

Effect of Incorporating Entrepreneurship Module in Non-Business Major Programs in Higher Education Institutes (HEI): A Study of the Science Major Students at The Institut d’Enseignement Supérieur (INES) de Ruhengeri in Rwanda

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This study assesses the impact of inclusion of entrepreneurial contents in curricula in developing entrepreneurial-like thinking in non-business major students in Institut d’Enseignement Supérieur de Ruhengeri in Rwanda. A comparison of findings before and after the training indicate that systematic learning of entrepreneurship can effectively contribute to the focused development of meta-level skills and leave important input for the policymakers and education strategists who look forward to reforming the supply-side of the labor market as a catalyst of growth.

Keywords: entrepreneurship, entrepreneurship education, entrepreneurial orientation.

Wpływ wprowadzenia zajęć z przedsiębiorczości do programów nauczania na kierunkach pozabiznesowych na uczelniach wyższych – badanie studentów kierunków naukowych w Institut d’Enseignement Supérieur (INES) de Ruhengeri w Rwandzie

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Artykuł oparty jest na studium przypadku i zawiera ocenę wpływu włączenia zagadnień z zakresu przedsiębiorczości do programów nauczania w celu rozwoju przedsiębiorczego sposobu myślenia u studentów kierunków pozabiznesowych w Institut d’Enseignement Supérieur (INES) de Ruhengeri w Rwandzie. Porównanie wyników przed szkoleniem i po nim wskazuje, że systematyczna nauka przedsiębiorczości może skutecznie przyczynić się do ukierunkowanego rozwoju metaumiejętności oraz dostarczyć istotnej wiedzy decydom i strategom edukacyjnym, którzy chcieliby zreformować podażową część rynku pracy jako katalizator wzrostu.

Słowa kluczowe: przedsiębiorczość, nauczanie przedsiębiorczości, orientacja przedsiębiorcza.

JEL: L26, J23

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1. Introduction

Employability potential is the manifestation of the individual's ability to fit in a job position that may require discipline-specific or generic skills. In Higher Education Institutions (HEIs), employability is about supporting students to develop a range of knowledge, skills, behaviors, attributes and attitudes which will enable them to be successful not just in employment but in life. Given the changes in the market environments, disciplinary knowledge (in science subjects) is judged vital for some employers (Adelman, 2001) while general knowledge (in social sciences) is deemed sufficient for others (HEQC, 1997). In either case, the quality of education plays a big role. Graduates with relevant knowledge and skills increase the potential for obtaining a graduate job (Yorke, 2006). On the one hand, a high grade in the subject of the study program is a good measurement of student success but on the other, it is not a guarantee for securing and succeeding in the job market.

In the quest of matching university education and the graduate labor market, there is a difficulty of foreseeing how technology and the markets will evolve. It is also questionable whether it is possible a priori to go into the details of: job duties, content and responsibilities, the changes that jobs will undergo in the future and the number of people who will be necessary to fill them (Corominas et al., 2010). This dichotomy demonstrates difficulties associated with satisfying the job market. It is also an indicator of how employability is complex and involves a number of areas that interlink (Mantz, 2006; Cole and Tibby, 2013).

In the above environment, exposure to entrepreneurship education and training delivers orientations to the cognitive features and skills necessary for initiating and managing entrepreneurial ventures (Rae, 2005). This fits within the progressive introduction of a way of increasing graduates employability so that graduates can better adapt to the constant transformation of professional environments and also raise the levels of worker qualification and expertise called for by the labor market (Corominas et al., 2010). EL is also seen as an extremely complex dynamic phenomenon (Warren, 2004). Moustaghfir and Širca (2010) concur with Bailey (1986) and Johannisson, Landstrom and Rosenberg (1998), who assert that EL is regarded as an experiential process in which entrepreneurs develop knowledge through four distinctive learning abilities involving experiencing, reflecting, thinking, and acting.

Considering the limits of existing educational systems to develop innovative learning strategies that help students acquire entrepreneurial skills and competencies, Moustaghfir and Širca (2010), Gibb (2002) and Rae (2009) argue that entrepreneurial learning is not accepted or adopted fully by business schools or, indeed, by higher education as a whole. This is because their values of practical and emergent learning challenge the 'bureaucratic control' culture of academe, which privileges programmed knowledge (idem). It is

within this context that this paper intervenes mainly looking at whether mixing standardized entrepreneurial learning components impact on the students' abilities to think entrepreneurially; such entrepreneurial thinking and acting abilities may top-up their subject-focused skills which may put them in a better employable condition.

Entrepreneurship education (EE) accommodates and fosters EL, and helps individual students develop a set of skills and competencies that can facilitate and support their entrepreneurial activities, thereby impacting their employability potential. Thus, putting knowledge, skills, values and attitudes together to interact in the learning process means learning from experience and, according to Revans (1983), it therefore fundamentally demands an action-learning approach (Arpiainen, 2012). Design and objectives of EE are usually a combination of the development of theoretical knowledge and practical skills for entrepreneurial thinking and acting; and the emphasis may vary according to teaching conditions (staff, curricula, didactics, etc).

Given that the Government of Rwanda faces a high number of university graduates not corresponding to its job supply capacity (MIFOTRA, 2013), entrepreneurship is considered as a means for motivating students to create own jobs which in turn can lower the high rate of youth unemployment. Entrepreneurship is therefore recommended as a crosscutting module at all levels of education in general and INES-Ruhengeri recommended it across all departments in particular.

In this paper, an action-oriented entrepreneurial learning module was developed and introduced to INES students in science majors. Many science disciplines put graduates into good employability positions due to the focus on specific skills but linking skills to market conditions is not sufficiently introduced to such graduates. We assess changes in students' entrepreneurial thinking and attitudes after such students acquired entrepreneurial knowledge/skills. No post-training behavior is assessed.

