Innovation, Technology, and Knowledge Management

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# Education Tools for Entrepreneurship

## Creating an Action-Learning Environment through Educational Learning Tools

Springer

# Innovation, Technology, and Knowledge Management

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# Foreword



Entrepreneurship in all of its aspects, connotations and applications has undoubtedly become a major force for new and sustainable wealth creation not only in emerging but also in developed economies.

The challenge consists in how to inspire or work beyond the mental limits in the classroom, to determine which learning platforms are required or useful to unlock and stimulate creativity and to eliminate the human aversion to failure.

Can educators teach entrepreneurship?

Can universities teach that failure may be a necessary part of this process?

Is the education or the conditions created in the surrounding environment the key factor?

Is there an entrepreneurial education tool or methodology that could help students to develop an entrepreneurial attitude or mind-set?

This book confirms that education is a positive response to all of these questions.

This force is indeed opening new possibilities for individuals which transcend all generations and lifestyles, new ways to foster development across industries as well as new innovation and entrepreneurial ecologies that help to develop robust socio-economical communities, such as those in Boston, Massachusetts; the Silicon Valley in California; Monterrey, Mexico; the Basque Country in Spain; and obviously many additional examples.

In this context, this book is a joint effort by a group of professors and academic institutions from both sides of the Atlantic Ocean, Mexico, Spain and Portugal, which introduce this entrepreneurial mind-set into both the traditional face-to-face classroom and the emerging "virtual" classroom: as expected, the aim is to implement "new intellectual wealth" and new enriched and enhanced methodologies and tools to the learning dynamics which students undertake in their academic careers.

In my capacity as an entrepreneur for more than 30 years and also as chairman of the Board of Trustees of CETYS University in Mexico (one of the participating universities in this book), I see tremendous potential and I especially celebrate this entrepreneurial approach to education as a crucial factor in developing agents of

change, new wealth creation, robust socio-economic development and ultimately, societal prosperity and peace.

The potential outcome is vitally important when seeking the methodology which will liberate the creative and practical aspects of development. Are the tools and methods the same in all cultures?

It is an intellectual delight to observe the entrepreneurship dynamics in our teaching-learning process and the high-level involvement of professors, students and mentors-coaches from many areas of human activity (NGOs, businesses, civil associations) in order to provide new relevant, rigorous and robust entrepreneurship-based learning.

This book on "Education Tools for Entrepreneurship" is a tribute to the professors and academic institutions which envision entrepreneurship and innovation as a new driving force for global education and development.

CETYS University System
Mexicali, Mexico

Juan Ignacio Guajardo

# Contents

# Chapter 1
# Classroom Experiments: A Useful Tool for Learning about Economic and Entrepreneurial Decisions

**Javier Perote, José David Vicente-Lorente, and José Ángel Zúñiga-Vicente**

**Abstract** This article discusses the implementation and advantages of classroom experiments for teaching and learning about economic and entrepreneurial decisions. We argue that this methodology is not only appealing from the students' perspective but also is consistent with the European Higher Education Area philosophy. Particularly, classroom experiments can help to promote or reinforce different generic and specific skills (e.g. 'auto-learning', 'problem-solving', 'capacity to adapt to new situations' or 'economics and managerial decision making') and facilitate the evaluation of such skills. In this method, students play a central and proactive role throughout the whole learning process and they have the opportunity to apply theoretical concepts and train their own skills. Feedback provided by experimental outcomes help students to identify strategies that improve their own methods and rules to make better economic and entrepreneurial decisions by recognizing and correcting potential bias in their perceptions. The methodology is illustrated with a straightforward experiment designed to detect potential deviations from the rational assumption (i.e. profit maximizing behavior) when subjects face investment decisions in a context of adjustment costs and heterogeneous (physical and human) resources.



## 1.1 Introduction

During the decades of the 1960s and 1970s of the last century, as the data availability and the use of computers were growing, the knowledge about economics and business started to be thought of as being big enough so as to predict and control the economic activity. Since then many experiences have shown that individuals do not

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always behave as traditional economic models predict and that agents make strategic decisions considering their expectations about the environment and the actions of all the agents involved. This means that economic behavior is closer to the theory of games and the rational expectations paradigm than to the neoclassical theories and the optimal control. Furthermore, in many contexts predictions based on rational expectations models are not supported by the agents' behavior, revealing that predictions from the economic theory and the theory of games must be tested in the experimental and behavioral framework. In fact, laboratory experiments have a long tradition in psychology but have been scarcely used in economics and business. Nevertheless, the pioneer works by Daniel Kahneman and Vernon Smith, awarded the 2002 Nobel Memorial Prize in Economic Sciences, demonstrated that psychological analysis should be integrated in economic research and, thus, the experimental economics ought to represent an important role in the understanding of the determinants of the decisions in the economics and entrepreneurial field (see, for example, Hey 1991 or Roth 1995, for a comprehensive introduction to experimental and behavioral economics).

Nowadays, this philosophy is shared by a great number of economists and management scholars who have incorporated experiments into their research methods but, surprisingly, they still refuse to introduce it in their teaching methodologies and, thus, economic and entrepreneurial theories and models with very weak empirical support and forecasting techniques with very poor predictions are still been studied at the university. As discussed in the next section, this trend is changing in the economics and entrepreneurial field, where there are some textbooks to implement laboratory experiments in teaching (see Bergstrom and Miller 2000; Brañas 2011).

This study aims to show how classroom experiments can be used as a suitable teaching and learning method for illustrating, explaining and better understanding important economics and entrepreneurial decisions. In other terms, it aims to illustrate the great potential of classroom experiments as an appropriate teaching and learning tool as it makes it possible to translate some abstract and theoretical concepts far from the student's experience to actual entrepreneurial making-decision. To this end, a straightforward experiment is designed and tested in class on a sample of 40 graduate students enrolled in a Master's and Ph.D. programme at a Spanish university (University of Salamanca). The experiment is primarily designed to detect potential deviations from the rational assumption (i.e. profit maximizing behavior) when subjects face investment decisions in a context of adjustment costs and heterogeneous (physical and human) resources.

Interestingly, experimental methodologies fit very well with the principles of the European Higher Education Area (EHEA, hereinafter) since they permit the students to approach the economic and entrepreneurial reality in a natural and attractive way. In fact, classroom experiments let students connect most theories to real world entrepreneurial and different decision making environments. This is a basic skill to achieve in a Degree/Master's in Business Administration that involves many other specific skills such as the ability to analyze, organize and solve entrepreneurial problems, the capacity to identify firm's opportunities and threats and optimally

react to them and, in general, every skill that requires being familiar with firms' decision making. Moreover classroom experiments are directly linked to transversal skills such as autonomous learning, since students learn from their own decisions and get swift feedback from the results of their actions and the strategic reactions of the other students to them. Therefore, this methodology reinforces the basic ability of 'learning to make economic and entrepreneurial decisions' but also the discussion of the results of the experiments allows understanding the economic and managerial relations and the importance of the different assumptions (treatments) on the subject's behavior and the economic results.

Furthermore, classroom experiments are stimulating for the students, incentivize their active participation in their own learning process and make the course topics more interesting to the students as well as easier to learn. From the teacher's perspective, this methodology is more challenging and motivating and also helps in evaluating the skills according to the student's performance during the experiment by using all the information recorded at a very low cost.

The remainder of the study is structured as follows: Section 1.2 shows the antecedents of classroom experiments in the economics and entrepreneurial field and discusses its usefulness as a teaching tool to stimulate students' learning process. Section 1.3 depicts the basic elements of the classroom experiment through an experiment on investment decisions with adjustment costs. Section 1.4 ends with a discussion of results and conclusions.

## 1.2 Classroom Experiments to Study Economics and Entrepreneurial Decisions

### *1.2.1 Antecedents in the Economics and Entrepreneurial Field*

It is well-known that classroom experiments have a long tradition of use with pedagogical purposes in science disciplines, such as physics, chemistry or biology. Their use is also very popular in social science disciplines such as psychology or sociology. However, in the economics and entrepreneurial field, researchers have begun to promote this teaching instrument only recently (Becker 1997; Becker and Watts 2001; Bergstrom and Miller 2000; Brañas 2011; Isaac et al. 2001; Watts and Becker 2008). There are several motives that can explain this delay. First, for many years there were very few researchers in the economics and entrepreneurial field who had significant exposure to experimental research. In fact, this field has been traditionally considered as non-experimental (Isaac et al. 2001; Webster and Sell 2014). For example, Holt (2007) shows that publications in the economics and entrepreneurial field using this methodology were practically non-existent until the mid-1960s of the last century, surpassed 50 annually for the first time in 1982, and by 1998 there were more than 200 experimental papers published per year. Today, it is becoming a "boom industry" since there are a growing number of books and journals that are specialized in publishing research that use the experimental methodology. From this standpoint, it is more

likely that there may be a growing number of scholars who have the formal training to effectively use this methodology in their classes. Second, the methodology necessary to successfully implement experimentation has been a stumbling block in the path of more widespread classroom use. Overall, most experiments, whether run using pencil and paper or computers, tend to utilize few subjects (Isaac et al. 2001). With classes having enrolled a great number of students in economics and entrepreneurial courses at most universities around the world (and, mainly, at public universities) it is impossible in practical terms to try to involve all students in a hands-on experience. Even in classes with few students, instructors may prefer to use more traditional teaching methods (Becker and Watts 2001; Watts and Becker 2008). Finally, there is the issue of how to effectively motivate the students to actively participate in an experiment. Experimental researchers have largely abandoned the early protocol of asking subjects to simply imagine that the decisions they are taking are generating benefits for a fictitious firm (Isaac et al. 2001). There are a handful of examples of research experiments using cash as a motivating device (see, for instance, Smith and Walker 1993). Nevertheless, in most cases the use of significant cash rewards when there is a great number of students involved can be not financially feasible.

One of the pioneer economists in conducting classroom experiments was Chamberlin (1948). He designed a classroom experiment to demonstrate that markets are not efficient such as was suggested theoretically. He gave his graduate students cards with numbers on them and told some they were sellers and others buyers. The students were to mill around the room and bargain with each other with buyers trying to buy for a number below that on their card and sellers trying to sell for a number above that on their card. Vernon Smith (1962), one of their students, was the first to demonstrate that a market structure that allowed traders better information about the decisions others were making did lead to efficient market outcomes. As noted above, Smith was awarded with the 2002 Memorial Nobel Prize in Economics (shared with Kahneman) for his contribution to the best understanding of this important issue.

Over the last few years, it is common to find experimental researchers in the economics and entrepreneurial field who are especially interested in proposing straightforward decision-making exercises into their classrooms. In most of cases, such exercises are based on their own experience with research experiments that they are handling. Ultimately, one of their primary objectives is to create "hands on" experiential learning and, hence, make the arguments and concepts considered from the different economic and entrepreneurial theories more understandable, meaningful, and interesting to the students (Durham et al. 2007; Isaac et al. 2001; Maier et al. 2012).

### *1.2.2 A Useful Teaching Tool to Stimulate Students' Learning*

Unlike what happen with most classroom experiments in the science disciplines (i.e. physics, chemistry or biology), classroom experiments in the economics and entrepreneurial field tend to rely more on introspection, and as such students are not merely spectators but active participants in the investigation themselves. In this sense, it is argued that this participatory experience enhances students' interest into

economics and entrepreneurial activities and, thus, can contribute to stimulating their learning process more effectively than more conventional teaching methods (Becker and Watts 1998; Eisenkopt and Sulser 2013; Kolb 1983; Walstad and Saunders 1998). Therefore, it can be asserted that the use of the classroom experiments are in clear consonance with the EHEA philosophy that champion a *model focused on learning*. This model is precisely based in the use of active methodologies where students become the main agent of their learning process and teachers become advisers, mentors and motivators or facilitators (Bologna 1999).

The main difficulty faced on doing a classroom experiment lies in the fact that it must be very carefully designed. The experiment does not need to represent reality with great fidelity; it just has to capture the relation and the subject incentives that we pretend to study. The simpler the experiment the better. Instructions must be very clear and we have to ensure (by control questions) that all the students understand it before the experiment starts. The treatments are selected according to the variables we intend to analyze and it is extremely important that the differences between treatments only depend on one item in order not to contaminate the decisions with different characteristics. This is the key of experimental methodology, the possibility of controlling all the aspects that can influence decisions except for that on which we intend to focus. In a laboratory experiment, the experimental subjects have to be recruited so that we have a representative sample, but in a classroom experiment the subjects are just the students. This sample might be biased for research purposes (since all students share too many characteristics) but we can skip this problem for teaching purposes.

Once the experiment has been designed it is supposed to be run in a laboratory, where subjects can make their decisions on the computer without the influence of the other subjects and taking into account the information displayed in the interface.[1] Nevertheless classroom experiments are often simpler than formal laboratory experiments. They can be developed with a 'paper and pencil' methodology (i.e., students make their decisions in a simple questionnaire) but also students can record their answers in a simple Google file, which requires the use of computers or even smart phones. The information can be also displayed with a simple projector for slides and then the experiment can be adequately performed in the classroom or in a computer room. What is important is not to allow the students to interact with each other during the session. Of course, the experimenter (teacher) should organize a different session for any treatment they pretend to analyze.

Experiments in general and classroom experiments in particular must be properly incentivized, i.e., to guarantee that experimental individuals behave as they would in a real setting. For this purpose they have to be paid according to the results on their own decisions. Unlike the psychologists, the economists consider that payments are mandatory. Given the existence of major financial constraints to pay all students that might participate in a classroom experiment, we could overcome this problem by linking students' grades with their performance during the experiment (for instance,

[1] z-Tree by Fischbacher (2007) is a free software commonly used for experimental economist community.

students with the best performance can receive extra points). In principle, this should be enough to achieve the students taking the experiment seriously.

After the experiment, discussion of the results has to be performed in the classroom as it is done in the traditional case method successfully implemented in Harvard Business School. During this discussion students have to discover the purpose of the experiment (the treatment variable), the optimal behavior, the typical errors incurred, and so forth. In this way the students understand an economic problem in depth and interiorize it so they will be able to make the optimal decisions when they face related problems in their future professional careers.

## 1.3 Design/Implementation of a Classroom Experiment on Investment Decisions

### *1.3.1 Experimental Overview*

From the standpoint of neoclassical economics, it is assumed that individuals, when facing a decision problem, behave rationally, i.e., by evaluating every potential choice and selecting the one that maximizes their welfare. As a result, economic decisions (e.g., investing in physical assets or hiring employees) are solely guided by cost-profit criteria and, hence, resource attributes not affecting their rents are considered irrelevant. On the contrary, behavioral economics suggests alternative assumptions and/or models aimed to achieve a more realistic representation of human behavior and also better predictions about several phenomena that remained poorly explained by the neoclassical view. Starting from the seminal works of Simon (1955, 1979) and the later contributions of Tversky and Kahneman (1973, 1974) and Kahneman and Tversky (1979), this approach is now a consolidated line of research built on two main cornerstones: (1) that most choices are based on intuition rather than in a rational/thoughtful analysis, and (2) that intuition and perception are similar underlying processes (Kahneman 2003). This controversy between the assumptions of neoclassical and behavioral economics is clearly a privileged scenario for exploring the potential of experimental method to test the explanatory capability of these competing approaches. Accordingly, we design an experiment in order to detect and illustrate potential non-rational (non-optimal) managerial decisions due to: (1) the difference in the perception and evaluation of the nature productive assets (physical versus human) and (2) the misjudgment of the relevance and consequences of adjustment costs in investment and hiring decisions.

### *1.3.2 Experimental Design: Instructions*

Subjects are required to make decisions about investment in physical assets (number of machines) and employment (number of employees) for six consecutive periods. They are supposed to manage investment in machinery and to hire employees for a

firm that they own and their goal is to maximize profits. Subjects start with one machine and one worker in period 0 and they can freely decide the desired number of machines and workers for each period (with a minimum of 1 and a maximum of 3). Output supply depends solely upon the number of machines and employees held at each period given by the following output–input table[2] (see Table 1.1).

The output is non-durable and, hence, there is no inventory and all output units produced but not sold in the market are discarded (or sold at a negligible price). Demand, in terms of output units, is known by the subjects for all periods at the beginning of the experiment (see Table 1.2).

Additional parameters of the experiment follows: the output price per unit is $P$ and it is the same for all periods. There are costs for holding the current bundle of physical and human resources. These expenses comprise fixed costs that only depend upon the number of machines and employees held at a given period. Examples of such costs are the maintenance work and insurance of machines and the wages and insurance of workers. In addition, there are adjustment costs of both machinery and employment. Costs of "upsizing" are incurred when a new machine or employee is incorporated to the production process owing to several sunk costs imposed by setup and financing expenses of machinery and/or due to hiring and training costs of employees. Conversely, retiring a machine and/or firing workers (downsizing) also imposes additional costs in terms of equipment devaluation and/or dismissal indemnity.

