidence of individuals in their own competencies, and encouraging their entrepreneurial intent (Co and Cooper, 2014). According to Kuratko (2005), “*it is becoming clear that entrepreneurship, or certain facets of it, can be taught*” (p. 580). Some studies advance the idea that early formal entrepreneurship education affects the attitudes of students, influencing them in the direction of their future career (Dinis et al., 2013).

To Somuncuoglu and Yildirim (1999), developing the *motivation* to become an entrepreneur would seem a key aspect to developing entrepreneurial curricula, as motivation represents a driving force for student learning goals. Previous studies (Dinis et al., 2013; Jusoh *et al.*, 2011; Neck and Greene, 2011) indicate that psychological and behavioral characteristics are important features of entrepreneurs and should be incorporated into entrepreneurship education. A challenge to educators is to preserve, or increase, these characteristics (including content-specific motivational characteristics such as locus of control and self-efficacy beliefs) while simultaneously making students more aware about, and more interested in an entrepreneurial career (Dinis et al., 2013). At the level of the individual student, Harms (2015) proposes self-regulated learning as an effective way to learn in entrepreneurial projects. Self-regulated learning “*is a didactical concept that emphasizes that a learners' abilities for metacognition, strategic action, and motivation are a key to effective learning*” (Harms, 2015, p. 3). Harms (2015) evidences the elements of the self-regulated learning phase model, based on Cheng (2011), in entrepreneurship education context: i) learners assess their strengths and weaknesses with regard to a specific learning task; ii) learners execute strategic planning and goal setting with regard to mostly self-chosen learning goals; iii) learners implement their learning strategy and continuously monitor its effectiveness; and iv) learners compare the actual final learning outcome with the intended learning outcome. Harms (2015) analyzed this model in the context of a lean start up-based entrepreneurship class. He showed that self-regulated learning has a positive impact on students' exam scores.

Jansen et al. (2015) aimed to know ‘Which entrepreneurship encouragement offerings contribute to the decision of a student to pursue a career as an entrepreneur?’ and in order to answer, a three stage student entrepreneurship encouragement model was performed containing fifteen entrepreneurship education and support offerings. This model was created in two steps: i) first a (snowballing) literature study was conducted to identify Entrepreneurship Education and Support Offerings; ii) Secondly, the student entrepreneurship encouragement model and separate EESOs were evaluated by performing three case studies at large universities. This model was evaluated in three different universities: Massachusetts Institute of Technology, The International Institute of Information Technology Hyderabad, and Utrecht University. According Jansen et al. (2015) the centers for entrepreneurship help increase overall visibility of entrepreneurial offerings and also organize university-wide educational offerings. Moreover, the entrepreneurship centers also organize all kinds of smaller activities, such as talks by experienced entrepreneurs, to inspire students that are interested in entrepreneurship.

Some studies (e.g. Dinis et al., 2013; Nabi et al., 2010; Pittaway & Cope, 2007) show that entrepreneurship education plays a positive role in student entrepreneurial intentions and that

entrepreneurship education programs contribute to the development of entrepreneurial intentions (Fayolle et al., 2006; Jansen et al., 2015). Knowledge on the student entrepreneurial characteristics is the most impacting factor on intention to start up a business. This may represent an important contribution to the development of educational programs suitable to fostering entrepreneurship and business creation (Dinis et al, 2013).

Donnellon et al. (2014) explored entrepreneurial identity and how it is constructed within an entrepreneurship education. They developed a set of categories addressing the construction of an entrepreneurial identity and analyze narrative data developed as students created new ventures. The study shows that, in the context of a new venture creation program, students experience challenges that lead to the development of entrepreneurial identity.

Entrepreneurship is a multifaceted phenomenon that is affected by a variety of social, cultural, environmental, demographic and economic factors (Dana, 2001; Ratten & Welpel, 2011; Stamboulis & Barlas, 2014). According to Moroz et al. (2010) entrepreneurship education programs help develop commercialization strategies for universities and this is vital as university commercialization has a substantial impact on regional and national economies.

According to Ioannou (2001), several other factors are associated with young people and have influence on entrepreneurship: the qualification of the new entrepreneur; the motive of creation; skills and personal characteristics; innovation, creativity, ability to work and motivation in creating something new; business plan; and risk.