1.1. Employment Market Condition and Youth Employment in Rwanda

In Rwanda, the National Employment Program (NEP, 2014) reports high rates of unemployment among young people who enter the labor market annually, resulting partially from the education and training system that does not provide the types of skills and work readiness required by businesses in the private sector. According to the Five Year NEP, job creation capacity of the economy is estimated at roughly 92,000 additional jobs annually (77,000 in the MSME sector, 10,000 in the public sector, and 5,000 from FDI), which leaves a deficit of close to 35,000 jobs to meet the employment needs of 125,000 new entrants into the labor market each year (MIFOTRA-NEP, 2014).

The labor market of Rwanda is one of the most growing sector showing high imbalance between the labor supply and labor demand. This is demonstrated by the rise in unemployment rate which almost tripled in four

years from 3.4% in 2012 to 13.2% in 2016. Such a situation puts pressure on the government of Rwanda to intensely invest in the education sector in order to fill the gaps in different sectors of national life. However, the employment provided by the government is less than what is expected to fill in that gap both in terms of quantity and quality; and worse to that, the higher the educational attainment of a young person, the higher his or her risk of unemployment (NISR, 2016).

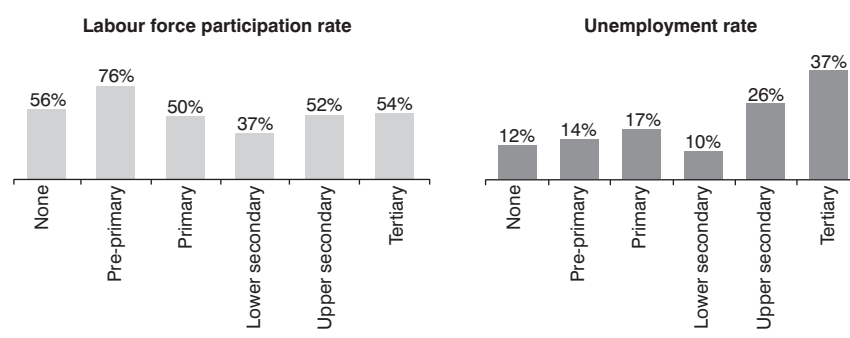


Fig. 1. Youth (16-30 years old) labor force participation rate and unemployment rate by educational attainment. Source: National Institute of Statistics of Rwanda, 2016.

According to the same source, “One could suggest a number of reasons for this unemployment phenomenon. First, persons with higher educational attainment have a higher reservation wage, preferring to wait for a suitable employment rather than accepting an inadequate or low paying job. Another reason may be the existence of a mismatch between the qualification of the young and the skills requirements of jobs in the labour market” (NISR, 2016, p. 29).

For being effective in terms of the quantity and quality of graduates, the government and stakeholders need to understand the market requirements. Out of curiosity, the author conducted an online survey of employment requirements in 2016 in 181 job offers advertised from January to July 2016 by government institutions, private companies and non-governmental organizations operating in Rwanda. The findings demonstrated different preferences by employers. The general picture shows high preferences for degree/diploma, experience, communication, ICT skills, interpersonal skills, analytical skills and logical thinking, management skills and result oriented qualities.

In different categories of job providers, the figure shows mixed preferences between disciplinary and generic associated skills. A quick observation in Figure 2 depicts the private sector leading in required entrepreneurial competences (initiative/proactive, team playing, result oriented, innovation, risk-taking) while sharing managerial and degree and disciplinary competences with the government and NGOs.

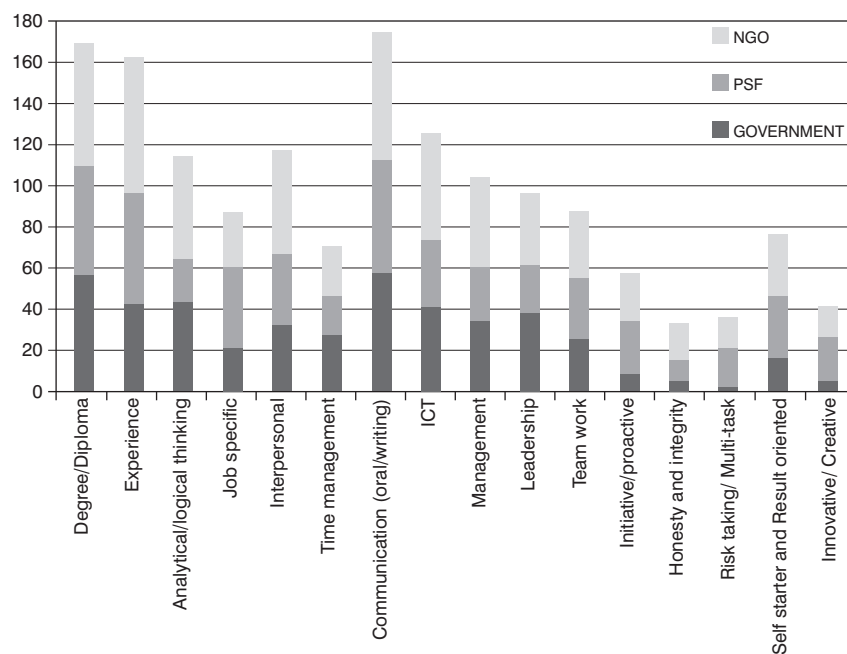


Fig. 2. Skills, attributes and traits asked from job seekers in Rwanda by the government, private sector and non-governmental organizations. Source: Nshimiyimana (2016).