Notice that, assuming that the output price, P, is large enough to compensate inputs costs, if upsizing and downsizing costs are null, the decision that maximizes profits (namely, the optimal rule of decision) is "to produce what is demanded in each period" and, hence, the optimal production plan is to set the number of workers and machines to one when demand equals one and three when demand is three as it is shown in the following table (see Table 1.3).

t1.1 **Table 1.1** Output per period

| t1.2 | | | Number of employees | | |
|---|---|---|---|---|---|
| t1.3 | | | *1* | *2* | *3* |
| t1.4 | Number of machines | ***1*** | 1 | 1.41 | 1.73 |
| t1.5 | | ***2*** | 1.41 | 2 | 2.45 |
| t1.6 | | ***3*** | 1.73 | 2.45 | 3 |

t2.1 **Table 1.2** Demand pattern over the period

| t2.2 | Period | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| t2.3 | Units demanded | 1 | 3 | 3 | 1 | 1 | 3 | 3 |

[2] The values of the table above correspond to a Cobb-Douglas type production function with constant returns to scale, namely, $Y = M^{1/2}W^{1/2}$ where $M$ is the number of machines held and $W$ is the number of employees hired at each period. This information is only relevant for understanding the properties of the production function that underlies the input-output table and, thus, it was omitted in the presentation of the experiment to the subjects.

t3.1 **Table 1.3** Optimal production plan

| t3.2 Period | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| t3.3 Units demanded | 1 | 3 | 3 | 1 | 1 | 3 | 3 |
| t3.4 Optimal production | 1 | 3 | 3 | 1 | 1 | 3 | 3 |
| t3.5 Number of machines | 1 | 3 | 3 | 1 | 1 | 3 | 3 |
| t3.6 Number of workers | 1 | 3 | 3 | 1 | 1 | 3 | 3 |

However, when upsizing and/or downsizing costs are large enough, alternative optima arise. For instance, in case of exorbitant (infinite) adjustment costs, the profit-maximizing rule is to maintain inputs consumption with no change at all during the six periods (namely, to hold one machine and one worker for the six periods). Between these extreme cases, there are a wide range of contexts associated to optimal solutions which depend upon the specific value given to the parameters of the experiment: output price, operation costs of a machine, costs of holding an employee, and adjustment costs.

One of the key aspects of experimental method to be successful as a researching or a learning tool is to achieve the highest level of simplicity and parsimony of the experimental exercise given its goals. As the experiment would require the subjects to process complex calculations and/or consider a huge number of parameters, the less obvious the interpretation of the results would be. For the sake of simplicity, the output price was equal to one, the cost of holding a machine for one period was 0.3 and it equals the cost of compensating an already hired worker (namely "operating cost"). Also the costs of adding (upsizing) and removing (downsizing) one machine or worker is also the same (i.e., "variation cost"). Every subject of the experiment had to provide responses for two versions of the same exercise. These two contexts represented alternative scenarios that differed solely in the magnitude of the adjustment costs. In the "low adjustment cost" scenario, the cost of adding or removing a machine or employee was set to 0.1 whilst this cost was 0.8 in the "high adjustment cost" scenario. Output price and "operating costs" is the same, 1 and 0.3, respectively, in both scenarios. The choice of these values for the above parameters guarantees that the profit-maximizing choice differs between the scenarios.



### *1.3.3 Identification of Optimal Decisions*

Decisions that maximize profit in the exercises of this experiment can be calculated and taken as a reference to analyze the potential misjudgments of subjects. In the experiment proposed, costs and earnings associated to the two classes of inputs are the same and the only difference lies in its nature (namely, physical versus human resources). From a purely rational standpoint, this attribute is irrelevant and, hence,

it should not pose any difference between the choices of investing in machines or hiring workers from a rational standpoint. In addition, a careful examination of the input-output table allows us to detect non-optimal choices given that the cost of both inputs units is the same. For instance, all choices that imply different number of workers and machines can be discarded as non-optimal. In particular it is clear that the choice of 1 machine (worker) and 3 workers (machines) implies lower profits than selecting 2 machines and 2 workers as they both have the same operating costs. Although less evident, it is also true that choices of any unbalanced pair of inputs (e.g., 1 worker, 2 machines) is also suboptimal since demand is defined in integer units, namely 1, 2 or 3 so if adding one unit of a given input improves profit then the acquisition of one unit of the other input will increase such profit even more, and conversely if choosing 2 machines and 2 workers leads to poorer results than selecting 1 machine and 1 worker, any unbalanced pair of inputs (i.e., 1 machine or worker and 2 machines or workers) will lead to poorer results than the minimum balanced pair (1 worker and 1 machine). We can summarize this logic in the following statement:

***Corollary 1*** *Any unbalanced pair of input quantities is suboptimal.*

The optimal rule of decision in the "low adjustment costs" scenario becomes clear after a detailed look at the values given to the parameters. Let us assume that we must decide to choose the inputs pair for period 1 given that we started with one machine and one worker as initial conditions (period 0). Satisfying the full demand for period one (namely 3 units of output) by increasing the stock of inputs up to the maximum (3 machines and 3 workers) is clearly better than any other option since the operating margin per unit of output sold is 0.4 and the total adjustment costs of supplying an additional unit is 0.2 and, hence, the gain per unit sold in this scenario is always positive. Alternatively, when demand decreases from 3 to 1 (as in period 3), it is more profitable to produce and sell one unit of output by dismissing 2 workers and removing 2 machines than any other alternative since the cost of sustaining the excess capacity (0.6) is greater than removing 2 workers and 2 machines (0.4). To sum up, the optimal rule of decision in the "low adjustment scenario" is stated as follows:

***Corollary 2*** *In the low-adjustment costs scenario, the optimal choice of machines and workers is the one that guarantees that firm supply equals demand.*

Intuitively, the identification of the optimal choice for the "high adjustment cost" scenario appears to be harder than for the "low adjustment cost". Notice that in the latter, the marginal cost of upsizing one machine and one worker (0.2) is always less than the marginal income of selling one more output unit (1.0). When demand decreases the marginal cost of adjusting one unit of output is lower than the cost of not reducing since the operating costs of a pair "machine-worker" is 0.6 and reducing it costs just 0.2. To sum up, it becomes clear that when adjustment costs are low, the optimal rule of decision is "to produce what is demanded". Conversely, when adjustment cost is 0.8, there are no gains to meet a perfect fit between demand and

supply as the cost of adding (or removing) an additional pair of machine-worker is always higher (namely, 1.6) than the operative margin of producing and selling an additional output unit (namely 0.4). However, one can find it reasonable to assume a loss due to adjusting inputs in period 1 if it will be offset by future increased sales (periods 5 and 6). It can be proved that such an offset is always unrealized and the maximum profit is reached when holding the initial input stocks (one machine and one worker) in all periods. In any case, the optimality of this rule can be easily confirmed by computing the profit of all feasible decisions rules by means of a spread sheet or basic programming. Thus, the optimal rule of decision for the "high adjustment costs" can be enunciated as follows:

***Corollary 3*** *In the high-adjustment costs scenario, it is optimal to keep the initial stock of inputs unchanged for all periods.*

### *1.3.4 Experiment Implementation: Sample and Data*

The subjects of the experiment were graduate students enrolled in the Master's Degree in Management Research and Ph.D. in Management programs at the University of Salamanca and, thus, they were knowledgeable of basic concepts and methods in the economics/business field. By selecting graduate students interested in developing their careers in management we attempt to guarantee that subjects fulfill some basic conditions in terms of the skills and abilities needed to understand and complete the experimental exercise. We performed the experiment with 40 students as subjects. The sample included a balanced sample in gender (22 men and 18 women). Most of the subjects in the sample were Spaniards (24) but there are also a meaningful number of foreign students from different geographical areas such as Latin-American (10), China (2), Iran (1), and Eastern Europe (3).

Each subject was required to solve both scenarios ("low" and "high" adjustment costs). In order to control for the effects of the order in which each scenario was shown and expectedly solved, we designed two questionnaires that only differed in the order that these scenarios were presented. As a result, we obtained 20 valid questionnaires in which the "low adjustment costs" scenario was presented in the first place and the remaining 20 valid responses corresponded to the questionnaire in the reverse order. Students were warned that their individual performance depends on the profitability of the firm scored in the experiment. This means that the closer their decisions to the optimal strategies (see Sect. 1.3.3) the higher the grade they get.[3] After analyzing and

[3] Note that the final evaluation of the experiment may be on the average profit during the entire experiment but also the learning during the experiment (the reduction of the deviations of actual and optimal decisions) can be positively rewarded. What is important is the fact that subjects can learn from the outcomes of their own decisions (auto-learning) but also that their decisions are properly incentivized (i.e., the higher the profitability, the higher the performance during the experiment).

processing data resulting from the experiment, we showed the summarized results to the subjects in order to have some feedback and complete the learning process.

### *1.3.5 Descriptive Analysis of the Experimental Results*

We found a significant number of suboptimal responses associated to the choice of unbalanced of worker-machine pairs (30 %) with a clear bias to maintain/hire more workers than machines (71 %). Among the 19 subjects that provided unbalanced pairs of inputs only five (26 %) were willing to hold more machines than employees. During the presentation of these results to the subjects we asked them about the reasons that led them to these choices. Subjects' interviews reflected a significant difference in their evaluation process when investing in physical against hiring employees, reflecting some type of emotional commitment with their stock of human resources. Moreover, this is also valid for four of the five subjects that held more machines than workers as they justified their choices by claiming that they were reluctant to hire more employees who will be fired in the future.

Regarding the second goal of the experiment (i.e., the potential misjudgment of investment and employment decisions in the presence of adjustment costs), we found a significant number non-optimal responses (37.5 %) for the "low adjustment cost" scenario. Surprisingly, more than one-third of subjects failed to find the optimal rule even when adjustment costs were negligible, and therefore, "producing what is demanded" turned out to be the best option. Even after excluding some non-optimal responses that can presumably be associated with a thoughtless answer (i.e., setting up 1 or 3 workers/machines to all periods), 20 % of the respondents adopted a "partial" fit strategy as the profit maximizing rule: for instance, increasing (removing) one worker and/or machine when demand goes from one (three) to three (one) units. This finding reveals an overall over-estimation of the adjustment costs since a better fit between production and demand would lead to a greater profit.

Non-optimal responses in the "high adjustment cost" scenario are even more frequent (32 subjects, 80 %) than in the "low adjustment cost" exercise. As it was expected, this fact corroborates the more complex calculations needed to discover the optimal rule in the presence of substantial adjustment costs. A more detailed view at the non-optimal responses in this scenario offered some interesting insight about the source of this misjudgment. Eight subjects (20 %) allocated the maximum quantity (three) of workers and machines and seven subjects (17.5 %) chose two workers/machines for all periods. Thus, these respondents acknowledged the importance of adjustment costs in their choices as they assumed as optimal "only" an initial adjustment (incurred in period 1) of increasing one or two input units. In addition, responses from subjects who allocated three machines/workers for all periods reveal a clear over estimation of opportunity costs (due to unsatisfied demand) in relation to those who chose 2 machines/workers. The remaining non-optimal responses in the "high adjustment cost"

scenario (42 %) were associated to changes in input stock in periods later than one, which clearly reflects an overall sub-estimation of adjustment costs in this experimental context.

## 1.4 Discussion and Conclusions

This study illustrates with a straightforward example how experimental methodologies and classroom experiments are an interesting tool for teaching purposes. Particularly this methodology satisfies most of the features that inspire the EHEA: autonomous learning, skills linked to the labor market and entrepreneurial activities, and continuous evaluation of knowledge and competences. All these dimensions may be reinforced by designing and running appropriate classroom experiments. Firstly, students may learn by their own experience the knowledge and skills for which the experiment was designed. Active learning is much more motivating and makes the students not forget what they learn. Secondly, the experimental method makes the students face many problems directly applied to their professional careers and forces them to make decisions, which is one of the best skills they should achieve. Thirdly, the decisions of the students provide a vast database for analyzing the evolution of the performance of the students that can be easily processed and contribute to the continuous evaluation of skills. Furthermore, classroom experiments are a very pedagogic methodology which motivates the students, incentivizes them to participate in class and can make the teaching experience very satisfactory for both the teacher and the students.

Classroom experiments are not a substitute for the traditional methodologies. On the contrary, it should be complemented with other teaching techniques such as discussion and debate of the results, which is necessary to ensure that students understood the fundamentals underlying the experimental design. Therefore, the successful application of the experimental methodology lies in the experimental design, which needs a careful preparation.

In this study, we commented how to design a classroom experiment to detect potential deviations from the rational assumptions (i.e., profit maximizing behavior) when facing investment decisions in a specific context: the existence of adjustment costs and heterogeneous (physical and human) resources. This is an important financial and entrepreneurial decision for most firms. We summarize our results in two main findings. First, when facing a managerial decision consisting on investing and hiring, individuals find it difficult to abstract themselves from apparently irrelevant information that can shape their choices. In particular, our results confirm that a substantial number of individuals with a good training in techniques of cost-profit analysis are prone to adopting decisions that seemingly favor the welfare of employees that are actually or can be potentially hired ("employee-oriented" decisions) in detriment of other physical resources. In this sense, choices associated with increasing and/or sustaining a higher workforce are seen as more "sensible" (but not more profitable) than acquiring and/or holding a larger stock of physical resources.

Second, making choices when adjustment costs are relevant requires a thorough analysis of observable and opportunity costs in order to find out the profit maximizing rule. Subjects knowledgeable of the cost-profit analysis (as the graduate students in our experiment) fail to find the optimal rule. A majority of individuals fail to maximize profit by underestimating adjustment costs when these costs are high. We also find evidence of overestimation of such costs when they are negligible (even though this failure is less frequent).

In the final stage of the learning process, participants in the experiment were confronted with the resulting evidence. This feedback helped to identify misjudgments, to analyses their ultimate causes and to find out ways and procedures that prevent suboptimal decisions. For instance, failures due to the "employee-oriented" bias can be detected by wondering if one would have made the same decisions after considering that all assets are different types of a unique homogeneous resource (e.g., different models of the same machine) instead of "workers" and "machines". If the answers change, this might be a signal that we are exposed to this bias.

Regarding the failures when evaluating adjustment costs, subjects with previous poor performance in the experiment achieved a better understanding of the role and interpretation of such costs by figuring out the optimal responses to extreme scenarios (e.g., zero versus infinite adjustment costs) as references to evaluate their choices in the conditions of the actual experiment. Also a thoughtful analysis of all types of costs of the available choices can lead to improving subjects' experimental performance. Unlike observable costs of actual decisions (operating and adjustment costs) the opportunity or "shadow" cost (e.g., cost of unsatisfied demand or excess capacity) are less "available" and then, more likely to be unnoticed or undervalued. To that extent, decision makers should avoid intuitive or spontaneous choices in favor of thoughtful and reflexive responses that would take into account all types of costs, including those that are less available.

To sum up, the use of classroom experiments as a didactic method can be particularly fruitful in achieving a better understanding or the relevance and consequences of misjudgments based on individual perceptions of a managerial problem that involves different type or assets and adjustment costs. Overall, experimental method offers remarkable advantages for training purposes since the student plays a central and proactive role throughout the whole learning. First, students have the opportunity to deal with abstract/theoretical concepts, models and phenomena that otherwise will remain as a pure intellectual constructs. Second, the feedback provided by experimental outcomes can help students to identify strategies that improve their own methods and rules to make better decisions by recognizing and correcting potential bias in their perceptions, given the characteristics of the decision problem.



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# Chapter 2
# An Experience in Teaching Innovation Based on Collaborative Learning and the Aronson Jigsaw Technique

**Eugenia Babiloni, Ester Guijarro, and Manuel Cardós**

**Abstract** Jigsaw technique is a collaborative learning technique that can be used as an alternative to conventional teaching methods. Basically this technique boosts group work cohesion since each member of the group is in charge of one part of the learning objective of the whole group. This work shows the experience of using the jigsaw technique in an undergraduate course named "Innovation and Competitiveness". The learning objective of the activity consists of highlighting the most important ideas of the "Oslo Manual" which is a reference manual in innovation concepts. The process is divided into five steps: (1) initial groups of five students are formed; (2) professor gives five parts of the "Oslo Manual" and the group decides which member will be the "expert" of each part; (3) experts of each part work together to understand and summarize main concepts; (4) experts come back to the initial group and transmit their expertise to the rest of the group; (5) professor asks for a "one minute question" regarding one concept or idea of the Manual. Results from this experience show that students feel that they are not only responsible for their own learning but also for the learning of the rest of the group. The inclusion of the "one minute question" after the process further enhances this feeling. Furthermore, it is known that sharing our knowledge with other people requires a deep understanding of the topic. As a conclusion, this experience improves not only the self-confidence of the student, but also the communicative competence and group work performance whilst students work and assess important concepts related to the course.



## 2.1 Introduction

The process of establishing the European Higher Education Area, EHEA, has meant a reorganisation of University education at each of its different levels. With this in mind, the Spanish Ministry of Education and Science released, on the 26th

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September and 21st December 2006, and the 15th February 2007 respectively, three work documents with general directions for the creation of university qualifications for Degree and Master's in accordance with the EHEA directives. To this same end, on the 29th October 2007 a Royal decree, RD 1393/2007, was passed by way of which the structure of Spanish university education was established (Degree, Master's and Ph.D.). From this point on, new Degrees are designed in accordance with the skills that a graduate will need in order to carry out his or her profession. These skills are defined in the study programme and, by way of the modules and subjects studied; skills are acquired as a result of the learning process. Once a Degree course is completed, a European Supplement is incorporated into the qualification as established by the Royal Decree RD 1044/2003, of the 1st August 2003 which details the skills acquired with a view to enabling the graduate to gain access to a Master's Degree course and later a Ph.D. course at any university in the EHEA (Spanish Ministry of Education, Culture and Sport 2003).