Brockhaus (1982) divided into three categories the factors that affect a person's decision to become an entrepreneur: i) the psychological effects that the person has been subjected to; ii) the results of their experiences (mainly from previous work); and iii) personal characteristics.

According Stamboulis and Barlas (2014) often the young entrepreneur faces barriers that influence and prevent the completion of the implementation. Barriers to entrepreneurship may be divided into three categories: i) Individual entrepreneurship barriers (family, education); organizational barriers (financing, physical resources, marketing); Environmental barriers (socio-cultural factors, rules and regulations). These authors research concerns the study of students' entrepreneurship activity and how this is affected by various barriers and success factors. They evidence significant differences before and after attending entrepreneurship class in both extrinsic and intrinsic barriers and also in success factors rates and future carrier plans. They suggest that direct assistance and support programs not only minimize the effect of those factors but create better economic opportunities to individuals, and also support local economic development. They conclude that the implemented Entrepreneurship Program has made significant impact on student's attitudes, especially with respect to critical aims such as students' perception of entrepreneurship, their self-confidence to pursue it and their perception of the external environment.

Some of the obstacles currently faced by European STEM PhDs wishing to become entrepreneurs and to commercialize their innovative ideas, can be seen bellow:

1. Lack of soft and entrepreneurial skills: usually these students want to become scientists because they either enjoy or are more comfortable working with experiments rather than people, therefore their soft skills should be strengthened substantially because otherwise they will face a lot difficulties in the business world;
2. Little or no knowledge or skills in some areas considered as crucial to start-up: financial management, marketing and market research, negotiation skills and ability to constitute multidisciplinary teams;
3. Lack of financial resources for product development: in some areas the amount of financing needed is huge, because the large time to reach commercialization, as happens with drugs and other types of therapeutics;

4. Lack of financial resources for registering a patent in Europe: for instance, a typical patent valid in between six to eight EU member states, will cost between €30.000 and €40.000, over 12 years; additionally there is also a painful bureaucratic process and the patent needs multiple validations and translations.

In order to overcome some of these issues, students try to find some support from universities, entrepreneurship centers, incubators and other related institutions in order to reduce their gaps in entrepreneurship and management skills. The problem is that most of the current entrepreneurship courses and programs are unsuitable for those STEM doctoral students wishing to become entrepreneurs, as showed in the Erasmus project Innovation and Growth – MBA Program for Doctoral Students (2010-2013) which empathizes that *“the contemporary general MBA programs fail to meet the specific needs of and demand from those who lack entrepreneurial skills and knowledge in pursuing entrepreneurial career ... contemporary general MBA programs are inadequate for STEM doctoral students in understanding entrepreneurial phenomena”* (p.7). The weaknesses of these programs are related to several aspects such as:

1. They are directed to the growth and expansion aspects of existing businesses, with few training on how to set-up a new start-up (are more adequate to serve those who work in business preparing them for higher managerial positions);
2. Most of them are designed for students who have already taken some courses in economics, business administration or finances. Usually those entrepreneurship programs were incorporated to postgraduates’ entrepreneurship courses followed by STEM students who have no knowledge on those areas;
3. Consist of modules covering theoretical issues and courses in which the most typical delivery method was through lectures, with little or no feedback from the market forces and the real business world.

Given this scenario there is need for scientific entrepreneurship programs in Europe to be tailor made for STEM students. The simple combination of general theoretical business/entrepreneurship courses will not give the understanding STEM students want and need.

ENTREPRENEURSHIP PROGRAMS CONSIDERED AS BEST PRACTICE EXAMPLES FOR STEM STUDENTS

From previous research, it is possible to conclude that there are several notable and successful entrepreneurship programs in the USA and Europe (Moroz et al., 2010). Usually they have in common some aspects as: they are not restricted to theory, focusing on the transfer of good scientific ideas from laboratories to the market; the training of participating students is done in multidisciplinary teams; the classes of finance, marketing or strategy are supplemented by workshops where students practice, for example, pitching and presentation skills; there are experienced and appropriate mentors/tutors; guest speakers are invited to talk with students in the training sessions; there are start-up idea competitions presenting the winning teams with financial prizes; almost all courses are connected to incubators/accelerators.