1.2. The Role of Higher Learning Institutions in Tackling Youth Employment Challenges Through Entrepreneurial Education

Evidence from a range of countries shows that education clearly enhances opportunities in the labor market, as those with the best qualifications enjoy superior job prospects (UN, 2003). In a number of developing countries, however, many highly educated young people remain unemployed mainly due to inappropriate matching of university degrees with in-demand occupations and the overall lack of jobs in the formal economy. Degrees are often conferred in disciplines that are less expensive to teach (social sciences) than in costly engineering and the physical sciences, which require more sophisticated equipment and technology (UN, 2003). Another reason is that the most new job growth is in the informal sectors of the economy. There remain few opportunities for young graduates to find work that corresponds to their level of educational attainment. Such environment results in overabundance of students graduating with degrees but facing insufficient number of jobs available (UN, 2003). Another factor why unemployment tends to be higher among young people than among adults relates to the existence of “job queues”. New entrants to the labor market may find

themselves waiting at the back of the line for jobs because employers often prefer experienced workers (ibid).

Under such circumstances, concerted efforts are being made to integrate entrepreneurship education within and across regions (UNCTAD, 2015). Effective entrepreneurship education is key to ensuring that young people acquire the competencies and skills they need to pursue entrepreneurship and to lay the groundwork for developing a culture of entrepreneurship (ibid.). It is in this line that the government of Rwanda introduced education reforms to increase the alignment of training to the labor market's needs (entrepreneurship is among them and is a cross-cutting course at all levels of education), recommended the establishment of Technology and Business Incubation Facilities in the Science & Technology oriented institutions of higher learning, etc. (ADF, 2013; NEP, 2014; RDB, 2013; MIFOTRA, 2013). Such new reforms appeal for changes from a traditional education model based on the transmission of knowledge in the different fields of study towards a model that advocates the development of competences and more active involvement of the learner. It is important to remember that some qualifications adapt more easily to the demands of the market and are strongly related to developing human capital skills, whereas others are less sensitive and less capable of responding to professional practice (De Wert, 1996; Mason et al., 2009).

Except the USA, which has long historical records in entrepreneurship education for non-business disciplines, the majority of entrepreneurship programs in other countries were being offered at faculties of business administration and economics even when the majority of students were from non-business programs (Levie, 1999). Less attractive were non-business students who, on the contrary, constitute a vast pool of potential entrepreneurs to be. It is argued that non-business students have several entrepreneurship-enhancing characteristics that business students do not have. Most notably they possess domain-specific knowledge that is considered important for the recognition of business opportunities (e.g. Scott, 2000). Non-business students, and especially those with an engineering background, are likely to end up at positions in innovation and new product development. Thus, as Charney and Libecap (2003) demonstrate, teaching these individuals how to behave entrepreneurially is critical to the innovativeness and growth potential of established organizations.

1.3. Entrepreneurship Education as a Targeted Cognition and Skill Development Intervention

As expressed by Katz (2014, p. 13), “entrepreneurship education efforts grew from a concentration in a single educational locale, typically a department or center in a business school, to a multifaceted operation housed in several parts of the university. This effort has been called Cross Campus Entrepreneurship Education (CCEE) and represents one of the most

distinctive and far-reaching elements in academia's efforts to teach entrepreneurship". CCEE builds on three imperatives: Entrepreneurial Occupation imperative (thinking, reflecting students' need for training relevant to the occupations they plan to pursue after graduation); Entrepreneurial Employment imperative (contribution of new businesses – and especially the high-growth new firms that Birch (1987) calls "Gazelles" – to the creation of new jobs and the subsequent strengthening of economies.), and The Entrepreneurial University imperative (active contribution to the economic development of the region and nation through commercialization methodologies, a distinctive element involving the commercialization of the intellectual property created at the university (Tece, 2000).

On the one hand, appropriate training is the key for entrepreneurs. On the other, many entrepreneurs have limited education and cannot take academic executive courses and full-time education. On top of that, training needs depend on the type of entrepreneurs in question. For smaller enterprises, there may be a need for a holistic approach to entrepreneurship development with "wrap around" and mentorship services – an approach which however is difficult and costly to scale up. Other possibilities include short term modules on relevant issues tailored to the needs of small entrepreneurs (CBDS, 2010). Formally, entrepreneurship teaching recognizes, in general, the importance of including within the definition two different elements: a broader concept of education for entrepreneurial attitudes and skills, which involves developing certain personal qualities and is not directly focused on the creation of new businesses; and, a more specific concept of training on how to create a business (EU, 2004; Edelman et al., 2008).

Thus, incorporating an entrepreneurship learning module in curricula is in line with the confirmation that teachers, academics, and professionals have moved away from the belief that entrepreneurs and managers are born, not made (Kuratko, 2005); entrepreneurship can be taught and education can enhance entrepreneurial skills, competencies and attitudes (Drucker, 1985; Niyonkuru, 2005; Brijlal, 2008). Considering the unanimity regarding the principles and values of entrepreneurship education as a means to enhance graduates employability, approaches to execute it vary in many ways. According to Kirby, variation is based on the fact that entrepreneurship can be taught about (cognitive aspect), in or for (skills and attitude/behavior). Therefore, the curriculum design, teaching methodologies and didactics matter in this respect.

1.4. Entrepreneurship Education and Entrepreneurial Orientation (EO)

In its broader sense, entrepreneurship education refers to preparing not only "an entrepreneurial person" who may become self-employed/owner of an enterprise, but also is able to pursue entrepreneurship and innovation as an employee and/or exhibits "enterprising behavior" (Gibb, 2002; Vesper and Gartner, 1997; Leitch and Harrison, 1999; Peterman and Kennedy,

2003). EE enhances EL that, in turn, influences the development of some mental and execution skills of the people. Studies into the classic and modern entrepreneurial determinants of success rotate around the willingness to take risk (Cantillon, 1931), perseverance (Say, 1845), leadership and administrative skills (Marshall, 1961), decisiveness, analytical skills (Menger, 1950), ability to deal with uncertainty (Knight, 1921), initiative, creativeness (Schumpeter, 1934, 1942), leadership, and alertness (Kirzner, 1979, 1981).