The entry of Spanish universities into the EHEA has meant a change in routine in the university classrooms and lecture halls. The main change revolves around considering the student as the epicenter of the teaching-learning process. This implies that the teacher must play the role of a guide in the learning process, replacing their traditional role as imparter of knowledge. Adapting to the EHEA has also led to a profound curriculum-based change in course programmes, which must adapt to the demands of the labour market, developing with this end in mind, learning opportunities based on professional skills.

As a consequence of all the above, more and more examples of active techniques are to be found in the classroom. Thus, for example, videos, case studies, debates, portfolios, learning based on solving problems or projects, etc. are increasingly used as habitual teaching tools. However, these techniques are often in reality used as a way of motivating and implicating the student in the teaching-learning process, without much thought into why each of them are used and, above all, which skills they are helping the students to acquire. With this in mind, the great difficulty of the new teaching-learning paradigm involves the choice of the most suitable methodology, especially in the case of the so-called generic or transversal competences, in which wide-ranging skills are developed which are more related to "know how" (skills) and "know how to act" (behaviour) in a particular profession than "to know" (knowledge) purely for its own sake. One valid solution in these situations is to employ collaborative learning strategies, which allow work on competences such as group work, time-management, ethical responsibility towards work, etc. considered, in most degrees as being part of the generic competences which might be expected of all graduates.

In this study, the collaborative learning technique, the Aronson Jigsaw, was used as a teaching method during the teaching of part of the syllabus of "Innovation and competitiveness", a subject which is part of the Business Administration and Management Degree at the Universitat Politècnica de València. The aim of the experience is to increase the degree of student involvement both in their own learning process and in that of their classmates, through the ethical responsibility of each student, group work and communication. This article is set out in the following way. After the introduction there is a description of collaborative learning, consisting of its main characteristics and the advantages which it provides. In the next section, the

Aronson Jigsaw technique is explained in general terms, as a way of introduction to the following section which deals with the application of the technique to the present experience. The phases and their scheduling and the method used for evaluating the experience are explained. The next section is dedicated to the results achieved by the experience. Lastly, the main conclusions drawn by the study are presented and the future direction of the study is outlined.

## 2.2 Collaborative Learning

The main characteristic of collaborative learning is that it is the students themselves, working as a team, who play the role of tutors in the learning process of their classmates, while, at the same time, being tutored themselves by the other students. In this way, a healthy interdependence is produced, given that each one can achieve their objectives if the others also achieve theirs. The students do not depend excessively on the teacher; they are the constructors of their own learning and, fundamentally, of that of their classmates. For this reason, it is classified as a meaningful learning technique as it considers the student to be the main protagonist of the teaching-learning process (Bisquerra 2006).

Within this type of learning there are various techniques, which are differentiated by the amount of autonomy the student is given. The benefits of using it in the classroom are twofold: (1) it encourages students to learn in a co-operative way, and (2) it allows the achievement of different learning objectives, not only in terms of content, but also in the development of skills and interpersonal dexterity linked to the acquiring of competences (Prieto 2007).

In fact, the five key distinct elements of collaborative learning are directly related to the development of interpersonal competences (Johnson et al. 1999), generally, they are considered as generic competences in course programmes. The five elements can be summarised as follows:

1. **Cooperation**. Students are linked with each other in order to carry out a task. If they each obtain their individual goals, the final objective of the task is achieved. There exists a healthy interdependence between the students. The success of one student, thus, depends on the success of the whole team. Consequently, the students support each other mutually and share goals, resources and achievements.
2. **Individual Responsibility**. The students are individually responsible for the part of the task which has been assigned to them. At the same time, however, they are also responsible for the final results of the group, which complements the concept of cooperation.
3. **Communication**. The members of the team must work together and learn from their classmates if they are to achieve the objectives expected of them. This requires the exchange of information and materials, helping each other, debating the different points of view, explaining the assigned task to the others, giving feedback and everything that involves communication in order to achieve the best quality results.

4. **Teamwork**. Students learn to solve problems together, developing leadership skills, communication skills, trust, decision-making, conflict resolution, and all types of social skills necessary for a group to function well.
5. **Group Self-assessment**. Teams must have the opportunity to assess the learning process that the group has followed through, so as to analyse which actions have been useful and which have not. The result of this assessment provides valuable information when it comes to identifying what changes must be carried out in order to improve their work in the future.

## 2.3 The Aronson Jigsaw Technique

One of the most commonly used techniques in collaborative learning is the Aronson jigsaw or puzzle (Aronson et al. 1978). In this technique students "teach" part of the curriculum of a subject to a small group of their classmates (Moskowitz et al. 1985). The Aronson jigsaw has been applied to many different fields, although it is usually used at secondary school or university level, given that it requires a series of social capabilities and skills to bring it to a successful outcome. The great advantages of this methodology are particularly based on the cooperation between the students; this, amongst other things (Martínez and Gómez 2010):

- Improves collaborative learning.
- Fosters a positive attitude amongst members of the group.
- Improves academic performance.
- Encourages meaningful and self-led learning.
- Fosters continued study of the subject, in such a way that, rather than merely memorising, the student widens their knowledge.
- Develops solidarity and social commitment amongst the students.
- Develops social skills geared towards relating to the group and presenting points of view assertively.
- Presents the results of group learning in an organised way.
- Fosters autonomy in learning.
- Takes account of the diversity of interests, values, motivations and capabilities of the students.
- Assigns responsibility for a task to each member of the group in order to achieve a final proposed outcome.
- Converts the role of the student in the process into that of the tutor.
- Works on enhancing consensus.

An analysis of these advantages leads us to conclude that most of them refer to skills, knowledge and capabilities related to the "know how" and "want to do" common to all professions, and which can be considered as generic competences in different areas of study. This leads to the conclusion that this technique is a valid strategy not only for working on collaborative work between students, but also on the development of generic competences. In addition, this technique is especially useful for working on areas of knowledge which are open to being "fragmented"

t1.1 **Table 2.1** Description of the Aronson jigsaw technique

| t1.2 Technique | Description | |
|---|---|---|
| t1.3 Aronson jigsaw | A collaborative learning technique in which the students are split into heterogeneous work groups and each member takes responsibility for a different part of the task. The students from different groups with the same task then gather together into groups of specialists to develop their tasks. They later return to their respective initial groups in order to present the part they have specialised in to the rest of their group | |
| t1.9 Advantages | Recommendations | Teacher-student roles |
| t1.10 It is motivational | The subject worked on must be fragmentable | Teacher: Divides and provides the material. Guides idea sharing, debate and reflection. May carry out a final synthesis of the information, emphasising the most important areas of each part |
| t1.16 Allows work on long theoretical topics | The students must understand clearly which part of the work corresponds to them | Students: Are active. They tutor their classmates. They trust in the other members of the group. They participate in active learning |
| t1.19 Facilitates the development of generic competences | The groups must be heterogeneous and there must be a level of trust between the members of the group | |
| t1.22 Fosters consensus, cooperation and peer tutoring in the teaching-learning process | | |

t1.27 *Source*: prepared by authors with reference to (Aronson et al. 1978) and (Martínez and Gómez 2010)

into different parts. In Table 2.1 there is a description of the Aronson jigsaw technique, a list of its advantages, and recommendations for its application and the role of the teacher and the student in the process.

A process utilising the Aronson jigsaw technique should be organised following the phases detailed below (Babiloni et al. 2013; Martínez and Gómez 2010):

*PHASE 1. Explanation of the Aronson Jigsaw*. The teacher explains to the students what the technique consists of, the different phases involved and scheduling. The topic to be considered is also explained along with the learning objectives. Finally the necessary material is handed out, subdivided into sub-topics, in order to get the process going.

*PHASE 2. Formation of the jigsaw group*. Students are grouped together making up the so-called "jigsaw groups". Although there is no established consensus concerning the optimal number of students per group, a recommended size is four or five students. One thing that is essential is that the number of members in the group is the same as the number of sub-topics into which the assignment is divided. It is important to give the group time to get to know each other, discuss the topic and even create rules of work for the process. Once the group has been formed, each member chooses a sub-topic.

*PHASE 3. Design and formation of the groups of experts*. Once each student has chosen their part, each member of the different groups gathers into a new group with other students from different groups who have chosen the same sub-topic. In this new group, which is called "the group of experts", the relation between members is topic based. Each group of experts works on and develops the sub-topic they have been assigned, creating a final group report as experts in their particular topic.

*PHASE 4. Re-forming the jigsaw group*. Once the task of the groups of experts has come to an end, each expert returns to their original jigsaw group and shares and explains information about their sub-topic with the other members of the original group. In this way, each member of the jigsaw group learns about each of the sub-topics from their fellow members (at this point they are working on collaborative learning) in such a way that, in the end, all the members are experts in each of the sub-topics.

## 2.4 Application of the Aronson Jigsaw Technique to an Undergraduate Subject

The area of application of the teaching innovation described in this article is an optional subject from the second term of the 4th year of the Business Administration and Management Degree at the faculty of Business Administration and Management of the Universitat Politècnica de València entitled "Innovation and Competitiveness". This subject is part of the block of optional subjects "Organisation of Industrial and Service Companies". The experience takes place with a group size of 60 students. Theory classes have a duration of 180 consecutive minutes, which enables us to start and finish the activity in one session. The teaching innovation has been carried out in the academic year of 2014/2015.

The first part of the subject looks at the management of innovation and the Oslo Manual is used to work on important concepts in this area. The Oslo Manual is a document developed by the Organisation for Economic Co-operation and Development (OECD) and EUROSTAT and proposes "Guidelines for the measurement and study of scientific and technological activities". Although it was edited for the first time in 1992, in the classroom, the third edition from 2005 is used. The Oslo Manual, thus, is the basis of the documentation which will later be used in the Aronson jigsaw.

The following is a description of the phases of the teaching technique as applied in the context of the subject:

*PHASE 1. Explanation of the Aronson jigsaw technique*.

In this phase, a presentation is given to explain what the Aronson jigsaw consists of. In addition, the concept of teaching innovation and collaborative learning is introduced. The chapters of the Oslo Manual which are to be used in the session are then introduced. For each of the chapters, the learning objective consists of summarising and extracting the principal concepts.

The class dynamics are explained, such as the size of the jigsaw group and the scheduling of each of the phases. How the activity is to be assessed is also explained: On the one hand, any part of the content may be tested in the subject's multiple choice exam. In addition at the end of the activity, the teacher will ask the same "one minute question" to each of the groups about one of the chapters which have been studied. This last part emphasises the need for all experts to work on and transmit the information from their chapter correctly. The one minute question will account for 5 % of assessment marks.
This phase lasts 20 min.

*PHASE 2. Formation of the jigsaw group*
The students divide up into groups of five, forming 12 jigsaw groups. Once this is done, five chapters of the Oslo Manual are handed to each group: Chapter 1. Objectives and scope of the Manual; Chapter 2: Theory behind the innovation and why it needs to be measured; Chapter 3: Basic definitions of innovation and types; Chapter 5: Linkages within the innovation process; and Chapter 6: Measuring the expenditure on innovation.
Within each jigsaw group, it is the students themselves who use their own criteria to distribute the chapters to be studied.
This phase lasts for 15 min.

*PHASE 3. Design and formation of the groups of experts*
The jigsaw groups break up and the groups of experts are formed. The class is redistributed into 5 groups of 12 students, who are going to work on each of the chapters in the Manual. One of the first problems to arise during this phase is that of the size of the group, which hinders the shared tasks. This has led the students to use much of the time in this phase working autonomously and, only when they have finished the task do they share it with the rest of the experts for the purposes of reaching a consensus on the concepts which they have considered to be the most relevant in the chapter and preparing a joint report.
This phase lasts for 60 min.

*PHASE 4. Reforming the jigsaw group*
Once Phase 3 is over and the experts trained, each one returns to his/her jigsaw group. At this point, each expert, in order of chapter, explains to the rest of his/her jigsaw group what the chapter consists of and which concepts are considered to be the most relevant, Each student should take notes on what the experts on other chapters explain.
This phase lasts for 50 min, with 10 min allotted to each expert's explanation.

## 2.5 Assessment and Sharing Information

Once the activity as such has been performed, two further phases have been added for assessment purposes. In order to carry this out, it is necessary to gather and analyse the information. The information for the assessment is basically obtained from two

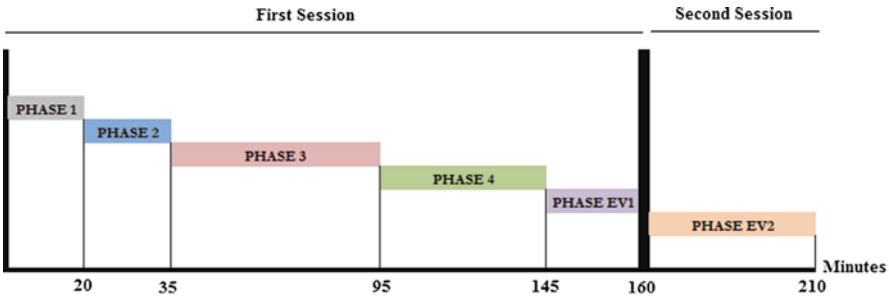


**Fig. 2.1** Chronogram of the activity. *Source*: prepared by authors

sources: the individual or collective tests and from directly observing the student (Llopis 2001). Obviously, the assessment is one of the most important elements in the teaching-learning process. However, this is not simply because it enables the student to pass the subject, but because if it is well-defined: (1) it makes a great deal of information available both to the teacher and the student; (2) it clearly regulates the learning process and allows corrective steps to be taken throughout; and (3) it conditions the depth and level of learning which has a direct influence on its quality.

During the first assessment phase (ASSESSMENT PHASE 1), a "one minute question" is asked about one specific part of the contents of one of the chapters of the Oslo Manual which have been worked on. In the second assessment phase (ASSESSMENT PHASE 2), the experts on each part give a class presentation on the most relevant concepts of each chapter. Figure 2.1 shows the complete chronogram of the whole experience.

Below, the last two assessment phases are explained in detail.

### *2.5.1 Assessment Phase 1: The One Minute Question*

After Phase 4 has finished, a one minute question is asked, which represents 5 % of the subject's final assessment. The aim is twofold. On the one hand, the content which makes up part of the summative assessment of the course is assessed. The summative assessment is a process which aims to appraise the student's performance, certify that the proposed objectives have been reached and unify the different value judgments made regarding the student throughout the course. The activity is also assessed, as, in function of how the question is resolved, it is possible to know whether the collaborative learning process has been completed correctly. This phase lasts for 15 min: the first 5 min for the explanation of what has to be done and the next 10 to solve the question and gather the results.

The content of the different chapters of the Oslo Manual which the students have worked on is taken into account very closely when the one minute question is being planned. One of the most relevant concepts, and one which appears in several chap-

ters, refers to the types of innovation that an organisation can adopt: product innovation, process innovation, organisational innovation and marketing innovation. The fact that the Aronson jigsaw technique is included within the so-called techniques of educational innovation makes it suitable for classification according to the Oslo Manual. Therefore, the one minute question is related to the technique itself and its classification as innovation. The one minute question is formulated as follows: "Describe the Aronson jigsaw technique and classify it according to the types of innovation which appear in the Oslo Manual. Justify the reason for classifying it as such". In order to answer this one minute question correctly, and bearing in mind the acquisition of competences based on Bloom's taxonomy [Bloom et al. (1973)], the student must "Know" the subject, "Understand" the concepts and "Apply" or "Classify" them, which corresponds with the first three levels of this taxonomy.

### *2.5.2 Assessment Phase 2: Presentation of the Experts*

In the first classroom session after the Aronson jigsaw technique, the five chapters of the Oslo Manual that have been worked on are shared. Taking the chapters in order, the corresponding experts give a presentation on the content of the chapters and which concepts they have taken to be the most relevant. This helps the students to synthesize, structure and present information or to develop communications skills, among others; this phase, therefore, also helps to develop generic competences.

This phase has two basic objectives. Firstly, it allows all of the students, regardless of their jigsaw group, to validate the information which their expert has transmitted. It also permits the teacher to stress the basic concepts in each chapter. It must be remembered that what is shared from each chapter is assessed in the subject's multiple choice exam, and as such, it is very important for the teacher to supervise what the experts have taken as fundamental and to underline what they consider to be the most relevant according to the aims of the course. This feedback from the assessment process has a formative function, since the students can verify whether they have been able to achieve their learning targets.



## 2.6 Results of the Experience

### *2.6.1 Group Work and Commitment to Learning*

The group work has been reinforced by the responsibility assumed by each of the members of the jigsaw group as experts in one area. From the beginning of the experience, the students are aware of the impact which their performance has on whether the group's learning targets are attained or not. There is, therefore, a commitment not only to the student's own learning but also to that of the group. There can be no doubt that the fact that the experience has an impact on the assessment,

which on the one hand is reinforced by the one minute question that counts towards the final assessment mark and, on the other hand, by the content itself, as it will be assessed in the multiple choice exam at the end of the course, contributes to the success of the experience.