In the scope of SCIENT Project, a (non-exhaustive) list of Universities/Business Schools offering scientific entrepreneurship programs considered as best practice examples was produced and analyzed. It includes MIT, Stanford Entrepreneurship Centre, Lündt Business School, Auckland Business School, Copenhagen Business School, Kellogg Business School, EMLYON, Texas Technical University and Krannet School of Management.

In this paper we will focus on case of two courses provided by European institutions: the Lünd Business School and the EMLYON, which respectively offer the “Entrepreneurship, New

Venture Creation - Master's Program” and the “MBA4PhD” (together with other three institutions).

In the Lund University (Sweden), the course “Entrepreneurship, New Venture Creation - Master's Program” is a one year curriculum program. It is designed for those students of any discipline wishing to start up a new business. In the New Venture Creation track students will learn how to create, develop and exploit business opportunities by starting up and managing new venture, offering students an opportunity to be fully involved as an entrepreneur in the start-up process, then from idea selection and multidisciplinary team composition to venture formation, which enables participants to gain real experience in starting up a new business. There are several guest lecturers that are experts in various areas related to new venture creation and a mentorship program with experienced tutors.

The key components of the program, through four courses, include the acquisition of knowledge in the field of (i) Opportunity recognition, (ii) Entrepreneurial marketing, (iii) Entrepreneurial finance and (iv) New venture growth. This school's pedagogy is based on the belief that individuals need practice to learn. However, it is also necessary to reflect on the practice, and learn from available theories in the field.

The students in the program come from different educational and cultural backgrounds. This increases the opportunity to form competent multidisciplinary teams, create innovative ideas, and contact to international networks. Thus, this course is designed to provide the tools necessary for starting new independent businesses or to work in advisory roles to new venture start-ups. It also gives graduates practical experience in research commercialization, as well as tools to proactively work in projects in highly uncertain or risky market environments.

EMLYON Business School (France), together with University of Turku (Finland), University of Wales (UK) and University of Gothenburg (Sweden) developed the MBA4PhD: From Science to Business (an MBA tailor-made for European STEM PhD students). This program was implemented in 2013 in the sequence of an Erasmus Report which investigated the deficiencies as well as best practice methods of entrepreneurship courses offered to STEM students internationally. The mission of the MBA4PhD program is to provide STEM PhD students in biosciences, health sciences and technology with knowledge and skills in entrepreneurship, new venture creation and innovation commercialization, by offering an innovative business creation and management curriculum. MBA4PhD is designed and tailor made for STEM doctoral students, who are interested in making a shift from academia to working life that is highly globalized and international by nature, driven by market forces. They have a need to understand the innovation value and potential of their research, when taking it into practice via entrepreneurship.

MBA4PhD Program consists of four modules (Entrepreneurship and Innovation, New Venture Creation, Growth Management and MBA Thesis) that can be taken alongside with the doctoral study process. Each study module includes 30 ECTS. The program is organized in such a way that a student can complete the studies within 2,5 years. It includes cases, teamwork and networking, a project year and intensive winter and summer schools and international networking opportunities.

METHODOLOGY

From the intensive search for the programs related with entrepreneurship education, it was possible to list a set of examples in Europe considered good practices. As notice, some Higher Education Institutions have been making a huge effort in the specific area of STEM

entrepreneurship programs. At this level, the incubators and the technological transfer offices, connected to the institutions, have been crucial.

This research follows the recommendation of Dana and Dana (2005) that point to the application of more inductive approaches, making use of non-quantitative data in areas such as entrepreneurship. These authors consider that qualitative research allows to learn directly from the research subject, thus minimizing measurement problems very common in survey studies, and also reducing Type III error (asking the wrong question) and Type IV error (solving the wrong problem). Qualitative approach includes different methods as *“personal observation of situations, events, individuals, interactions and transactions, as well as document analysis (including quantitative records) and open-ended interviews yielding in-depth and oral testimonies”* (p. 82).

Using a set of organizations considering has having good practices in entrepreneurship education, we choose two organizations to visit and to analyze deeply: the University of Lünd (more specifically the Sten K. Johnson Centre for Entrepreneurship) in Sweden and the EMLYON in France. Once made the initial contacts we requested additional information about the entrepreneurship programs and asked permission to interview some of the responsible of these programs. The personal interviews were carried out in the two institutions between May and June of 2015 having the duration of about two hours. The personal interviews included the following sections: presentation, delivery, demand, successes, improvements, partnerships, and other information, and the aim was to understand why these institutions had such a good reputation in entrepreneurship education and if, in fact, they had a special attention to STEM students. Next we present a brief description of the institutions sampled.