Close to this concept of EL is the entrepreneurial orientation (EO) concept which refers to processes, practices, and decision-making activities that lead to new entry, and “involves the intentions and actions of key players functioning in a dynamic generative process aimed at new-venture creation” (Lumpkin and Dess, 1996; Wei-Loon, 2013). EO determinants are almost similar to those of an entrepreneur and can be very useful when measuring the effect of EE on students. EO comprises five dimensions including autonomy (ability and will to be self-directed in the pursuit of opportunities), innovativeness (tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes), risk taking (incurring heavy debt or making large resource commitments, in the interest of obtaining high returns by seizing opportunities in the marketplace), proactiveness (taking initiative by anticipating and pursuing new opportunities and by participating in emerging markets) and competitive aggressiveness (propensity to directly and intensely challenge competitors to achieve entry or improve position, that is, to outperform industry rivals in the marketplace) (Lumpkin and Dess, 1996).

1.5. Entrepreneurship Education and Enhanced Employability

Mantz (2006) argues that employability derives from the ways in which the student learns from his or her experiences and therefore it is inappropriate to assume that students are highly employable on the basis of curricular provision alone. However, the curricular process may facilitate the development of prerequisites appropriate to employment, but does not guarantee it (*idem*). In support of Hapidah and Mohd Sahandri (2011), Rahmat et al. (2012) emphasize that learning entrepreneurially means matching entrepreneurial education and employability to reflect the development and transfer of academic, connectivity skills, personality management, and exploration skills that every graduate should have for his/her security in the market. Graduates must exhibit soft skills expressed in the ability to work in groups, communicate in writing and speech, and life-long learning skills (*idem*). Entrepreneurial skills constitute an added value to future success as they are associated with attributes that enable graduates to have the strength and consistency in building their own careers and be able to be innovative employers who can build wealth and create jobs (Kadderi, 2010).

Lichtenstein and Lyons (2001) cited by Cooney (2012) argue that it is important for service providers to recognize that entrepreneurs come to entrepreneurship with different levels of skills and therefore each entrepreneur requires a different “game plan” for developing his or her skills.

By combining EE and EO, entrepreneurship programs and courses must provide the context and content to help students learn and apply skills and behaviors intended to create value in entrepreneurial firms. Creativity skills enable students to discover new ideas and opportunities that contribute to innovation (Gundry et al., 2014).

In the dynamic learning environment, Honig (2004) on the one hand, points out that a business plan is meant to be the first step toward a specific process widely known as entrepreneurship, but unlike the activity of entrepreneurship, it focuses primarily on ideas as opposed to actions. Furthermore, linear planning of a start-up process may not be conducive to dynamic environments (key factor to EO), which require entrepreneurs to face uncertainty and to continuously adapt to a changing environment (Honig, 2004). On the other hand, in Meyer’s (2011) article “The Reinvention of Academic Entrepreneurship”, he argues that educational environments and methods should emphasize “the development of tacit knowledge and the ability to adapt and modify a plan, rather than to preconceive and detail one”, which may be accomplished within an educational context through action, experiential, and simulation environments (Honig, 2004).

Models of EE can be deductive (also known as prescribed-process model) where the focus is more on the technical aspects of the start-up process, and management and operations of new ventures (Katz, 2003; Meyer, 2011); or inductive (also known as method-based lens) where students are trained in a series of techniques and encouraged to apply them in an environment of doing and creating which, according to Neckand (2011) cited by Christophe (2014), allows the students to learn from their experiences in an iterative, experimental, and applied fashion.

2. Entrepreneurship Education at INES-Ruhengeri

2.1. Brief Overview

Since its inception in the academic year of 2012–2013, the module of entrepreneurship cuts across all departments in the Faculty of Economics, Social Sciences and Management. Around 1579 students benefited in the same year. The focus has always been on creation of a business plan which still remains the dominant method in entrepreneurship, followed by class discussions and case studies. During curricula revision in 2013–2014, the decision of the academic senate recommended all students at INES-Ruhengeri to study this module. The purpose was to give the growing number of undergraduate students in applied fundamental sciences (63% of 3379 in

academic year 2015–2016) the opportunity to acquire entrepreneurial skills that help them link their disciplinary knowledge with the market (<http://ines.ac.rw/ines-facts-figures/>). As the module was new to non-business major students, theoretical approaches focusing on business planning and class discussions and case studies alone were not sufficient. Other approaches were needed for developing their entrepreneurial thinking and learning including but not limited to action-learning which is similar to approaches science students are used to. Entrepreneurial education emphasizes imagination, creativity, and risk taking in business whereas traditional business schools tend to overemphasize quantitative and corporate techniques at the expense of more creative skills (Porter, 1994).

As developing graduates' entrepreneurial learning requires developing personality skills, entrepreneurship training approaches should concentrate on activities that develop students' dimensions of autonomy, pro-activeness, risk taking, innovativeness and competitive aggressiveness. Given that science major students spend much time on disciplinary skills with less exposure to market environment, which may give little room for manifestation of entrepreneurial attitudes, we explore how the proposed entrepreneurial learning module affects students' entrepreneurial mindset in the above dimensions.

2.2. Entrepreneurship Module Design and Content in INES

An action-learning entrepreneurship training package (see Annex 1) was developed and administered to science major students, covering and combining the concepts of:

- entrepreneurship and intrapreneurship: An introductory lecture series for understanding entrepreneurial dynamism in self-employment or employment by others;
- business idea and business model generation: a critical and experiential approach for understanding product and market complexities, applying creative thinking to find the right value to customers;
- rapid market appraisal: exploratory and experiential approach applying an iterative and interactive research methodology to better understand complex market systems in a short time, follow the commodity chain, have a closer look at the links of the chain (stakeholders) and the interlinks (market mechanisms).