This experience, therefore, works on generic competences such as the capacity to work efficiently in a group, the ethical commitment understood as the responsibility assumed in both the student's own teaching-learning process and that of his/her classmates, the capacity to analyse information or the ability to present information compiled by other students in an efficient way.

### *2.6.2 Results of the Assessment*

The assessment of the one minute question has given rise to several conclusions. On the one hand, as far as the part of the question concerning the description of the experience is concerned, 100 % of the students were capable of providing a clear explanation distinguishing between the different phases of the experience's implementation (Phase 2, Phase 3 and Phase 4). However, the conclusions from the second part of the question, that which refers to the classification of the teaching innovation according to the Oslo Manual, were more divergent. As regards this part, and bearing in mind that the Aronson jigsaw innovation is a process innovation as it consists of introducing a new or significantly improved process for the purposes of performing a task, we can make out three types of answers: type 1, corresponding to a correct answer; type 2, corresponding to an incorrect answer in which the innovation is wrongly-classified; and type 3, in which the innovation is either not classified or is done so according to a classification which does not exist in the Manual.

Figures 2.2, 2.3 and 2.4 show examples of the three types of answers, as written by the students.

The percentage of students who gave a type 1 answer is 52.2 %, a type 2 answer 39.1 % and a type 3, 8.7 %. Therefore, as regards applying the concepts to the types of innovation and, although more than half of the students have answered correctly,

| **TYPE 1 Answer** |
| --- |
| This consists of forming groups with a fixed number of people and assigning a task to each member of the group so that each person then joins up with someone who has the same task. This will be the group of experts who, between them, will analyze the task to be carried out in order then to share the knowledge, thus obtaining the main ideas and arriving at the best solution.<br>Once the knowledge has been shared, each member returns to their first group and explains the task. This is process innovation because the method varies depending on the type of task, according to the Oslo Manual. |

**Fig. 2.2** Example of type 1 answer

| TYPE 2 Answer |
| --- |
| The Aronson jigsaw which we used in today's class consists of forming groups or experts amongst which tasks or activities are divided up, each person then splitting off from the group with the task that has been assigned them and forming new groups with the people who have the same task. In this way, groups of experts are formed that will focus on the task in hand and carry out the assignment; once this is done, they will go back to the first groups to explain what the rest of the group has done and perform all the tasks together. This is a way of sub-dividing tasks for the purposes of carrying out an activity more efficiently.<br>This innovation is classified in the Oslo Manual as organizational, as its aim is to organize the activity so that it can be performed with greater efficiency. |

**Fig. 2.3** Example of type 2 answer

| TYPE 3 Answer |
| --- |
| The Aronson jigsaw consists of forming groups of 5 people (for example) giving each member a chapter. Then all those people with the same chapter form new groups. In these groups, the task is studied for approximately one hour and, once this is done, conclusions are drawn.<br>This is how the groups of experts are formed to deal with the different tasks. They then return to their original groups to explain their chapters to the other members. Every member of the group is an expert in his/her respective chapter, so at the end everybody will gain some knowledge of the whole syllabus.<br>This technique can be classified as both an internal and external type of innovation; external because the members of the group "leave" to compile information and obtain some background in new ideas and "internal" because they then go back to the group to explain what they have learned. This is a new way of spreading information in which all the efforts made are mutually beneficial. |

**Fig. 2.4** Example of type 3 answer

47.8 % (the result of adding the percentages of the type 2 and type 3 answers) have not. This raises the question of what we should change in the experience so that a greater number of students are not only able to "know" (the lowest level in Bloom's taxonomy) but also to "understand" and "classify".

## 2.7 Conclusions

The Aronson jigsaw technique is a teaching-learning technique in which the students put collaborative learning into practice in the classroom. It not only permits the students to tutor their own learning and that of their classmates, but it also promotes group work and responsibility. This study describes the application of the

Aronson jigsaw technique in an optional subject called "Innovation and Competitiveness" in the degree course of Business Administration and Management in the Faculty of Business Administration at the Universitat Politècnica de València.

The Aronson jigsaw technique is made up of four phases. In Phase 1, the technique is explained to the students. In Phase 2, the jigsaw groups are formed. In Phase 3, the groups of experts are formed and, lastly, Phase 4 is when the experts go back to their jigsaw groups to explain their part. What's more, two more assessment phases have been added to this experience. The first of these consists of using a one minute question to assess the knowledge and the concepts learned during the experience and how to apply them. Furthermore, the Aronson jigsaw technique itself is used as a reason for explaining and applying such concepts. In the second assessment phase, the experts share the content of their part of the task so that the whole class can take notes and the teacher can underline what they consider to be most relevant for the final assessment.

By means of this experience and via collaborative learning, we have been able to work on: (1) content: everything related to the five chapters of the Oslo Manual which are used in the experience; (2) generic competences, especially group work, ethical responsibility and effective communication. Moreover, through the one minute question, it has been possible to assess several things. The one minute question concerns the teaching innovation of the Aronson jigsaw, and as such, the students have to describe it. This is a way of obtaining very important feedback which permits us to know if the student has understood what the technique consists of. In this regard, 100 % of the students provide a suitable description of the essence of the technique. In the second part of the one minute question, the students have to classify the innovation of the Aronson jigsaw within one of the four types of innovations explained in the Oslo Manual. To this end, the students not only have to know the four types of innovations, but they also have to be able to understand them and apply them for the purposes of suitably classifying the teaching innovation. According to Bloom's taxonomy, this implies a progression in the acquisition of competences from the lowest level, corresponding to "knowing", to higher levels which involve "applying". The results from this part indicate that 52.2 % of the students are able to classify the technique correctly; 39.1 % classify it wrongly; and 8.7 % either do not classify it or invent a classification. In our opinion, these results leave much scope for improvement and, as a future line of work, we have to plan the use of mechanisms which will improve the ability of the students to apply the key concepts and not only to acquire them.



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# Chapter 3
# Learning by Teaching and Assessing: A Teaching Experience

**Andreea Apetrei, Jordi Paniagua, and Juan Sapena**

**Abstract** This chapter describes a teaching experience whereby students learnt by teaching and assessing other students. A group of students was tasked with explaining a topic from the course and preparing an exam on that topic. The remaining students in the class completed a questionnaire to measure their satisfaction. They also completed an online test on the topic following the presentation by their peers. Assessment was based on a win-win strategy because the average mark on the test counted towards the final assessment of the students who gave the presentation. The methodology allows students to study content in greater depth level and develop skills like responsibility, critical analysis and empathy. Learning by teaching lets students take individual actions that demonstrate responsibility for the group as a whole Survey results indicated high student satisfaction. Furthermore, social interaction was greater with the learning by teaching method than with the traditional case study approach.



## 3.1 Introduction

Is it often said that teachers can only truly understand a subject after they have explained it in the classroom. By preparing materials, lectures, and classes and anticipating students' questions, teachers acquire a deeper knowledge of the subject than they would with traditional methods. Teaching a lesson to peers should therefore benefit students. Learning by teaching means not only helping to reinforce course contents, but also building students' sense of responsibility and self-esteem (Frager and Stern 1970). Empirical evidence suggests that learning by teaching helps students to learn better. Cortese (2005) reported that learning by teaching fosters important skills like observation, attention, and experimentation. Giesecke et al. (1993) found that learning from peers positively affects students.

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This chapter describes a teaching experience whereby the student played the role of teacher. Working in teams, students prepared, taught, and evaluated a course module. This method yielded two outcomes. First, students acquired a deeper knowledge of the subject. Second, students built key transversal skills—as defined within the European Higher Education Area (EHEA)—such as teamwork and public speaking. In addition, students had the responsibility of assessing their peers. The entire process took place on the Moodle platform under instructor supervision. The final course assessment included an incentive system that incentivized the evaluation group and the rest of the class.

This chapter describes a practical case of learning by teaching and assessing for a Business Administration undergraduate course, namely 'Business Growth Strategies'. The chapter contributes to a better understanding of peer assessment's benefits. Students were taught the course using two methods: case study and learning by teaching. We prepared and conducted a survey comparing students' satisfaction and learning outcomes for both methods. Students reported high levels of satisfaction, especially in social interaction.

The chapter is organized as follows: Sect. 3.2 describes the teaching method, Sect. 3.3 explains the survey research method, section 3.4 discusses results, and Sect. 3.5 presents conclusions.

## 3.2 Teaching Methods

The teaching methods described below were used during the academic years 2013–2014 and 2014–2015 to teach the optional course 'Strategies for Business Growth'. The course was part of the Business Administration degree from the Faculty of Economics and Business Administration at the Catholic University of Valencia 'San Vicente Martir'. Erasmus exchange students accounted for a high proportion of the class, so the course was taught in English. Two instructors divided the course into two 3-month periods, with each instructor adopting a different teaching technique.

### *3.2.1 Case Study Method*

During the first half of the semester, the first instructor presented theoretical elements of the subject using basic Microsoft PowerPoint presentations combined with case studies. The case studies were based on real companies or start-ups, some of which are now well known. Students had to read the case study and follow the instructor's directions. After students had read the case study, the instructor placed the students in groups of three or four. As a group, students then answered questions on relevant aspects of the case study.

The case study method is a well-known teaching method in Business Administration education (Herreid 2007). It is also widespread in many other disciplines including sociology, psychology, history, management, planning, social work, and education (Yin 2013). Teachers use realistic or true narratives to encourage students to combine multiple information sources in a real context. Teachers are thus able to engage students with ethical and social problems related to their discipline (Lundeberg and Yadav 2006). The major advantage of case studies is that students solve problems and apply complex decision-making processes to scenarios of uncertainty.

We used the case study method as a benchmark to assess the benefits of learning by teaching, which is described in the next subsection.

### *3.2.2 Learning by Teaching and Assessing*

At the beginning of the second half of the semester, working groups were created automatically using the online teaching platform Moodle. Randomly allocating students to groups often creates controversy in the classroom. Despite not being a prerequisite for the exercise, random allocation is actually beneficial to students. Students leave their comfort zone, learn to work in multicultural environments (because of the presence of Erasmus exchange students), and must confront the realities of professional life (because students will be unable to choose their colleagues in the future).

The groups prepared material to teach the following topics:

- Corporate growth strategies: Internationalisation and diversification;
- The strategy of the multinational company;
- Strategy, technology, and innovation;
- Virtual growth strategies: Internet and social networks.

The optimal group size is three or four, so if the class has more than 16 students, the lecturer splits the subjects into two parts or extends the work to other topics.

Before starting the learning by teaching programme, the teaching team ensures that each group had signed a performance contract to deliver the following documents:

- A report (max. 5000 words). This document describes the chosen topic in detail. The document is assessed for consistency, structure, and suitability of references.
- A relevant case study. At the end of the case study, each student should prepare a few questions for peers to answer. The group should also prepare solutions of the test and keywords for each question;
- A Microsoft PowerPoint presentation;
- A progress test with 20 questions: 15 multiple choice and 5 true or false.

Within each group, students established formal responsibilities for each deliverable set. All students were expected to collaborate on the tasks, but each student took responsibility for delivery in his or her area. Groups were allowed to use the basic manual for the subject written by Calabuig et al. (2009) to prepare the presentation and virtual resources on the online platform. Nevertheless, groups were expected to expand on the information in the manual. Students had approximately 4 weeks to prepare the documents. During this period, the instructor allowed time for students to study in the classroom and ask questions. The last 2 weeks of the semester were dedicated to presentations and assessment.

Throughout the semester, we invited guest speakers to give a practical vision of the subject based on their professional experience. The groups then had to prepare a case study based on the guest speaker's lecture. This exercise combined both methods. Groups described the company/case and prepared a set of questions and solutions. The experience from the first half of the semester helped them to identify key issues when preparing a case study. These case studies could then be used as teaching materials.

At the end of the preparation period, all groups submitted the results of their work. The instructor uploaded the report, presentation, and case study to the virtual platform. As part of the teaching process, the students had to prepare a questionnaire on Moodle based on the questions that each group had already prepared.

#### 3.2.2.1 Assessment Phase

The assessment of the indivual work dedicated to solving the case study questions was based primarily on the instructor's judgment. The instructor assessed the participation of each of group member and compared the answers with those of other teams. The individual assessment phase is a weak part of the learning by teaching method, and it can be improved in the future.

The learning by teaching method used a complex assessment system. Assessment took place in the classroom via the online platform. Internet access (laptop, tablet, smartphone, etc.) was essential for testing. After listening to the presentation (about 30 min), the rest of the class answered an online survey on Moodle. The survey contained the following questions:

- Content: Demonstrates a complete/good/fair/poor understanding of the topic;
- Topic coverage: During the presentation, the subject matter was covered 100 %/75 %/50 %/25 %/0 %;
- Duration of the presentation: Fair (30 min), Excessive (+30 min), Short (−30 min);
- Clarity in speaking: Yes/No, almost all the time;
- Auxiliary material: Adequate use of resources (PowerPoint, video, graphics, etc.);
- Vocabulary: Use of appropriate vocabulary for the audience.

Assessment Test

After the survey, the class took the corresponding progress test via an online midterm questionnaire on the Moodleonline teaching platform. The instructor modified or added new questions to the midterm evaluation to prevent any knowledge sharing among students.

The group's final score had the following weighting:

- Written report: 50 %
- Class' survey for the group: 25 %
- Class' average test rating: 25 %

The instructor assessed the written report. Using the survey, the class members directly assessed each group's presentation performance. The rating scale was calibrated around the class average score. The class took the midterm test immediately after the presentation. Presenting students therefore received immediate feedback on their presentations. The group members knew their survey results immediatelly after their presentation, and the instructor gave the class average midterm score. Bitchener et al. (2005) argue that direct feedback positively affects learning.

The mark obtained by the group constituted 50 % of each student's final mark. The rest of the assessment included the final examination and an average score on progress tests for each topic from the course. Crucially, this assessment step is available only when using the teaching by learning technique. The instructor alone was responsible for assessing the case study.

Notably, the results of the midterm test affected students' marks. Students were marked depending on how well the group presented the most relevant concepts. This approach encouraged collaboration between group members because questions had to reflect the presentation's content to ensure the class obtained a good mark. The group had an incentive to perform well in the presentation, and each other student in the class was personally motivated to perform well in the midterm test (because it was part of the final mark).

## 3.3 Research Method

The aim of the research survey was to compare the student's satisfaction and learning outcomes of learning by teaching and of the benchmark method (i.e., case study). Student satisfaction corresponds to the student's perception of the university experience and perceived value of the education received at an educational institution (Astin 1993). The instructor is the main predictor of student satisfaction (Williams and Ceci 1997; Bolliger and Martindale 2004).

When evaluating teaching methods, students may provide general ratings based only on some memorable good or bad experience in certain areas, whether or not that experience actually affected their education significantly (Bowden 2011). Nevertheless, all individuals respond to the same set of questions, so the influence

t1.1 **Table 3.1** Constructs and items

| | |
|---|---|
| t1.2 | **Learning objectives** |
| t1.3 | I feel that I learnt many new things during this activity |
| t1.4 | The activities were selected on the basis of the method's objective |
| t1.5 | I felt comfortable with the assignments set during this activity |
| t1.6 | **Social interaction** |
| t1.7 | This method is an excellent medium for social interaction |
| t1.8 | I felt comfortable interacting with other participants during the activity |
| t1.9 | The activity helped me to make friends and build better friendships |
| t1.10 | **Instructor** |
| t1.11 | This activity was facilitated by the instructor |
| t1.12 | The type of activity forced me to interact with my instructor |
| t1.13 | The interaction between the instructor and me was helpful |
| t1.14 | **Individualautonomy** |
| t1.15 | Other participants acknowledged my point of view during this activity |
| t1.16 | I was able to form different impressions of some course participants during this activity |
| t1.17 | **Overall** |
| t1.18 | The quality of learning for this activity was excellent |



of good or bad personal experiences is minimized. Furthermore, using the dependent sample reduces the degrees of freedom of the t-tests used to compare the means of student satisfaction.

The survey instrument used for this study was based on social presence scales by Richardson and Swan (2003) and Sinclaire (2014). For each teaching method activity, students indicated their agreement with each statement using a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*). Table 3.1 lists the scales.