Lünd University has an excellent academic reputation with a large number of visiting professors and international students. The School of Economics and Management is one of eight faculties within this university, and includes the Sten K. Johnson Centre for Entrepreneurship, that dedicates its activities to the promotion of entrepreneurship, using an action-oriented learning approach, that benefits from the entrepreneurial environment that is surrounding the university. The cooperation includes the development of joint business ideas where students get the opportunity to develop ideas based on research conducted at the university, business ideas with an origin from certain regions, or ideas developed during internships in established companies.

In its turn, EMLYON Business School is considered by itself a “learning experience like no other” and has as slogan *“Educating entrepreneurs for the world”*. For over 140 years they have offered a unique education centered upon entrepreneurship, innovation and humanism, becoming a leading European business school. EMLYON’s mission is to educate entrepreneurs for the world, equipping students with the entrepreneurial skills, values and attitudes they need to succeed as leaders in this challenging global environment. Thus, all students have to attend at least one entrepreneurship course. There is also complementary training provided by the Executive Programs and a close relation with the Incubator.

RESULTS

The interviews with the director of Sten K. Johnson Centre for Entrepreneurship in Lünd University and with the Head of the Entrepreneurship Research Centre in EMLYON were recorded and transcribed. In order to organize the information in a better manner. The analysis was divided according to the parts of the interview guide, and when necessary, compiled into

tables. Note that the aim was not to focus in a particular course, but instead to get an overall view of the entrepreneurship education delivered in these institutions.

Regarding delivery, in Lünd University the methods of contact with students are combination of face-to-face and online, as well as the experimental learning. In terms of support there is *“a mentor to each group of students and the possibility to use all the resources of the Venture Lab. Usually the sequence of support is: mentoring - internships (in Corporate Entrepreneurship and Innovation master) - Venture Lab (students’ incubator) – Ideon (technological park)”*. The courses are free for national students, but students outside the EU have to pay. Collaboration is encouraged trying to bring together the multidisciplinary of the attendants. Some students have an idea, but others not, so they have a first course of Idea Generation in which they have to work together. In general, in this EMLYON university, the method of contact is face to face combined with eLearning (conferences, workshops, tutoring, field work, in-company stay, coaching). Expert tutors and a collaborative platform are also used. As we are facing a private organization attended by the upper classes, the fees are significantly higher. The professionals involved in the training delivery are professors of the academy, entrepreneurs and professionals. The focus is on creativity and soft skills (learn by doing). Some of the programs are very open to the society - students try to solve a social problem (for instance for a NGO) and show the projects to other people. There are also courses more indicated to students from other areas of knowledge (e.g. engineering). Other programs consist in going to an enterprise and stay there some time. The students should make a proposal and have a mission, a kind of compromise with the company in which they have to stay some weeks and generate reports. They have to discover the model of business, how to sustain that model and at the end to make some recommendations.

There is some demand of STEM PhD students/graduates in Lünd University. They come to the Business School to attend entrepreneurship programs, and as the director said *“their skills are different from the business students. They are very practical and focused in the outputs. They know all about calculation and project design. However they have a lack in the financial topics”*. In the case of EMLYON, the courses selected are mainly attended by graduates (STEM and other areas) and the selection process is based in the candidates’ profile. They *“try to adapt the course to the students’ profiles and to the trends. Usually we collect the student, teacher and mentors opinions. An adviser board (composed by professionals and business man) is also asked to contribute with suggestions”*. Both institutions are open to foreign attendants and changes are related with the inclusion of new contents.

Regarding the **successes** of these organizations, it is possible to observe the information collected about creation of businesses, differentiation of the course and qualities to make a successful entrepreneur (table 1).

The approach of Lünd University is based on an action-oriented learning. The pedagogical idea of this program has as pillars the Action (reflection), Experience (guest lectures, cases, mentoring) and the Theory (entrepreneurship, multidisciplinary, knowledge). The qualities pointed to be a successful entrepreneur were to be creative, take risks, persistence. In turn, EMLYON is very focused in global entrepreneurship and in excellence, offering an education centered upon entrepreneurship, innovation and humanism. When asked about the more relevant skills of successful entrepreneurs, the options ranged between global vision, risk taking, curiosity and motivation.