3. Methodology

This case study is qualitative and descriptive in nature and applied to science major students at INES-Ruhengeri. They were purposively targeted on condition that they had not attended any other entrepreneurship training before. Sixty eight students comprising twenty two in departments of civil engineering, twenty in land surveying and twenty six in biotechnologies

were subject to a standardized questionnaire administered before and after training to assess their Personal Entrepreneurship Characteristics (PECs) progress. The five dimensions of EO (risk-taking, proactiveness, autonomy, innovativeness and competitive aggressiveness) were used as measurement. The dimensions comprise twenty four indicators (listed under each dimension) adapted from Lumpkin and Dess (1996). Before filling the questionnaire in the presence of the author, students were briefly introduced to the concept of entrepreneurship and determinants of successful entrepreneurs as these seemed new to them. After that, they were asked to appreciate their current personal entrepreneurship characteristics (PECs). After training, the same exercise was done to assess if any progress regarding entrepreneurial thinking was made. They were requested to be as honest as possible because this was a self-assessment and not a judgment of their results; realistically identify and assess areas where they felt strong and where they needed help. A seven-point Likert scale measurement was applied: 1 = Strongly disagree, 2 = Disagree, 3 = Disagree a bit, 4 = Neutral, 5 = Agree a bit, 6 = Agree, 7 = Strongly agree. The data collected was analyzed using Statistical Package for the Social Sciences (SPSS).

The study was conducted in an institutional setting that has no sound records and culture of entrepreneurial learning. It was applied to a section of students whose major concern after graduation includes unemployment threats. Though immediate assessment of the learners' progress gives good results, another step is needed to evaluate the behavioral aspect after training. Therefore, complementary research could look at what can happen if the same module is applied to students with job security after graduation or to those with some background and experience in business skills.

4. Findings

The respondents' age concentration is between 22 and 28 years old. The majority of respondents live in rural areas, are members of associations but mostly not business oriented.

Age category	Gender		Membership of group/ association	Habitat		
	Female	Male		Rural	Urban	Total
22–28	17	41	Business oriented	8	7	15
29–35	3	5	Not business oriented	27	18	45
36 and above	1	1	No group/association	3	5	8
Total	21	47		38	30	68

Tab. 1. Demographic description of respondents. Source: Compiled by Nshimiyimana, 2017.

The belongingness to groups or associations is a sign of external entrepreneurial influence on the respondents. This influence can be exercised through relatives, colleagues or neighbors and can affect their learning motivations.

According to the following Table 2, the results reveal that four dimensions (risk-taking, innovativeness, proactiveness and competitive aggressiveness) registered statistically significant mean differences before and after training, whilst the results for autonomy were not significant.

Dimension	Mean Standard Deviation (SD)	Before (n = 68)	After (n = 68)	t-value	p
Risk taking	Mean SD	5.4 0.88	5.8 0.79	-2.70	.004*
Autonomy	Mean SD	4.0 1.15	4.2 1.21	-.92	.179
Innovativeness	Mean SD	5.0 0.85	5.6 0.66	-4.75	.000*
Proactiveness	Mean SD	5.3 0.83	5.6 0.74	-2.11	.018*
Competitive aggression	Mean SD	5.4 0.84	5.8 0.65	-3.17	.001*

*significant if less than .05 level

Tab. 2. Mean difference in the dimensions of entrepreneurial orientation in the students attending the EE curriculum. Source: Compiled by Nshimiyimana, 2017.

From the above results, risk-taking was analyzed through commitment to exploration of new areas, choice between a profitable opportunity with risky alternatives and a safe opportunity with less profit, doing things in a way different from traditionally accepted, and confidence in own ability to succeed. All indicators registered a positive shift compared to the assessment before training; thereby observing statistical significance in the mean difference after training. Initially students were neutral about choosing risky alternatives with high profitability against safe opportunities with less profitability. After explaining the meaning and different perspectives of risks and risk mitigation strategies, students overcame the fear of venturing into unusual business with high risk but associated with high profit. Risk perspectives included the perspective of uncertainty in risk-taking – uncertainty of knowledge differences between purchasing and selling prices (Kyrö, 2008), a perspective of propensities and control premises – what a person can control and actions that he cannot control (Kyrö, 2008; Lumpkin and Dess, 1996), and the perspective of action oriented insecurity in risk-taking – human action and interaction (Cunning, 1996; Kyrö, 2008). According to Arpiainen (2012), through the action-learning approach, students experi-

ence insecurity and risk-taking during which their conceptions change and develop.

Self-assessment of proactiveness demonstrated statistical significance in the mean difference before and after training. Proactiveness was assessed through five indicators including search for establishing new relationships, commitment to develop healthy and mature relationships, taking the lead in the market or imitating, talking about business topics with peers, taking initiative and pursuing new opportunities, and high level commitment to achieving own goal. External influences such as family/peers/business background and group belongingness are influential factors. Also the training on rapid market appraisal (RMA) – one of the training topics that encourage proactiveness – contributed to students' proactive behavior. Market Map and Market Path which are RMA tools that require high level of interaction were very useful for short-time data collection. With exercises, participants were able to draw a map of their area and indicated what resources were available. The visualization was attractive for other debaters; information was immediately visible and could be challenged. Market Path follows a product from the supplier/farm gate to the client. It helps to get more qualified and quantified results, i.e. value added at each step or the persons involved (Joss et al., 2002)

Regarding autonomy, four indicators were considered: self-direction in the pursuit of opportunities, ability to function independently, dependence on others for task execution, and the worry to leave a secure position to venture into new fields. The findings show a completely different situation where the statistical difference in the means was not significant. Many factors might be behind this. For example, students at campus are still operating in the university safe and comfort zone, they depend on parents or supporting organizations (for school fees, accommodation, etc.) and their ideas concentrate mainly on study programs.