The following constructs measured student satisfaction: learning objectives, social interaction, instructor guidance, and individual autonomy. Learning objectives were measured through three items capturing student satisfaction with activities, assignments, and subjects. Social interaction was an important construct in both methods. Three constructs assessing how students relate to peers measured social interaction. The instructor's role as a facilitator in the learning process was measured with three items measuring the facilitation, interaction, and helpfulness of the teacher in the learning process. Individual autonomy was measured with two items: individual point of view acknowledgement and impressions. Overall satisfaction was measured by a single item assessing the overall quality of learning. Finally, students answered two open-ended questions about their perceptions of the benefits of course activities in terms of learning and satisfaction. These questions gave students the chance to make comments and suggestions. Each student answered the questionnaire twice: once for the case study method used in the first half of the semester and once for the learning by teaching and assessing methodology used in the second half of the semester.

t2.1 **Table 3.2** Summary statistics

| t2.2 | | Case study | | Learning by teaching | |
|---|---|---|---|---|---|
| t2.3 | | Mean | SD | Mean | SD |
| t2.4 | Learning objectives | 3.538 | 0.46 | 3.487 | 0.46 |
| t2.5 | Social interaction | 3.435 | 0.56 | 3.615 | 0.59 |
| t2.6 | Instructor | 3.667 | 0.69 | 3.435 | 0.64 |
| t2.7 | Individual autonomy | 3.769 | 0.59 | 3.692 | 0.75 |
| t2.8 | Overall satisfaction | 3.307 | 0.94 | 3.461 | 0.87 |
| t2.9 | Observations | 13 | | 13 | |

## 3.4 Results

We collected 13 valid questionnaires during May 2015. Table 3.2 reports the descriptive statistics for each method. Both methods received high ratings (above 3) in all items.

Figure 3.1 shows a bar graph of the mean results for each construct. Student satisfaction was clearly above the median in all learning areas: subject, social, and individual empowerment.

For overall satisfaction and social interaction, learning by teaching and assessing had a slightly higher rating than the case study method did. These differences, however, were non-significant according to results of the two-tailed t-tests (Table 3.3).

There were no significant differences between the two methods in terms of student satisfaction'. Moreover, there was no significant differences between the two methods in terms of the constructs measured'. Learning by teaching had a similar acceptance to the case study method. In addition, the role of the instructor was similarly important for both methods.

Results highlight some barriers to innovate in teaching methods, particularly institutional policies (Hockings 2005). Higher education regulations in Spain require all students to pass a final written exam worth a minimum of 50 % of the final grade. This constraint might reduce student satisfaction regarding learning by teaching. Student involvement might be hindered because they are ultimately required to sit a traditional exam. Without this barrier, would expect students to be totally involved in the subject preparation with the learning by teaching method.

### *3.4.1 Qualitative Results*

In this section, we report some of the open responses that summarize students' feelings. These qualitative responses highlight some interesting aspects of student satisfaction that the survey did not fully capture. For example, three students highlighted the importance of foreign language learning (i.e., English). Because groups were allocated randomly, all groups contained students from a range of nationalities and

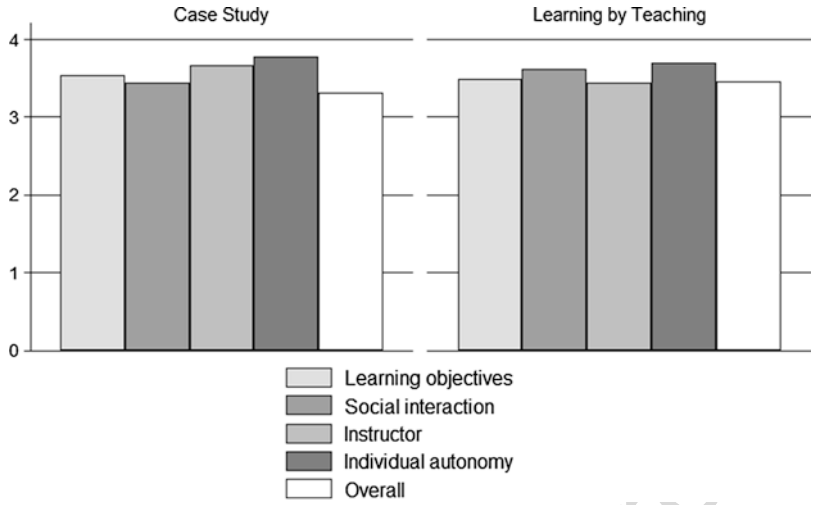


**Fig. 3.1** Case study vs. learning by teaching

t3.1 **Table 3.3** T-test for difference

| | Difference | |
|---|---|---|
| Learning objectives | −0.051 | (−0.27) |
| Social interaction | 0.179 | (0.73) |
| Instructor | −0.230 | (−1.01) |
| Individual autonomy | −0.076 | (−0.08) |
| Overall satisfaction | 0.153 | (0.41) |
| Observations | 13 | |

*t* statistics in parentheses

languages. Therefore, learning by teaching improved not only social interaction but also cultural awareness and language skills.

How satisfied were you with this course? For example, were your goals and/or expectations met?

"I learnt a lot of new things and I saw a new style to have lessons"

"All in all I was satisfied with the class because I learnt a lot and due to the case study it was very practical related. And due to the preparation of the presentation in the second part we got more in contact with other students from other cultures and that was quite interesting"

"I'm very satisfied with this course because I listened and tried to speak English language and the course activities and assignments were appropriated."

"I didn't expect much of this course because most of the concepts I have already known. However, the methodology and the different activities were useful for my improvement."

"The course activities and assignments were appropriate. I already knew a lot of stuff taught in class. I liked the group discussions."

"Many things were already taught during our classes at home. The content was really long but I liked the conversations in class and the interactions in groups."

Which aspect of this course was most beneficial to you and why?

"Integration, communication."

"Cases done within the class due to the variety of things. Especially entrepreneurial case studies were very good."

"The best for me was the presentation of guests and presentations during the classes. They were interesting and give me some good information for following life."

"The case studies were interesting and most of the guest lectures as well. In addition I liked the contact with the different people from different countries."

"Case studies and discussions about the topics with the whole class and teacher."

"I think that the most beneficial aspect was the interactions with people that came from other countries because we could learn some English and we could teach some Spanish."

"Talk all the time in English with Erasmus because we talked business English. So, I've improved my English and my knowledge about many things of the businessstrategy."

"The type of activities, we can look the reality of the company with external instructors and we need to think as a CEO to resolve problems of some companies."

"The most beneficial of this course was the people who came to present their companies and also the different Erasmus classmates."

## 3.5 Conclusions

The learning by teaching and assessing method allows students to study course material in greater depth than is otherwise feasible with traditional teaching methods. Learning by teaching and assessing helps students to develop competencies such as accountability and critical analysis. The technique forces students to step out of the comfort zone afforded by traditional courses, which generally require students to study only for an exam. With learning by teaching and assessing, in contrast, students must confront situations they will face in professional environments. The evaluation process promotes decision-making and encourages students to identify relevant issues. The method also improves one important aspect of the case study method: teachers' assessment of students. As Douglas et al. (2006) note, 'promptness of feedback on performance' and 'usefulness of feedback on performance' are two feedback items that are key components of student satisfaction.

Despite questionnaire results, our observations during the last 2 years have shown that teaching by learning and assessing stimulates students' empathy more than traditional methods do because playing the role of teacher forces the student to think about other students. Results of the qualitative survey highlight the benefits of learning by teaching in social interaction, cultural awareness, and foreign language learning. Learning by teaching is therefore highly recommendable for groups with a high percentage of foreign exchange students.

This approach also enhances students' responsibility and empathy. The result of a student's individual midterm influences both the student's own marks and the marks of peers. A poor test result is a setback not only for students' academic

records but also for the results of classmates. Thus, students must take individual actions that demonstrate responsibility for the group as a whole.

Both academic and personal results are unequivocally positive. Learning by teaching nonetheless requires careful teaching and technology planning. We are interested in making changes to improve the programme. These changes may include correcting cases studies, creating a self-assessment instrument, and finding the right tool to measure aspects of education such as empathy and self-awareness.

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# Chapter 4
# DINNO®: An Innovative Technological Tool for Empowerment in Assessment

**María Soledad Ibarra-Sáiz and Gregorio Rodríguez-Gómez**

**Abstract** This chapter introduces DINNO®, a technological tool for designing innovations in assessment, and presents the opinions on its usefulness and benefits of 60 university tutors who used the tool during a training programme. The DINNO® tool was developed in order to guide the decision making of university tutors when initiating a process of innovation in their assessment practice, so that they focus on the key aspects that educational research has shown to be relevant and innovative in the field of assessment. The tutors' opinions were collected through an online questionnaire and the results demonstrate the usefulness of this tool for planning innovation in assessment practice.

## 4.1 Introduction

To be enterprising requires a proactive attitude to life. Universities should encourage and enable this attitude by innovating in ways that promote active learning so that students cease to be passive subjects who "tolerate" their education and become active participants in learning. This implies helping students to take control of their learning process so they can continue to learn throughout their lives (OECD 2013). This chapter focuses on one single aspect of what universities engage in; the assessment of students and the innovation required in assessment practice.

When university tutors attempt to introduce innovation into their assessment practice they frequently face the difficulty of knowing precisely how to deliver true innovation in this area. This challenge often means that they resort to proposing innovations that result only in updating traditional practice but using new technological tools, whilst continuing to replicate the same, outmoded assessment strategies.

The incorporation of any technological element into assessment practice is automatically seen as an innovation, but is this really the case? Does simply incorporating some technological elements actually represent an innovation? The innovative nature of educational experiences can be analysed from multiple perspectives

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Carless (2011: 16). Considers it from the perspective of the end-user of innovation and says "I define innovation as an attempt to bring about educational improvement by doing something that is perceived by implementers as new or different. I use it interchangeably with the term change… (…) I use innovation from the point of an end-user. If formative assessment requires tutors to do things differently, then it is an innovation".

From our perspective we believe that it is not enough just to do things differently. Innovation must be analysed from a dual approach: the essence and the context.

When we refer to the essence, that is, the fundamental nature of innovation, its permanent and invariable qualities, we mean to identify to what extent the nature of what is being proposed as an innovation, may actually be something truly innovative. Referring to the use of technology, the work of Healy et al. (2002) highlights that the use of a digital tool per se, does not automatically improve student learning. It is critical that appropriate design strategies are also employed to ensure that any digital tool used is pedagogically effective.

By contrast, when referring to the context, that is the environment in which innovation is implemented, we are focusing on the importance that the proposal or the proposed change has to the concrete and specific context. We must not forget that innovation must deliver added value to what was being done before. So, when considering any proposed innovation we should be clear about exactly what is the added value it delivers.

Problem Based Learning as a teaching strategy or the use of portfolios as a means of assessment lack an innovative character in themselves because they are strategies or methods that have been used for some time in the educational context. In this sense, simply using these teaching strategies or assessment instruments cannot be described as being innovative. However, if we resort to implementing these strategies or instruments in a university that has traditionally delivered its teaching through lectures or master classes, logically it would represent an innovative approach for that university. Thus, innovation can in some cases be achieved simply by the new implementation of a long-established and widely used strategy or instrument.

What is really needed is innovation *per se*; the added value that can provide a strategy, a means, a technique or an assessment tool. We must remember that an honest assessment of any new technology or of progress in general, requires a sensitivity to what is lost, as well as to what is gained. We must not allow the wonders of technology to make us blind us to the possibility that we may be diminishing the essential and relevant.

This chapter introduces *DINNO®, a technological tool for designing innovations in assessment*.[1] It has been developed[2] to guide university tutors when initiating a process of innovation in their assessment practice. Its aim is to facilitate the process of decision making about changes that need to be made, focusing on those essential aspects that research on assessment has shown to be the most relevant.

[1] http://dinno.evalfor.net

[2] Tool developed by the EVALfor Research Group (http://evalfor.net). Available in Spanish and English.

The aim of the chapter is to present the initial results of a study on the perceptions of university tutors on the use of innovative technological tools to support the planning and design of assessment in Higher Education. Firstly, it focuses on the concept referred to as "assessment as learning and empowerment" (Rodríguez-Gómez and Ibarra-Sáiz 2015) based on, among others, the contributions of Brown and Glasner (1999), Nicol and MacFarlane-Dick (2006), Carless (2007) and Boud and Associates (2010). Secondly, it describes the DINNO® programme, a technology based tool developed by the EVALfor Research Group to provide university tutors with ideas and options for introducing innovation into their assessment practice. Finally, it presents the initial results of the study focused on DINNO®'s usability.

## 4.2 DINNO® Design Tool for Innovations in Assessment

DINNO® is an open source tool developed with the aim of guiding and facilitating university lecturers' decisions when introducing innovations in assessment within their educational practice. The ultimate goal of this tool is to enable tutors to develop an Action Plan for Innovation in Assessment when they prepare their modules or teaching materials. DINNO® can be used both by individual tutors or by a team of tutors.

DINNO® is based conceptually within the framework of assessment as learning and empowerment (Rodríguez-Gómez and Ibarra-Sáiz 2015) (Ibarra Sáiz and Rodríguez-Gómez 2013a, b). Our understanding of this concept is as assessment that, within an academic context, facilitates the learning of students, giving priority to involving them in the assessment process, promoting strategies that provide proactive information to students on their progress and results and which is delivered through high quality tasks that require intellectual rigor, are relevant, meaningful, authentic, and provide support, guidance and direction to students so as to encourage self-regulation to acquire meaningful learning. Consequently, and in an extra-academic context, assessment as learning and empowerment involves learning throughout life; it enables the development of transferable skills that produce the capacity for self-determination in making personal and professional decisions based on an ecological, sustainable and socially responsible approach. In response to this, DINNO® is structured around three challenges:

- *Participation*. Students as evaluators.
- *Feedforward*. How to use assessment to improve students' performance.
- *High Quality Tasks*. High quality assignments—assessment as learning.

Tutors can use DINNO® to develop their Action Plan. They can incorporate some or all of these challenges, whichever they consider to be priority areas, and subsequently modify or extend their Action Plan. The three challenges are based on ten guiding principles (Fig. 4.1) and are expressed through ten declarations or statements that guide the development of the Action Plan for Innovation in Assessment. Three statements relate to the challenge about student participation, four to the challenge of providing feedforward and three correspond to challenge related to designing high quality tasks. Or assignments

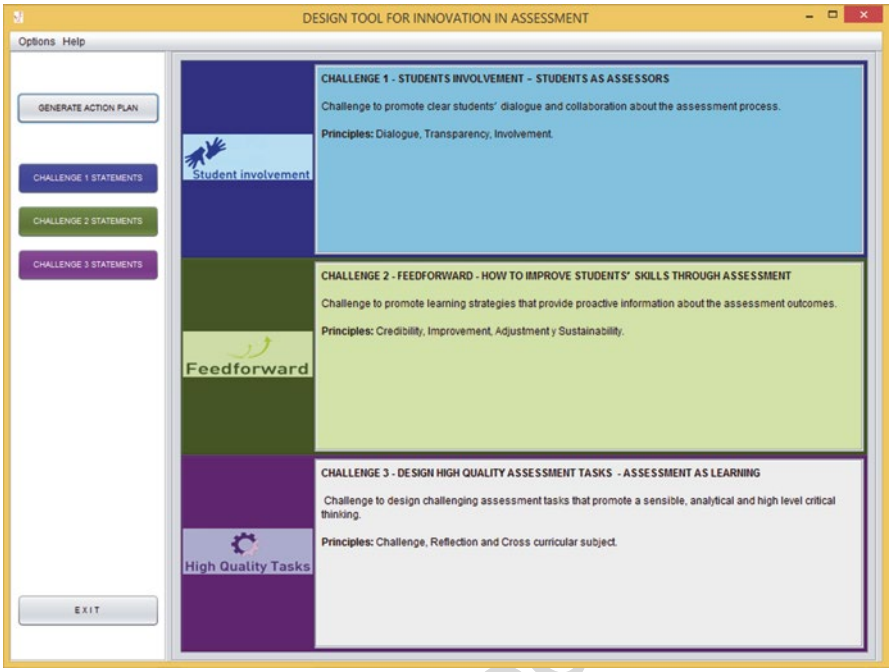


**Fig. 4.1** DINNO® Interface. Challenges and principles of assessment as a learning and empowerment

In order to guide the tutors, each statement consists of a brief explanation of what is considered to be good assessment, then poses a question about what students can do (Fig. 4.2) and finally introduces actions related to the statement.

For each of the ten statements a range of activities is suggested, 56 in all, from which tutors can select according to their priorities, to incorporate within their Action Plan. The challenges of student participation and high quality tasks are each divided into 17 potential actions and the challenge on feedforward into twenty actions. DINNO® allows tutors to select just one, several, or all of the actions presented as well as the possibility of including additional actions related to each statement (Figs. 4.3, 4.4 and 4.5).

Once tutors have prioritized the actions they plan to include in the assessment of their students' assignments, the DINNO® tool delivers their Action Plan in PDF, ODT or RTPF format (Fig. 4.6) that they can then share with other tutors or teams. Figure 4.7 offers an excerpt from an Action Plan drawn up by tutors.