Table 1 HOW TO FOSTER YOUNG SCIENTISTS' ENTREPRENEURIAL SPIRIT? Successes In Entrepreneurship Training		
	LÜND	EMLYON
Of those that participate how many set up in business?	It is difficult to measure. However, a survey passed in the last year pointed that about 40% continued with the business idea.	Non-available data because of the difficulties to follow the entrepreneurs.
Differentiation from other offerings	Maybe the type of the approach that is based on an action-oriented learning. The pedagogical idea of this program has as pillars the Action (reflection), Experience (guest lectures, cases, mentoring) and the Theory (entrepreneurship, multidisciplinary, knowledge).	The premise of the institution is to build global entrepreneurs and to show why the things are done. They have an entrepreneurship school of excellence.
Top three qualities to make a successful entrepreneur	1. Be creative 2. Take risks 3. Persistence.	1. Global vision 2. Curiosity 3. Motivation

In the section improvements, we present the interviewees' perception regarding the improvements they would make to the service if there were no limits, their opinion about what EU could do to foster entrepreneurship and the main obstacles to entrepreneurship (table 2).

Table 2 HOW TO FOSTER YOUNG SCIENTISTS' ENTREPRENEURIAL SPIRIT? Improvements In Entrepreneurship Training		
	LÜND	EMLYON
What improvements would you make to the service if there were no limits?	Have funds not only to experiment but also to create in fact real businesses.	To improve the professors training (sometimes they do not have enough competences to teach entrepreneurship)
If the EU could do more to improve entrepreneurship, what would this look like?	May be divulgate more the good practices and the results of the entrepreneurship educational	- The European institutions are not very open to external opinions regarding this issue - Policy makers should follow a more open and collaborative strategy
What do you feel is the main barrier to entrepreneurship?	The culture. Individuals prefer to go work to big companies instead of create their own business. It is preferable to be unemployed than a small entrepreneur.	Culture and mentality. Everyone wants to study in a great university and goes to work to a big company. To become an entrepreneur does not give social status

Lünd University considers that it would be great if they have funds not only to experiment but also to create in fact real businesses. *"To develop the professors training in entrepreneurship field and to "upgrade" to a technological park"* were the aspects that could be improved in the opinion of EMLYON. The most referred barrier to start-up was the culture and the mentality of individuals and society, as well as in Lünd, as stated by the director *"individuals prefer to go work to big companies instead of create their own business. It is preferable to be unemployed than a small entrepreneur"*.

EMLYON has several partnerships in EU (e.g. the program EEJ that consists in a European network of teams of students that includes a short stay in a foreign university) and

outside EU (e.g. in the Global Entrepreneurship Program - University of Zhejiang in China and Purdue University in USA), since some of the programs demand for stays in foreign universities. In its turn, Lünd University has partnerships with some institutions in France (guest professors), denoting that the internationalization needs additional work. Nevertheless, there are some debates with countries as Russia, Canada and China.

In the last part of our interview, we drew two open questions in order to get the interviewees' perception about the problems faced by STEM students when they decide to start-up, as well as to collect some clues and suggestions of what a course directed to this public should be like (table 3).

Table 3		
HOW TO FOSTER YOUNG SCIENTISTS' ENTREPRENEURIAL SPIRIT?		
Problems and suggestions related with STEM entrepreneurs		
	LÜND	EMLYON
Please point the main problems students/entrepreneurs in the STEM field face when creating a start-up.	STEM students have lack of the financial knowledge.	Students don't have enough support from teachers because they usually don't know how to deal and surpass this lack of capabilities
What suggestions/contents would you recommend for an entrepreneurship course directed towards STEM students/entrepreneurs?	Focus on the field of Communication and Finances	To insist in the topic of entrepreneurial culture

The problems mentioned were consensual – this target has a great aversion to bureaucracy and to management and financial issues; there are problems related with the soft skills (e.g. difficulties in communication); lack of sensitivity to market (in terms of knowledge and market orientation). The inexistence of multidisciplinary teams was other constraint that these individuals face when they decide to start-up. In sum, *“don't know the clients' needs; concentration on the product and not in the market; lack of focus (they have always lots of things to do at the same time); to think that the competence do not exist”* (Director of Sten K. Johnson Centre for Entrepreneurship). The University of EMLYON puts also the responsibility on teachers because sometimes they are not able to help students with this type of gaps. To overcome this situation, by one hand it is necessary to invest in courses focused in soft skills, in simple and useful management tools and in pre-accelerator programs. By the other hand, as mentioned, it is necessary to work and to implement a culture of entrepreneurship in all society. According Kirkwood et al. (2014) findings, because of all these problems only a limited number of graduates from entrepreneurship programs follow through on their original intentions and launch new ventures immediately after graduation.