For innovation, results demonstrate a highly significant statistical difference in the means before and after training. Five indicators were assessed including attraction by creativity and opportunism, interest in the value of achievement over money, tendency to engage in and support new ideas, time spent thinking about novelty, interest in experimentation and creative processes. Pre-training assessment registered positive self-appreciation in all indicators.

With regard to competitive aggressiveness, the four indicators assessed include commitment to seeking new opportunities, resilience until the idea becomes a reality, conviction that success comes with hard work and action, and continued trials no matter the number of failures in the process. There is statistical significance in average differences before and after training. Given these findings, competitive aggressiveness has to do with two approaches which, according to Yorke (2006), do try to make connections between employability and theories of learning: (1) Bennett and colleagues' (2000)

model linking disciplinary content, disciplinary skills, workplace experience, workplace awareness, generic skills, and (2) Knight and Yorke's (2002, 2004) USEM model which interrelates understanding, skills, efficacy beliefs, personal skills and qualities, and metacognition.

5. Discussion

Considering the threat of unemployment awaiting young graduates, learning entrepreneurially increases the chance of fitting in a job position and career prospects. On the other hand, EE enhances EL which in turn influences the employability potential. Factors affecting success of each concept range from personal to environmental background and the interest of the learner cannot be left behind. Given such circumstances, raising awareness and developing entrepreneurial traits that highly impact the attitudes and decision-making of the learner for meeting market preferences is key for every university. Bliemel (2014) and Jones and Matlay (2011) argue that the design of EE programs is highly context dependent, and its impact is also highly contingent on several factors, including when EE is taught, by whom and how.

The increasing rate of youth unemployment in Rwanda coupled with the need to link disciplinary skills with the market for the increasing number of science major students at INES-Ruhengeri requires changes in learning approaches from classical (research and publication) to modern transformative and market-driven approaches that involve experiencing, reflecting, thinking and acting.

The action-oriented entrepreneurial module covered by science major students registered positive progress in four out of five dimensions assessed for their entrepreneurial thinking and attitudes. Self-appreciation with regard to autonomy demonstrated statistical insignificance. Findings regarding autonomy show that, despite good progress in other dimensions, students hesitate to venture into self-employment. In Bliemel's (2014) article: "Getting Entrepreneurship Education out of the Classroom and Into Students' Heads", a case study of EE at the University of New South Wales (UNSW), Xavier et al. (2013) found that a small fraction of students is disposed to step into self-employment, and the vast majority has not yet made the decision.

This study leaves the room for doubt about the results if the same training module is delivered to students with some background in business or management. Since the sampled population covered students in the final or pre-final year who expect to join the job market soon, their level of motivation – which builds on the threat of being unemployed as it is in this case study – can have an influence on the learning process and its outcome. Therefore, what can happen if such a threat is not there or if any other incentive is introduced before the learning process begins?

Similarly, the exposure to market-driven learning processes whereby students are motivated to start small businesses as they complete their studies can have an influence on the way they understand and interact with the employment market. Referenced in Katz et al. (2014), Kevin Hindle (2007) demonstrates that a key challenge in teaching entrepreneurship at universities is determining where entrepreneurship fits. That requires thinking about and reflecting students' need for training relevant to the occupations they plan to pursue after graduation. Many occupations are composed primarily of self-employed people, and other occupations can have large numbers of self-employed people, thereby concluding that entrepreneurship education will need to be taught in many places in a university. Doing so can broaden the scope of the student's exit profile.

Specific to the content and the design of the covered entrepreneurship module at INES, it can be adapted and replicated to different disciplines, both business and non-business. However, the training ecosystem at the training institution should be conducive enough to attract students' interest. A strong awareness campaign or career guidance also requires maximum attention and involvement of internal and external stakeholders. Trainers should mind the number of attendants as it requires personalized coaching and sound competences. The smaller the number, the better the coaching and mentoring especially when experiments are planned and when the institution faces a shortage of infrastructure or human resources. The learning process for science students can be time consuming if students need access to laboratories and parallel coaching: first, in the development of ideas falling within their respective study disciplines and, second, in business skills. Thus, when adopting this module, other issues that have to be addressed by decision makers are whether:

- educators and instructors in EE have prior entrepreneurial expertise;
- the module will be taught in sequences (for example different components to different academic levels) or as a one-time session;
- the time allocated to the module is sufficient enough to transfer skills and monitor their effect on students' thinking, attitudes and actions.

6. Conclusion

Current trends in entrepreneurial learning at different training institutions focus on producing competitive and employable graduates. This requires a variation and/or a mix of different EE approaches that tackle both disciplinary and generic skills that learners use when they are dealing with dynamic markets. The long serving business plan approach has been accused of being too process-and management-oriented and new action-learning approaches which instill creative thinking are being tried. Results are mixed depending on various factors (what to be taught, how and by whom).

Research findings of this study have contributed to the exploration of the influence EE can exercise on students' EO in the case of INES-Ruhengeri. Students fear to be autonomous (partially explained by a lack of exposure to market) but are eager to innovate and compete (partially explained by clear understanding of market drivers, during the training, and linking them to their skills).

The experiment of the module at three distinct departments provided good signs of progress in students' creative thinking, personality assessment and development and, finally, entrepreneurial learning. It connects various concerns of disciplinary and generic skills, and any academic institution can use it and adapt it according to its teaching ecosystem. The module can be split into different components that can be taught to students as they advance at different academic levels. This option can spare them enough time to experiment with their business ideas through laboratory use, field visits to industries, entrepreneurship events, etc. These factors enhance students' entrepreneurial action and behavior in the end. An appropriate delivery of this module can lead to multiple exit profiles.