On the DINNO® website (http://dinno.evalfor.net), in addition to the application itself to design the Action Plan, there are two short videos that contextualize the theoretical framework and introduce the Flashcards for *Principles and challenges of assessment for learning and empowerment in Higher Education* (Ibarra Sáiz et al. 2013)

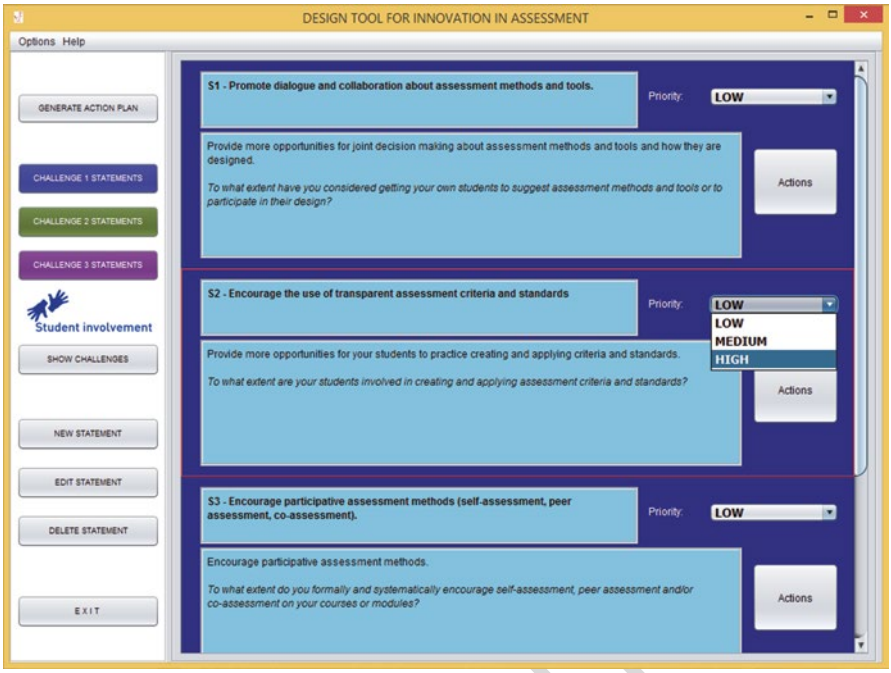


**Fig. 4.2** DINNO® Interface. Statements relating to the challenge of student participation

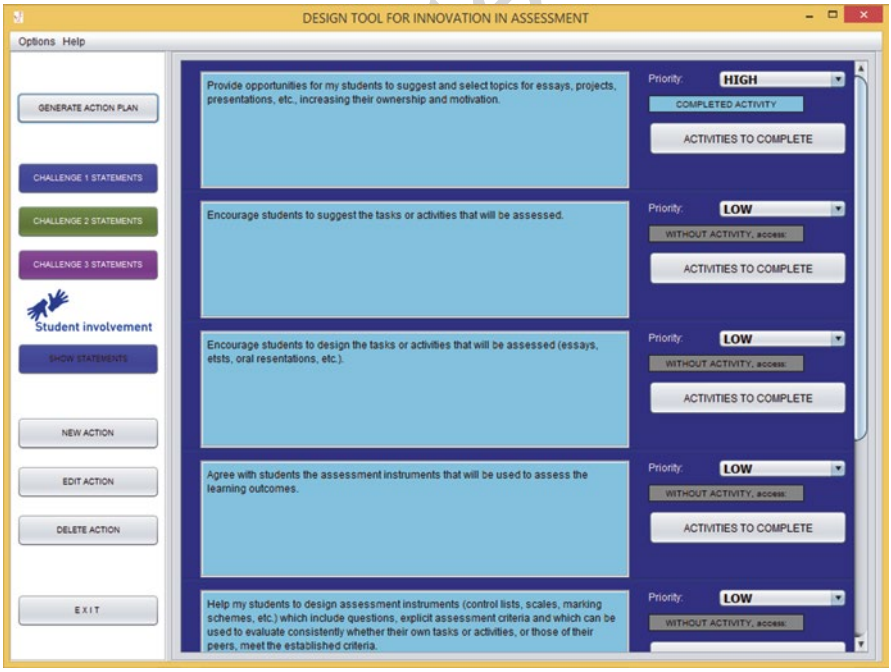


**Fig. 4.3** DINNO® Interface. 5 actions relating to the statement *Promote dialogue and collaboration about assessment methods and tools*, as part of the challenge re student participation

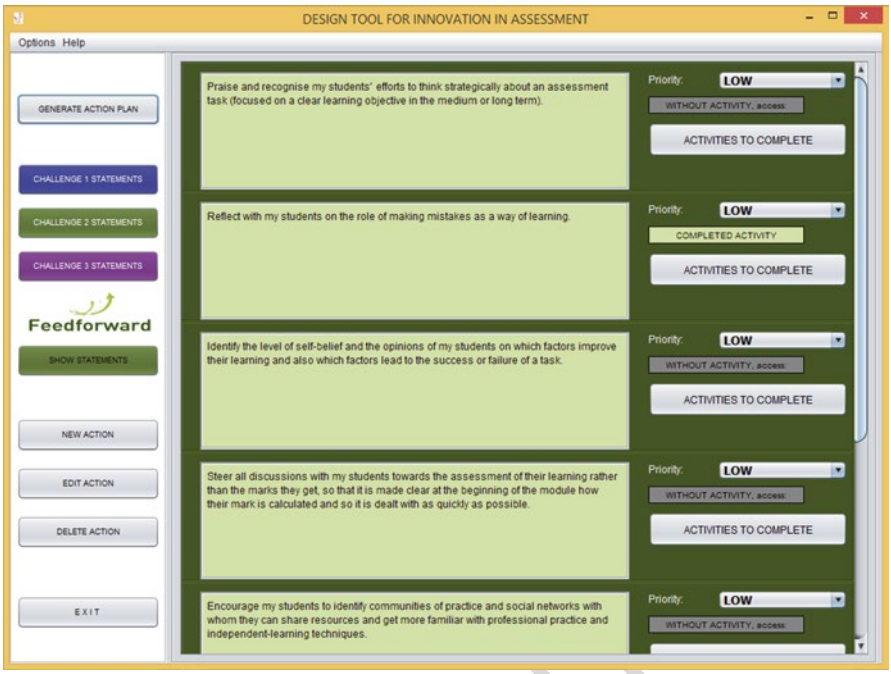


**Fig. 4.4** DINNO® Interface. 5 actions relating to the statement *Trust in the students' ability to learn for themselves* for the challenge related to feedforward

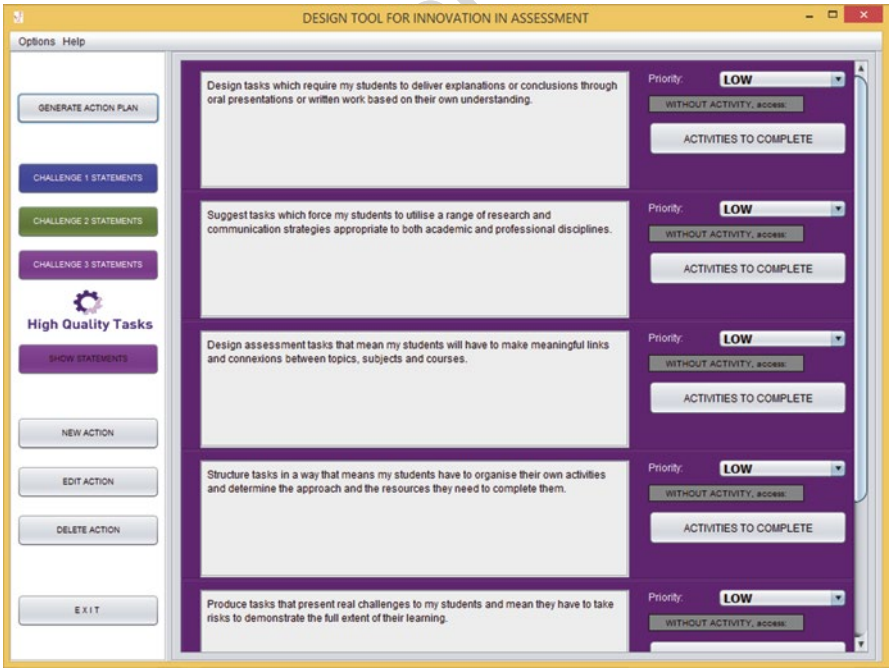


**Fig. 4.5** DINNO® Interface. 5 actions relating to the statement *Design challenging assessment tasks* re the challenge about high quality tasks

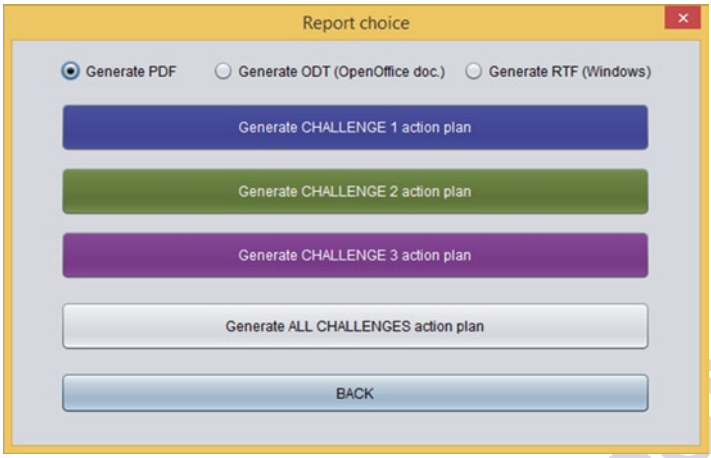


**Fig. 4.6** DINNO® Interface. Generation of Action Plans

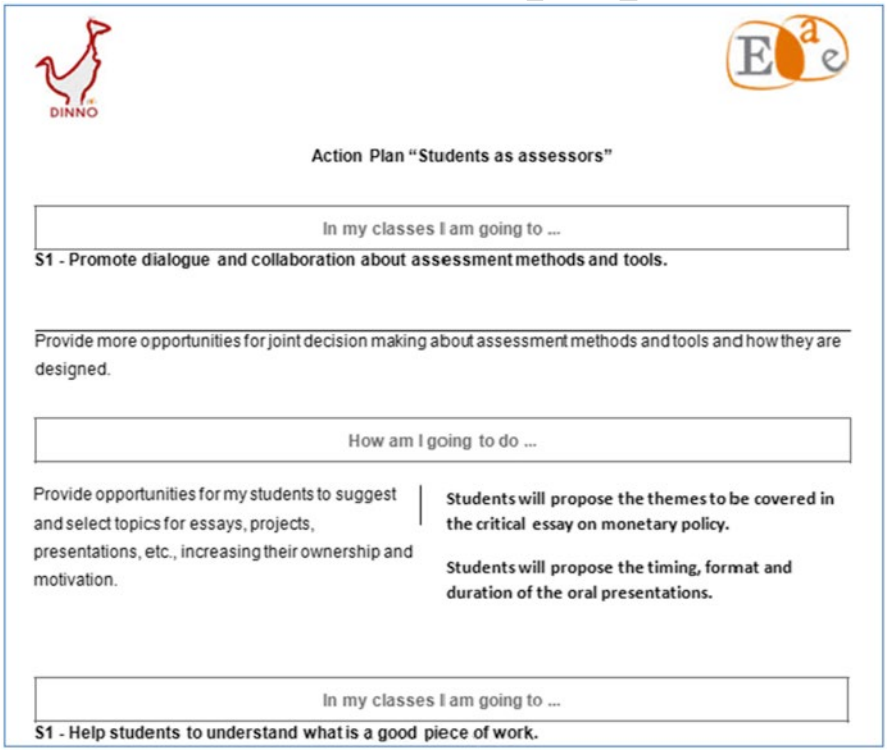


**Fig. 4.7** PDF format sample extract from an Action Plan drawn up using DINNO®

## 4.3 Objectives

The aim of study was to obtain lecturers' responses to the following research questions:

- Do university lecturers believe the DINNO® tool is useful to them for their assessment practices?
- To what extent does the DINNO® tool help lecturers reflect on and plan innovations in their assessments?
- Do lecturers see the DINNO® tool as a resource that benefits their professional development?

## 4.4 Methodology

This study, based on a quasi-experimental single group posttest design, followed a survey methodology. During 2014 academics from various Latin American universities participated in various editions of the EVAPES-DevalSimWeb Training Programme that was primarily aimed at training tutors in assessment. In the context of this training programme they were presented with the DINNO® tool and they used it to design an Action Plan for innovation in their assessment practices. After using the tool 60 tutors responded to a specific questionnaire on the usefulness of DINNO®.

### *4.4.1 DINNO® in the EVAPES-DevalSimWeb Training Programme*

Training in the fundamentals and use of the DINNO® tool took place during the third training unit *The challenges of assessment for learning and empowerment in Higher Education* as part of the EVAPES-DevalSimWeb Training Programme *Assessment for Learning in Higher Education*.[3] The design, development, implementation and assessment of this training programme sought to address the following specific objectives:

- To promote the improvement and widespread use in universities of computer and web-based assessment tools developed in open source format, to encourage self-regulation and strategic learning that lead to improvements in the quality of higher education.
- To promote innovation in universities through changes in assessment models that promote skills development and continuous learning throughout the lives of their students.

[3] DevalSimWeb Project- *Development of professional skills through participatory assessment and simulation using web-based tools*. Ref. ALFA III (2011)-10. Funded by the European Commission.

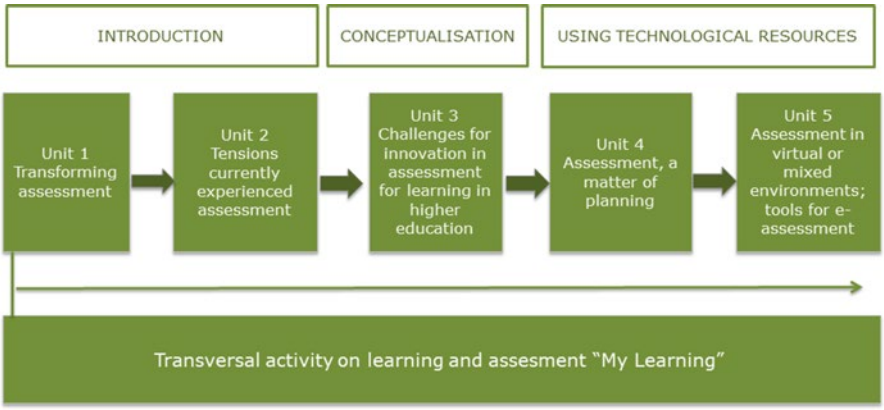


**Fig. 4.8** Organisation of the EVAPES-DevalSimWeb Training Programme

- To encourage the professional development of university tutors by increasing their level of competence so that they can address the assessment of student learning from a democratic and participatory perspective, using an approach that is based on self-regulation and strategic student learning and the use of open source LMS.

This training programme is accredited with 4 ECTS credits (100 h) and uses a blended learning strategy; virtual learning accounting for 80 h and physical class attendance 20 h.

Figure 4.8 illustrates the structure of the programme, divided into five training units and a transversal learning and assessment activity. The first two units introduce and foster reflection on assessment. The third unit focuses on conceptualizing assessment and on the challenges for innovation in higher education using the DINNO® tool. In the last two training units technological resources are used to design assessment procedures and to develop assessment tools that require the involvement of all concerned.

Within Unit 3, which focuses on the challenges of innovation in assessment for learning in higher education, DINNO® is specifically contextualized and used with the aim of developing an Action Plan for innovative assessment. Table 4.1 shows the contents of this unit. Training unit 3 entails 30 learning hours, virtual learning accounting for 22 h and class attendance 8 h.

### *4.4.2 Research Sample*

A total of 60 lecturers completed the online DINNO® Assessment Questionnaire. Table 4.2 shows the distribution of gender, the university of origin[4] and the subject or disciplinary area of the participants.

[4] Pontificia Universidad Católica de Ecuador—Sede Ibarra (PUCESI), Universidad de Costa Rica (UCR), Universidad Nacional Agraria de Nicaragua (UNA).

t1.1 **Table 4.1** Contents of Unit 3 of the EVAPES-DevalSimWeb Training Programme

| | |
|---|---|
| Unit 3 | *The challenges of assessment for learning and empowerment in higher education* |
| | • Assessment for learning and empowerment |
| | • The challenges of assessment for learning and empowerment |
| | – The challenge of student participation. Students as assessors |
| | – The challenge of feedforward. How to improve students' performance through assessment |
| | – The challenge of creating high quality assessment tasks. Assessment as learning |
| | • Innovation in assessment: the Action Plan as a prior stage to implementing assessment |

t2.1 **Table 4.2** Sample distribution by gender, university and disciplinary field

| | n | % |
|---|---|---|
| Gender | | |
| Male | 18 | 30.00 |
| Female | 42 | 70.00 |
| University | | |
| PUCESI (Ecuador) | 26 | 43.33 |
| UCR (Costa Rica) | 27 | 45.00 |
| UNA (Nicaragua) | 7 | 11.67 |
| Disciplinary field | | |
| Art and Humanities | 10 | 16.67 |
| Pure Sciences | 11 | 18.33 |
| Health Sciences | 10 | 16.67 |
| Social Sciences | 20 | 33.33 |
| Engineering and Architecture | 9 | 15.00 |



### 4.4.3 Instrument

After completing the training programme the tutors completed the DINNO® assessment questionnaire. This instrument consisted of eight Likert type questions with six levels of response (1 = Minimal; 6 = Maximum) and two open questions where tutors indicated the most positive aspects and those they felt that could be improved. In total, the tutors had to give their opinions on 28 questions about the tool.