As evidenced by interviewees, there is a need to emphasize situational experience, capability to handle with change, as well as skills training from real case-based training. Therefore, Taatila (2010) refers there are reasons to argue that the pedagogic foundations of academic entrepreneurship curricula should be based on a philosophy of educational pragmatism.

Both organizations were not very specific when asked about suggestions for topics and modules to an entrepreneurship program directed to STEM students. Having in mind previous programs as the MBA4PHD, those modules should focus on issues related to intellectual property and patents, business management, financing of product development, effective pitching/presentation methods (soft skills), negotiation skills, strategic alliances and commercialization strategies.

CONCLUSION

It was possible to observe that the institutions visited in France and Sweden are well known by their excellence in the field of entrepreneurship, aiming to “build global entrepreneurs” as their main purpose. Both universities put a great effort in the implementation of a real entrepreneurship culture.

At EMLYON University it is mandatory that all students attend at least one compulsory entrepreneurship course which can assume the format of face to face or e-learning. Students can go to workshops, seminars or in-company stays. The aim is learning by developing a project that can be done in articulation with the incubator. In Lünd University a huge effort is carried out to develop and implement an action-oriented learning approach that benefits from the entrepreneurial environment that is surrounding the university and to help students in the development of their own ideas (in the Venture Lab).

Nevertheless, the responsible for the entrepreneurship programs thinks that it is always possible to get better results. For that, it is necessary to surpass the inexistence of an entrepreneurial culture in society and change mentalities. Specifically in the field of entrepreneurship, pedagogy is crucial to enhance the formation of entrepreneurship teachers, encourage risk taking among students and motivate them to engage in multidisciplinary teams.

Considering the complexity of the SCIENT project, the focus should be in the development of a general set of competences applicable in all aspects of life, not simply about learning how to run a business, which includes all forms of learning, education and training that contribute to entrepreneurial spirit, competence and behavior.

As noticed in the interviewers, there is a widespread perception that STEM students/researchers/experts share certain characteristics that should be treated differently. This public usually works in the back office, they are more focused on their invention and less worried with the market. They also have great aversion to bureaucracy and financial issues. The absence of knowledge in the management field, plus lack of communication and negotiation skills are also relevant aspects. As such, the creation of an entrepreneurship program directed towards them makes a lot of sense in the opinion of the visited organizations, as long as a lot of attention is paid to teacher’s formation and real entrepreneurs are involved in the conception of the program.

Thus, providing the PhD students with high quality courses and exposing them to a highly motivating entrepreneurial curriculum are of great importance in enhancing and fostering the academic entrepreneurship in STEM courses in Europe in future.

Practical and Social Implications

In this paper we have focused on the initial phase of the project - the diagnosis phase. At this point, it was necessary to list the main obstacles currently faced by European STEM PhDs wishing to become entrepreneurs and to investigate some entrepreneurship programs considered as best practice examples for STEM students. The focus should be in the development of a general set of competences applicable in all life routines, not simply about learning how to run a business, which includes all forms of learning, education and training.

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aversion to bureaucracy and financial issues. The absence of knowledge in the management field, plus lack of communication and negotiation skills are also relevant aspects.

Providing the PhD students with high quality courses and exposing them to a highly motivating entrepreneurial curriculum are of great importance in enhancing and fostering the academic entrepreneurship in STEM courses in Europe in future. Creation of an entrepreneurship program directed towards these STEM students' makes a lot of sense in the opinion of the visited organizations, as long as a lot of attention is paid to teacher's formation and real entrepreneurs are involved in the conception of the program.

Considering the complexity of the subject, and despite we have focused only in two university examples, the paper gives a contribution to entrepreneurial spirit, competence and behavior of STEM students. Furthermore, it allow us to understand why these institutions had a good reputation in entrepreneurship education and how these programs are conducted.

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