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Annex 1: Training plan

Topic/Module: Entrepreneurship Education versus Entrepreneurial Orientation

Day	Time	Subject	Content	Objectives	Methodology	Implementation Approach/Plan	Observation/Principles	
Day 1	8.30–10.30	Introduction to Entrepreneurship	Entrepreneurship Characteristics	<ul style="list-style-type: none"> To check up and raise awareness of personal entrepreneurship characteristics (PECs) 	Lecture + Interactive + Individual assignment	<ul style="list-style-type: none"> PPT (45 min) Q&A (15 min) Individual questionnaire for PECs (45 min) 	For PECs, request respondents <ul style="list-style-type: none"> to be as honest as possible because of no judgment of their results to realistically identify and assess areas where they feel strong and areas where they need help 	
	Morning break							
	11.00–12.00	Introduction to Intrapreneurship	Personality types + Skills for work	<ul style="list-style-type: none"> To know the qualities of a good employee To link Entrepreneurship and Employment 	Interactive + Lecture	<ul style="list-style-type: none"> Q&A (30 min) PPT presentation (60 min) 	Participants reflect on employees' qualities/skills needed in (for ex.): <ul style="list-style-type: none"> manufacturing service 	
12.00–13.00	Business Idea Generation (BIG)	Techniques for assessing and selecting best business ideas	<ul style="list-style-type: none"> To peruse information for the most viable business idea To explain the BIG template 	Introduce a BIG template + Group exercise in class	Brainstorming (30 min) + Mind mapping (30 min)	Form two groups (one in service, another in manufacturing sectors) <ul style="list-style-type: none"> Each group answers questions in the template Each group keeps up to 4 ideas for each question in the template Imagine connections between various pieces of ideas (use different colors for key pieces of an idea) Keep only two ideas for each key piece for connection 		

continued Tab.

Day	Time	Subject	Content	Objectives	Methodology	Implementation Approach/Plan	Observation/Principles
Lunch break							
	14.00–16.30	Business Idea Generation (BIG)	Develop own business idea	Identify and assess the best business idea	Individual exercise	Fill in the template + Coaching	
Day 2	8.30–10.30	Business Idea Generation (BIG)	Recapitulation + Pitching individual ideas	Group formation Selecting ideas with close similarity	Q & A + Individual pitching	5 min each business idea	After pitching, form groups of 5 persons, each group selects a business idea to develop till the end of the training.
Morning break							
	11.00–13.00	Business Model Development and Evaluation	Business Model Canvas (definition, factors and evaluation)	To explain the tool and process for developing a winning Business Model	Presentation + Q & A		
Lunch break							
	14.00–16.30	Business Model Canvas (by Osterwalder)	Customer segmentation: • Describing customer profile	<ul style="list-style-type: none"> To stimulate attention to details and logical thinking in market environment To describe the needs, requirements of the potential customer 	Lecture + Interactive	Personas (PPT = 30 min) Group exercise + Coaching (120 min)	<ul style="list-style-type: none"> One idea per poster Posters have different colors Participants can draw or paint the picture reflecting the profile of the potential customer

Day 3	8.30–10.30	Business Model Canvas	Value proposition • Product/ service description	<ul style="list-style-type: none"> To stimulate learners' imagination and creative thinking To identify the competitive advantage 	Lecture + Interactive	Product clinic (PPT = 30 min) Group exercise + Coaching (120 min)	Participants describe the product characteristics or benefits the customer gets from consuming the product
	Morning break						
	11.00–13.00		Value proposition • Product/ service description	<ul style="list-style-type: none"> To stimulate learners' imagination and creative thinking To identify the competitive advantage 	Interactive	Group exercise + Coaching (90 min)	Participants describe the product characteristics or benefits the customer gets from consuming the product
	Lunch break						
	14.00–16.30		Identification of • Channels • Customer relationships	To describe the rationale of how an organization creates, delivers, and captures value for customers	Lecture + Interactive	What is CR (PPT = 30 min) + Group exercise + Coaching (90 min)	Semi-structured brainstorming to limit participants to 3 major ideas

continued Tab.

Day	Time	Subject	Content	Objectives	Methodology	Implementation Approach/Plan	Observation/Principles	
Day 4	8.30–10.30	Business Model Canvas	Identification and description of <ul style="list-style-type: none"> • Revenue streams • Key resources 	<ul style="list-style-type: none"> • To identify sources of income from successfully delivered value propositions • To identify (non) disposable assets for effective delivery 	Lecture + Interactive	What is a revenue stream or resource? (PPT = 30 min) + Group exercise + Coaching (90 min)	<ul style="list-style-type: none"> • Prioritize streams that generate high revenues and are easy to reach • Prioritize efficiency in the use of assets • Participants use posters, one stream/resource per poster (use different colors) 	
	Morning break							
	11.00–13.00		Identification and description of key <ul style="list-style-type: none"> • activities • partnerships • Cost structure 	<ul style="list-style-type: none"> • To identify what will be done during operations, who does what (internal or external stakeholders) and how much on what 	Interactive Iterative	Define terms: partnership & cost. (PPT & discussion = 30 min) + Group exercise + Coaching (90 min)	<ul style="list-style-type: none"> • Participants enumerate key activities and link them with the responsible stakeholder/partner (internal or external) • One idea per poster 	
	Lunch break							
14.00–16.30			Presentation of business models by participating groups		Interactive	Visualization + presentation + Q&A	Groups hang up posters according to blocks and discuss with the rest	