The internal consistency of the online questionnaire was measured using Cronbach's Alpha statistic (0.98). The consistency of the tutors' responses was also determined by the use of two very similar questions, which produced a Weighted Kappa coefficient of 0.205 ($p = 0.007$ ***).

### 4.4.4 Data Analysis

The IBM-SPSS v22® software package was used to analyse the data. First, a descriptive analysis of measures of central tendency (Mean, Standard Deviation), reliability analysis and graphical analysis was completed. The Mann–Whitney U Test was

then used to identify the possible existence of differences in opinions depending on the subject area or discipline, the university of origin or gender of the respondent.

## 4.5 Results

### *4.5.1 Value Differences*

No statistically significant differences ($p<0.05$) are found concerning the subject area of respondents. Differences are, however, found in relation to the university of origin and gender.

In the case of the university of origin differences are found only in a total of five items from the tutors of the University of Costa Rica (UCR) who indicate a lower overall score for the usefulness (M = 5.07; SD =. 91) and clarity (M = 4.93; SD = 0.87) of DINNO®; its design appeal (M = 4.96; SD = 1.01), ease of use (M = 4.78; SD = 1.21) or whether it helped them to plan actions (M = 4.93; SD = 1.10), in comparison to the view held by tutors from the other two universities, who delivered scores in excess of 5 for each of these items.

The differences detected in the opinions of tutors analysed by gender are greater. In general, female respondents give higher scores to 57.14 % of the items, suggesting that women perceive greater value and benefits than men from using the DINNO® tool.

### *4.5.2 The Usefulness and Benefits of Using DINNO®*

One of the essential characteristics for a technological tool to facilitate any work is its usability, meaning the extent to which it can be employed by specified users to achieve the objectives set out effectively, efficiently and satisfactorily within a specified context of use (ISO/IEC TR 25060: 2010).

Overall 87.34 % of the tutors say that they are satisfied with the use of DINNO®. The following sections present the results of asking the tutors about the design of the interface and the benefits and usefulness of the tool, both from an individual and an institutional perspective.

#### 4.5.2.1 Interface Design

We can see in Fig. 4.9 how the DINNO® tool has an attractive design for 80 % of tutors (M = 5.20; SD = 0.97), that it is friendly and easy to use according to 78.33 % (M = 5.17; SD = 1.09) and the information is presented in a clear and precise way in the opinion of 81.67 % (M = 5.25; SD = 0.96).

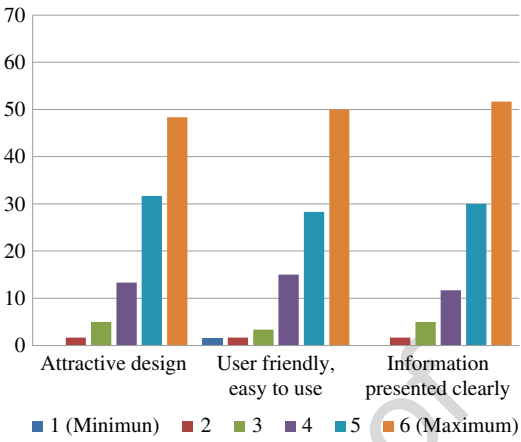


**Fig. 4.9** Design, user-friendliness and clarity of DINNO®

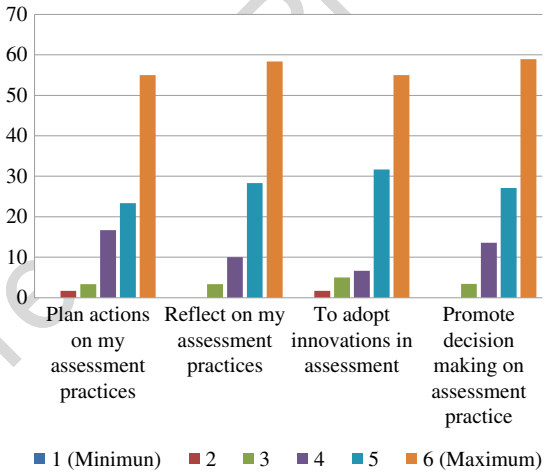


**Fig. 4.10** Rating for personal use of DINNO®



### 4.5.2.2 Individual Usefulness for Assessment Practice

Figure 4.10 presents the results obtained from asking the tutors about the use they have made of DINNO® from an individual and personal perspective. We can see how the most valued aspects (86.66 %) are that DINNO® helps them to reflect on their assessment practices (M = 5.42; SD = 0.89), has provided them with a structure to produce an Action Plan (M = 5.34; SD = 0.84), has provided them with an analysis of their actions to implement innovations in their assessment practices (M = 5.33; SD = 0.93) and allowed them to plan specific actions to take regarding their assessment practices (M = 5.27; SD = 0.97).

#### 4.5.2.3 Help with Reflection and Planning

In Fig. 4.11, from a global, institutional perspective, we can see the results from asking tutors about the extent to which the DINNO® tool allows university lecturers generally to engage in certain activities relating to assessment in higher education. In this regard it is worth noting how the tutors indicate that the use of DINNO® fosters innovation in the process of assessment (M = 5.50; SD = 0.81), is useful when introducing innovations in assessment (M = 5.48; SD = 0.85), and serves to systematize planning (M = 5.47; SD = 0.83) and to reflect on assessment practice (M = 5.45; SD = 0.81).

#### 4.5.2.4 Professional Development

When tutors were asked about the usefulness and benefits of DINNO® for the professional development of lecturers they also express a highly positive opinion (Fig. 4.12). In this sense, university tutors believe that using DINNO® in relation to their assessment practice improves their level of competence (M = 5.43; SD = 0.83); it facilitates the introduction of innovations in the process of assessment (M = 5.42; SD = 0.85); it can be used in university teaching (M = 5.35; SD = 0.88); it serves to encourage innovation in universities (M = 5.48; SD = 0.74) and according to 82.76 % it should be more widely used in higher education institutions (M = 5.33; SD = 0.87).



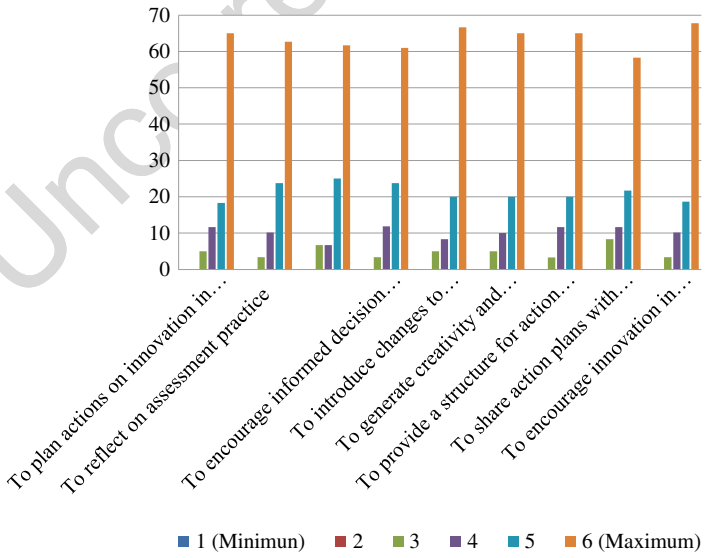


**Fig. 4.11** Help with reflection and planning

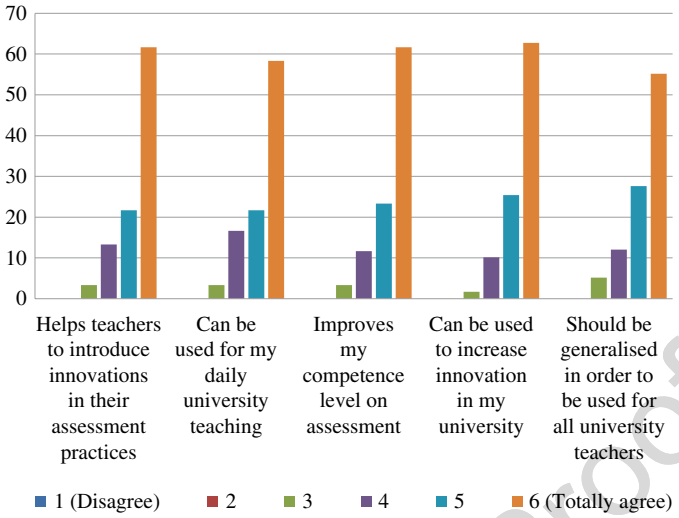


**Fig. 4.12** Usefulness for the professional development of university tutors



## 4.6 Conclusion

According to the opinions of the university tutors who used the DINNO® tool it is user-friendly, has an attractive design, provides clear and detailed information, provides motivation and, consequently, is easy to use when considering assessment practice.

This study presents data which highlight the real possibilities and benefits of the DINNO® tool. In terms of its usefulness the majority of tutors feel that the tool helped them to reflect on their assessment practice and to plan developmental actions. Tutors also state that the use of DINNO® in Higher Education institutions would encourage and support the implementation of changes and innovations in assessment practice that would beneficial both in terms of systematizing the assessment planning process and of reflecting on and analysing assessment practices whilst enhancing creativity and motivation to effect changes.

In relation to their professional development, tutors highlight in general that by using DINNO® they improve their assessment skills, can introduce innovations in their assessment process and that the tool is useful for driving innovation in universities.

Biggs (2015) maintains that it is necessary to introduce innovations in higher education in order to construct a coherent system in which student learning becomes the focal point. From the perspective of assessment this study has indicated where these innovations should be directed (Boud and Associates 2010; Brown 2015; Taras 2015) and, as Boud (2015) asserts, a new focus on assessment is needed in order to put the spotlight on the promotion of lifelong learning, which encourages

student participation in the assessment process, so that students are able to make judgments about their own learning process.

Based on the results obtained in this study, we believe that the DINNO® tool facilitates lecturers' analysis, reflection and decision making about assessment practice, due to its appealing design and easy usability. Its effectiveness results from providing choices and perspectives, offered in the form of the specific actions suggested for each of the various statements that make up every challenge. These choices and perspectives enable analysis of what is done and what can be done, opening the door to innovations in assessment which are oriented and focused towards developing a sustainable assessment process which empowers the students' learning processes. In this regard we believe that the DINNO® tool guides and facilitates decision-making to innovate in assessment because it is based on solid data regarding improving assessment practice. We consider that, in this case, DINNO® represents useful and innovative technology because it is contextualized and supports contemporary notions of assessment as learning and empowerment.

**Acknowledgement** This work was supported by DevalSimWeb Project- Development of professional skills through participatory assessment and simulation using webbased tools - Ref. ALFA III (2011)-10, funded by the European Commission, and the DevalS Project (Ref. EDU2012-31804) funded by the Spanish Ministry of Economy and Competitiveness.



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# Chapter 5
# Towards Sustainable Assessment: ICT as a Facilitator of Self- and Peer Assessment

**Gregorio Rodríguez-Gómez and María Soledad Ibarra-Sáiz**

**Abstract** This study describes an e-assessment experience undertaken at a Spanish university. Students taking the Project Management module undertook e-self-assessment and e-peer assessment, using the web service EvalCOMIX®. The aim of the study was to identify to what extent students valued technological resources designed for assessment and their opinion of participative forms of e-assessment. Four assessment tasks were designed to undertake during one semester. For each task students had to hand in a piece of work or undertake an assignment to be assessed. The students were asked their opinion on this experience. The results of this survey among 108 students showed, firstly, that they valued e-assessment highly. Secondly, it showed that students found these e-assessment formats very useful for the development of skills such as the application of knowledge, arguing a point, problem solving, analysing information, communication, autonomous learning, ethical considerations, creativity, group working, critical and analytical judgement and decision-making.



## 5.1 Introduction

This study originated from an interest in two key issues in Higher Education: student participation in assessment, specifically self- and peer assessment, and the way information and communication technologies are used in assessment.

The importance of student participation in assessment has been highlighted by many authors, significantly, Brown and Glasner (1999), Dochy et al. (1999), Falchikov (2005), Brown and Pickford (2006), Ibarra-Sáiz et al. (2012), Gielen et al. (2011) or Strijbos and Sluijmans (2010), among others. Sambell et al. (2013) go as far as to suggest student participation in assessment should be a requirement of all university curricula.

This study starts from the premise that not only should university students play an active role in the assessment process but that when they do their judgements are

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equal to those made by teaching staff, as demonstrated in works by Gessa Perera (2011), Smith et al. (2013) or Boud et al. (2014).

The literature review in Nulty (2011) concludes by recommending that greater use should be made of peer and self-assessment. Having acknowledged the importance of student participation through self-assessment (Boud 1995; Bourke 2014) and peer assessment (Topping 2009, 2010) the next step is to determine how best this can be implemented using technological resources.

The use of technology for innovation is integral to educational practice. McKezee et al. (2013: 20), based on an analysis of three different research projects focused on professional development of the faculty, conclude that 'integrating technology into traditional teaching and learning settings was one of the three most important issues' and they suggest that 'professional educators have always been eager to advantage their students by attempting to add the latest advancement to their instructional practices'. However, as put forward by Whitelock and Basher (2006), from a personal perspective, a variety of barriers may restrict the use of e-assessment, such as the attitude of staff and of learners, training/development issues and changing methodologies. This study focuses attention on student attitudes, since the other barriers could be seen as having been overcome. Appropriate resources were in place to implement e-self- and e-peer assessment; teaching staff were positive and had sufficient training to deliver these assessment formats using technology, and, finally, the suitability of the assessment format had already been established in relation to the specific nature of the assignment and the students. Consequently, the focus was to investigate the confidence, skepticism or preferences that students demonstrated in relation to more traditional methods and consider things from the perspective proposed by Whitelock when recommending 'Let us envisage new forms of e-assessment and then build and evaluate them' (2009: 202) based on the need identified by Haythornthwaite and Andrews (2011): 14 'to situate technologies within their social, political, economic and pedagogical contexts'.

Participation means students should be experts in assessment or, as suggested by Price et al. (2012: 14), 'students need to be assessment literate'. But, within a technology-based context we need to widen the concept of assessment literacy and, as proposed by Eyal (2012), talk rather of 'digital assessment literacy'. In essence, the aim of this research was to analyse students' perception of their involvement in e-self-assessment and e-peer assessment and how they regard using web-based services specifically designed for these forms of assessment. In particular, the study aims to find answers to the following questions:

- To what extent do students feel their involvement in assessment using electronic resources, enhances their skills development and is useful for their future employment?
- Do students feel that their involvement in self- and peer assessment is useful and beneficial?
- How reliable do students think their own and their peers' assessments are?
- How valuable do students think the web-based EvalCOMIX® programme is for e-self- and e-peer assessment?

## 5.2 Sustainable Assessment and Student Participation

Located within the context of the learning society, Boud (2000: 151) incorporates the concept of 'sustainable assessment', understood as 'assessment that meets the needs of the present and (also) prepares students to meet their own future learning needs'. Consequently, if the objective is for students to be efficient and effective learners throughout their lives they need specific training in assessment so that they can successfully deal with assessing their own performance in both their academic and future working environments, the latter aspect having been endorsed by Boud and Associates (2010) in their set of proposals 'Assessment 2020'.

Falchikov (2005) demonstrated the vital importance of involving university students in assessment processes. This involvement can take place at different times such as when planning assessments, that is to say when determining the type of assignments or tasks that will be assessed, the assessment criteria, the assessment instrument to be used and who will undertake the assessment. It can continue during the development of learning and assessment tasks using self-assessment, peer assessment and co-assessment of the progress that is being made or by evaluating the initial outcomes or work handed in for which students receive feedback to help them improve their subsequent performance. And it can end with the assessment of the final tasks or outputs through self-assessment, peer assessment and co-assessment.

In line with the reference framework and principles put forward by Nicol (2007, 2009) relating to assessment in Higher Education, aimed at encouraging student reflection on their own work and the work of others and, as shown by Vermunt (2013), to help them become independent learners, student involvement within this current study has focused on self- and peer assessment because, as suggested by Smith et al. (2013: 44) 'To become self-regulated learners, students need to be able to judge their work, identify its merits, locate its weaknesses and determine ways to improve it'.

## 5.3 Technologies for Assessment

Initial attempts to incorporate technology into assessment processes meant, to some extent, a conceptual backwards step to earlier stages of development in assessment. Boud (2007) revealed that the key discovery in the field of assessment in the 1960s was the incorporation of the progress that came from educational measurement, integrating the concepts of reliability and validity and the rapid spread of test type exercises and objective exercises. When technology became widely used in Higher Education, especially through Learning Management Systems (LMS) like Blackboard® or Moodle® in the initial decade of this new millennium, multiple choice objective tests again became fashionable as rapid and effective assessment formats.

This led to a seemingly paradoxical and contradictory situation because the theoretical and conceptual developments achieved in relation to assessment in Higher Education from the 1980s to now have insisted on the need to design authentic tasks (Ashford-Rowe et al. 2014) with a clear aim to achieve sustainability (Vermunt 2013; Boud 2000) which require students to produce outcomes or undertake tasks of a complex nature which demand equally complex assessment techniques and instruments.

Following this line, innovative proposals have been made in recent years for using technology in assessment processes which are both more advanced and more valuable than the classic notions of 'true or false' or multiple choice questions. Of particular importance are the contributions from Davies (2009), Willey et al. (2009), Loddington et al. (2009) or Liu and Li (2014), as well as those delivered by JISC (JISC 2010; Winkley 2010).