Day 5	8.30–10.30	Rapid Market Appraisal (RMA)	Rapid market appraisal • Principles and approaches • RMA Tool kits	• To show and involve participants in how to quickly grasp product and market information	Iterative and interactive	Lecture session + Q&A	• Identify market outlets for surplus produce • Orient production to market demand (quantity, quality, processing...) • Facilitate a change in thinking from “production minded” to “market minded”
	Morning break						
	11.00–13.00		Consumer–producer assessment (Tool: Interview guide)	• To develop behavioral attitudes (self-confidence, self-efficacy, proactiveness)	Case study Exploratory	• Explain the template for interview • Role playing	• Participants will act on “Potato value chain” as a case study • One group act as researchers and others as producers/sellers
	Lunch break						
	14.00–16.30		• Design own interview guide	• To appraise a grid of questions and aspects to be covered		• Participatory + Coaching	Groups are advised to think of one substitute to the product chosen in the Business Model
Day 6	8.30–12.00	Rapid Market Appraisal (RMA)	• Administer the interview- guide	To practice primary data collection	Field research	• Participants visit the nearest town or market place	Various recording instruments can be used provided they are accepted by respondents and respect their privacy
	Lunch break						
	14.00–16.30	RMA	• Tool 2: Market mapping	Stimulate visual illustration of the market (supplier-producer-client)	Direct participation	Participants draw the market (map of their area)	The markets (sites, distance, products...) and not the resources are usually the centre of interest

continued Tab.

Day	Time	Subject	Content	Objectives	Methodology	Implementation Approach/Plan	Observation/Principles
Day 7	8.30–10.30	RMA	• Tool 3: Market path	To show how to follow a product from the supplier gate to the client	Participatory + Reflective	Quantification and qualification of the added value along the chain of product	Where appropriate researchers show the changes (+/-)
	Morning break						
	11.00–13.00	RMA	Marketing + Sales	To capture the role of a marketing & sales officer	Role playing + Reflective	3 sellers try to attract buyers among the rest of the group (30 min)	<ul style="list-style-type: none"> • A set of training materials + small items will be purchased • Three participants will act as sellers • Training room materials will be used for setting the stages
	14.00–15.30		Marketing and Sales	Figure out complexities between having a product and selling it (Front-officer vs. customer behavior)	Interactive + Reflective	<ul style="list-style-type: none"> • Q&A • Critiques and observations 	• Participants discuss what went right or wrong
15.30–16.30	Checking progress in PECs	Assessing PECs	Assess the progress in PECs awareness and abilities	Individual assignment	Filling the questionnaire	• For PECs, request honesty and realism in assessing areas where they feel strong and where they need help.	

Annex 2:

QUESTIONNAIRE: MEASURING STUDENTS' PROGRESS IN ENTREPRENEURIAL ORIENTATION

Students, no matter what subject studied, will find themselves in a working environment that demands both personal and functional competences. Tasks can be very or less demanding, individualized or team oriented. *The "Things I like to do" predicts whether an individual prefers to be self-reliant or under guidance*, whether in certain circumstances the individual has or has not the ability to adapt, change and lead and how fast, etc.

Instructions

1. This questionnaire is intended for students in the Departments of
2. The purpose of this questionnaire is to assess individual personal entrepreneurship potential and how it can effectively develop to produce a student with enterprising behavior (creative, proactive, risk-taker) needed in the market.
3. Individuals are requested to be honest as possible because there is no judgment of their results.
4. The individuals are requested to realistically identify and assess areas where they feel strong and where they need help. Once finished areas of weakness can be developed over time with proper training, education, skill development, practice and experience – and then have a great foundation for entrepreneurship.
5. Respondents express self-appreciation for the following dimensions. Indicators are measured through the Likert scale (1 = Strongly disagree, 2 = Disagree 3 = Disagree a bit, 4 = Neutral, 5 = Agree a bit, 6 = Agree, 7 = Strongly agree).
6. It takes 10 minutes to the maximum.
7. The answers are treated with maximum confidentiality and results are used for training purposes.

Part 1: Demographic information

1. Age:
2. Gender: Female Male
3. Habitat: Rural Urban
4. Membership of groups/association: Business oriented...Not business oriented....No group...

5. Individual's external entrepreneurial influence

- Relatives who are entrepreneurs
- Colleagues who are entrepreneurs
- Neighbors who are entrepreneurs

Part 2: Personal Entrepreneurship Potential

Notice 1: Before training: As a person who has not attended any entrepreneurship training, how do you appreciate your potential in entrepreneurship?

Notice 2: After training: How do you judge your potential in entrepreneurship after you have attended the last entrepreneurship training?

Dimension	Perception	1	2	3	4	5	6	7
1. Risk-taking	1. I am highly committed to exploration of new areas or visiting new sites							
	2. I highly value choosing a profitable opportunity with risky alternatives than a safe opportunity with less profit							
	3. I prefer doing things in a way that is sharply different from a traditionally or generally accepted standard							
	4. I have confidence in my ability to succeed despite challenges							
2. Proactiveness	5. I always look for establishing new relationships							
	6. I am highly committed to developing healthy and mature relationships							
	7. I try my level best to be first in the market or first to imitate							
	8. I very often talk about business topics with my peers							
	9. I am committed to taking initiative and pursuing new opportunities							
	10. I have a high level of personal commitment to achieving my goal							
3. Autonomy	11. I am very self-directed in the pursuit of opportunities							
	12. I am able and prefer to function independently							
	13. I rarely depend on others' approval for the execution of assignment							
	14. I am not worried to leave secure positions in order to promote novel ideas or venture into new fields							

Dimension	Perception	1	2	3	4	5	6	7
4. Innovation	15. I am always attracted by creativity and opportunism							
	16. I am always interested more in the value of achievement than money							
	17. I often have the tendency to engage in and support new ideas							
	18. I spend most of my time thinking about novelty							
	19. I often show high interest in experimentation and creative processes							
5. Competitive aggressiveness	20. I am always committed to seeking new opportunities							
	21. I rarely give up until my idea becomes a reality							
	22. I am convinced that success comes with hard work and action							
	23. I keep trying and trying no matter the number of failures in the process							
	24. I am happy and comfortable in a leading position							