In this study EvalCOMIX® web service for e-assessment was used to facilitate self- and peer assessment. EvalCOMIX® has been developed to facilitate the design of assessment and enable two main activities to be carried out. Firstly, the design and management of complex assessment tools such as checklists, rating scales, semantic differential questions or rubrics (Fig. 5.1) with comments and observations. Secondly, integrated within an e-learning environment such as Moodle®, it allows these assessment tools to be used for self-, peer and tutor assessment (to review or mark) and to provide immediate feedback (Fig. 5.2).



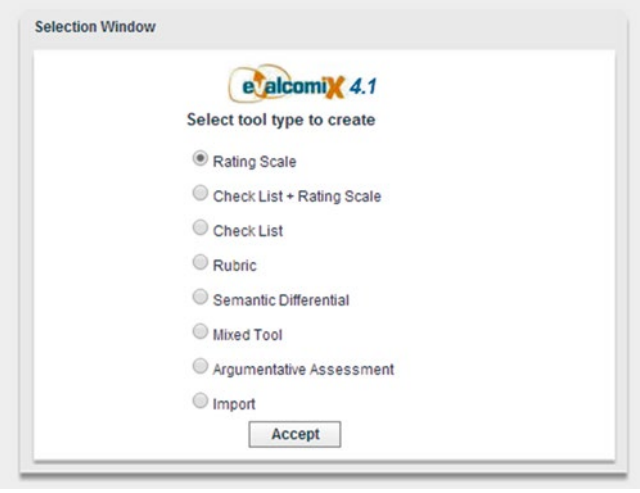


**Fig. 5.1** EvalCOMIX® interface to the design and management of assessment tools

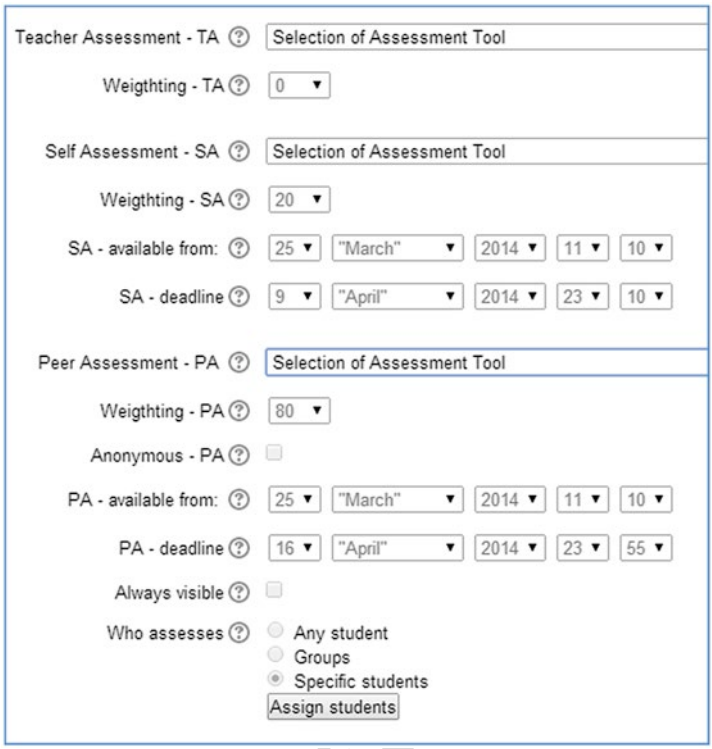


**Fig. 5.2** EvalCOMIX® interface to the design of self-, peer and tutor assessment

## 5.4 Methodology

A survey was used for this study, based on the logic of a quasi-experimental posttest design. At the end of the academic years 2012/2013 and 2013/2014 students responded voluntarily to a questionnaire on completion of the Project Management module.

## 5.5 Participants

The participants in this study were Year 4 students on the Business Administration and Management Degree or the Finance and Accounting Degree who took the Project Management module during the first semester. A total of 73 students took the module in 2012/2013 and 92 students took it in 2013/2014.

At the end of the semester 108 students completed the questionnaire (65.4 % of the total), of which 50.9 % were female and 49.1 % male. 44 students from the 2012/2013 cohort (60.2 % of registered students) and 64 students from the 2013/2014 cohort (69.6 % of those registered) took the questionnaire.

### *5.5.1 Supervision*

#### 5.5.1.1 The Assessment Tasks

Initially the team of academics responsible for the module designed a range of assessment tasks based on the conditions that Ashford-Rowe et al. (2014) consider to be the key elements of authentic assessment:

- An authentic assessment should be challenging
- The outcome of an authentic assessment should be in the form of a performance or product
- Authentic assessment design should ensure transfer of knowledge
- Metacognition as a component of authentic assessment
- The importance of a requirement to ensure accuracy in assessment performance
- The role of the assessment environment and the tools used to deliver the assessment task
- The importance of formally designing-in an opportunity to discuss and provide feedback
- The value of collaboration

In particular, at the beginning of each half-semester, students were shown the learning and assessment tasks that they would be asked to complete: (1) Analyse projects from a methodological perspective; (2) Plan a project; (3) Evaluate projects; and (4) Design a project for an end of course dissertation.

The following skills are developed through these assessment tasks: application of knowledge (AK), arguing a point (AR), problem solving (PS), analysing information (AI), communication (CO), autonomous learning (AL), ethical considerations (EC), creativity (CR), group working (GW), critical and analytical judgement (AJ) and decision-making (DM).

For each task students were offered a guide to their specific structure and characteristics (type, timescale, outcomes, etc.). They were also told who would mark the work or outcomes and given details of the assessment criteria, instruments and timing. Students were therefore able to clarify what constituted a good piece of work and they were offered information on all the different elements of the assessment, which according to Nicol et al. (2014), is an essential aspect. After they had been presented, each of the assessment tasks was modified as a result of the discussions and agreements with the students on the module and the final assessment criteria, methods, instruments and formats were established. Table 5.1 shows the assessment formats and the assessment instruments used in each case.

In accordance with the typology established by Taras (2010) the self-assessments undertaken by the students could be characterised globally as conforming to Tara's model, as the criteria were agreed between the tutor and the students, feedback was given both by the tutor and their peers and the final marks were awarded by the student and their tutor.

Based on the variables that Gielen et al. (2011) consider to be the main characteristics of peer assessment it can be said that in this study the objects of the assessment were both the artefacts (technical reports, essays) and observed behaviours (oral

t1.1 **Table 5.1** Assessment modalities and assessment tools

| t1.2 t1.3 Tasks and artefacts or performances | Assessment modalities | | | Assessment tools |
|---|---|---|---|---|
| | Self | Peer | Tutor | |
| t1.4 *Project analysis* | | | | |
| t1.5 t1.6 Comparative report | | X | | Rating scale for the evaluation of the comparative report |
| t1.7 t1.8 Report on methodology | X | X | X | Rubric for evaluating methodological reports on professional documents |
| t1.9 t1.10 Oral presentation | | X | | Rating scale for oral presentations and vivas on the methodological reports |
| t1.11 *Project planning* | | | | |
| t1.12 t1.13 Draft plan for end of course report/dissertation | X | | | Checklist for planning pre-projects |
| | X | | | Rating scale for evaluation reports |
| t1.14 *Project evaluation* | | | | |
| t1.15 t1.16 t1.17 Report on evaluation of draft plan for end of course report/dissertation | X | X | X | Rating scale for evaluation reports |
| t1.18 *Design and planning of dissertation* | | | | |
| t1.19 t1.20 Design and planning of end of course report/ dissertation | X | X | X | Rating scale for design of the end of course report/dissertation |
| t1.21 t1.22 t1.23 | X | X | X | Checklist and rating scale for the timeline, Gantt Chart and operational plan |

presentation). Furthermore, the assessment was used initially in a formative way, to encourage improved performance, but also summatively.

#### 5.5.1.2 Assessment Tools

The web service EvalCOMIX® was used for all of the assessments with different instruments being used as required. Students could do the assessment either in class or outside class depending on the nature and characteristics of the product or performance being assessed.

### *5.5.2 Instrument*

At the end of the semester the students completed an online questionnaire (Questionnaire on levels of satisfaction of participation in the assessment process) comprising 12 Likert type questions with six levels of response (1 = Totally disagree; 6 = Totally agree), structured as follows:

(1) The *influence* of their involvement in the assessment on their development of skills
(2) The *usefulness and benefits* of self-assessment and peer assessment

(3) The *credibility* students give to self-assessment and peer assessment
(4) The *effectiveness* of the web-based service EvalCOMIX® for undertaking self-assessment and peer assessment

The internal consistency of the online questionnaire was measured using Cronbach's Alpha statistic (0.975). The consistency of the students' responses was also determined by the use of two very similar questions, which produced Weighted Kappa coefficients of 0.55 ($z=5.825$; $p=0.000$***) and 0.64 ($z=6.885$; $p=0.000$***), respectively.

Because ordinal measures were used with a Likert type scale, multidimensional scaling analysis was used -PROXSCAL- (normalized raw stress: 0.09605; Dispersion Accounted For (DAF): 0.90395 and Tucker's Coefficient of Congruence: 0.95077), which all indicate a well-designed model.

### *5.5.3 Data Analysis*

IBM-SPSS v22® and ROPstat® were used for the data analysis. First, the Mann–Whitney t-test and *U*-test were used to identify if there were significant differences between the two cohorts. As no differences were found ($p<0.05$) between the students from the first and second cohorts it was decided to continue with the data analysis considering the data from all the subjects as a single group.

To identify any statistically significant differences between the values of the two assessment Methods (self-assessment and peer assessment) the t-test was used on related samples and the size of the Vargha-Delaney A measure was calculated.

## 5.6 Results

Even when the online questionnaire was concerned with the students' degree of satisfaction with their participation in the assessment process, this study only focuses on the key results relating to self-assessment and peer assessment.

### *5.6.1 Skills Development*

With regard to general skills development it can be seen overall that students gave very positive scores to both self-assessment and peer assessment, both in terms of the consequences they had for their personal skills development and their usefulness and interest.

In Fig. 5.3 it can be seen how both self- and peer assessment has helped a great deal with their skills development [application of knowledge (AK), arguing a point

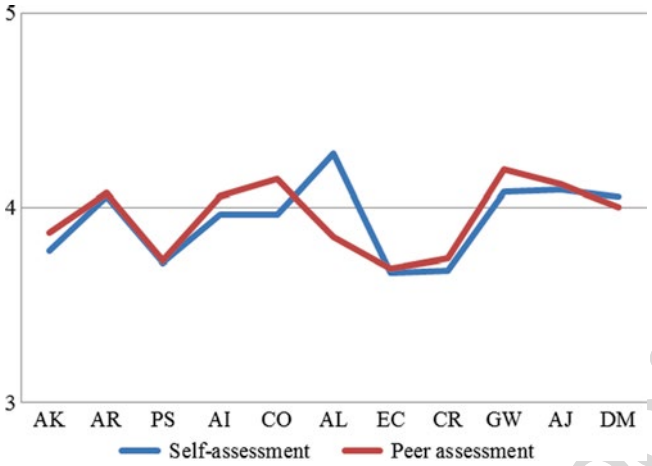


**Fig. 5.3** Average scores for the development of skills through the use of self- and peer assessment

(AR), problem solving (PS), analysing information (AI), communication (CO), autonomous learning (AL), ethical considerations (EC), creativity (CR), group working (GW), critical and analytical judgement (AJ) and decision-making (DM)]. In every case the average scores were above 3.6 and in five of them they exceeded an average of 4, specifically in arguing a point (AR), autonomous learning (AL), group working (GW), critical and analytical judgement (AJ) and decision-making (DM).

Statistically significant differences were only found in relation to the skill of autonomous learning (AL) [$t(107) = -4.07$, $p = 0.000$***, $A_{YX} = 0.39$] in that students felt it was self-assessment that was of greater use in developing this skill.

#### 5.6.1.1 Usefulness and Benefit

When asked to what extent these assessment methods could help them in their future professional lives their overall response was very positive. In fact, the responses to all questions of this type gave average scores in excess of 4.

No significant differences were found between the scores given to self-assessment and peer assessment in relation to 'learn how to assess the necessary effort and dedication to complete a task' ($M_{Self} = 4.23$; $SD_{Self} = 1.05$; $M_{Peer} = 4.32$; $SD_{Peer} = 1.15$); 'identify missing information and errors' ($M_{Self} = 4.30$; $SD_{Self} = 1.18$; $M_{Peer} = 4.25$; $SD_{Peer} = 1.18$) or 'analyse one's own work and that of others' ($M_{Self} = 4.34$; $SD_{Self} = 1.09$; $M_{Peer} = 4.32$; $SD_{Peer} = 1.15$). However, students did feel that although self-assessment was the best strategy for 'developing learning from mistakes' [$t(107) = -2.45$, $p = 0.01$*, $A_{YX} = 0.42$], peer assessment is seen as best for 'learning to help others to improve their performance' [$t(107) = 2.45$, $p = 0.01$*, $A_{YX} = 0.57$].

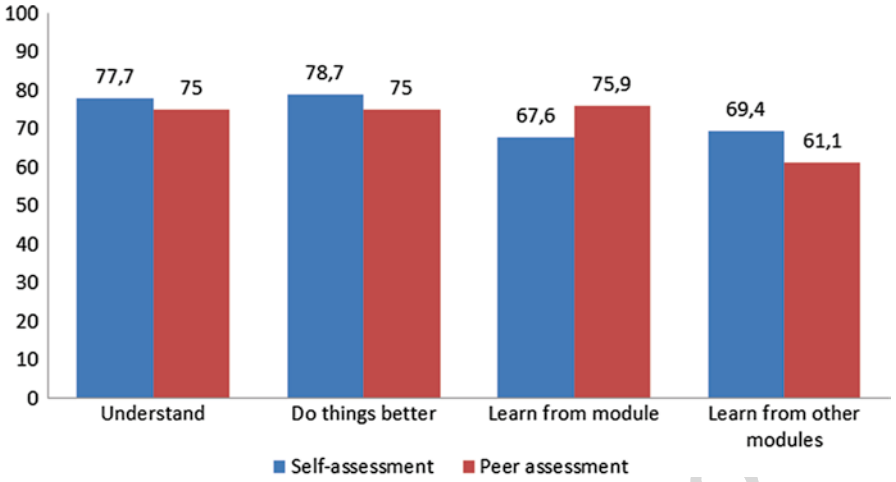


**Fig. 5.4** Percentages of the students that valued the use of self- and peer assessment

In terms of the possible benefits of undertaking self- or peer assessment (Fig. 5.4) the average scores were also greater than 4. In fact, for most students, having undertaken self- and peer assessment has helped them to 'better understand how to carry out all the tasks in this module', to 'know how to do things better in subsequent tasks', to 'learn from this module' and 'learn from other modules'.

The differences between the two assessment methods are statistically different in only one case. Peer assessment has actually been more useful to students than self-assessment in terms of 'learning from the module' [$t(107)=2.09$, $p=0.03$*, $A_{YX}=0.46$].

### *5.6.2 Reliability and Confidence in Self-Assessment and Peer Assessment*

In relation to how students considered the reliability of these participative assessment methods and their confidence in them they believe that the assessment they make of their peers' work is more 'credible', 'objective', 'provides information' and 'is done in a more rigorous way' than that which they receive from their peers. This indicates a degree of concern about the assessments done by their peers. It is confirmed by the fact that 45.4 % of the students believe that knowledge of or a degree of friendship with their peers has little or no influence on the marks they give them. In contrast, only 26.9 % of the students feels that this knowledge of or the degree of friendship with their peers has little or no influence over the marks their peers gave them personally. As can be seen in Fig. 5.5, when students were asked to evaluate different assessment methods they feel the tutor's assessment is the most rigorous, credible, useful and objective, followed by self-assessment and finally, peer assessment.

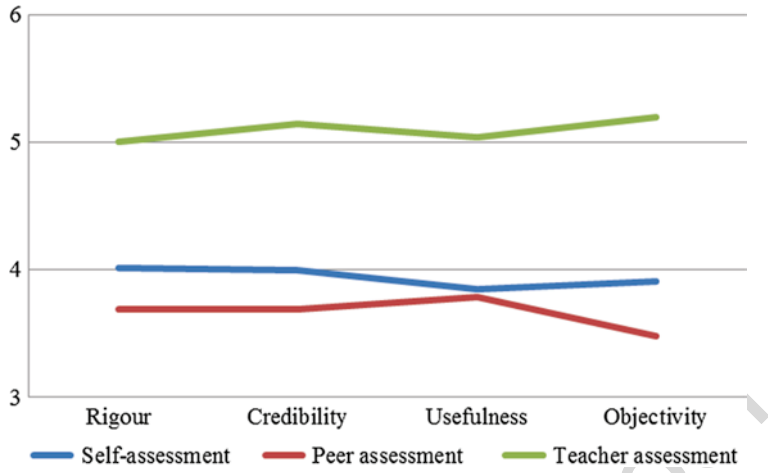


**Fig. 5.5** Average scores for the differences between assessment methods

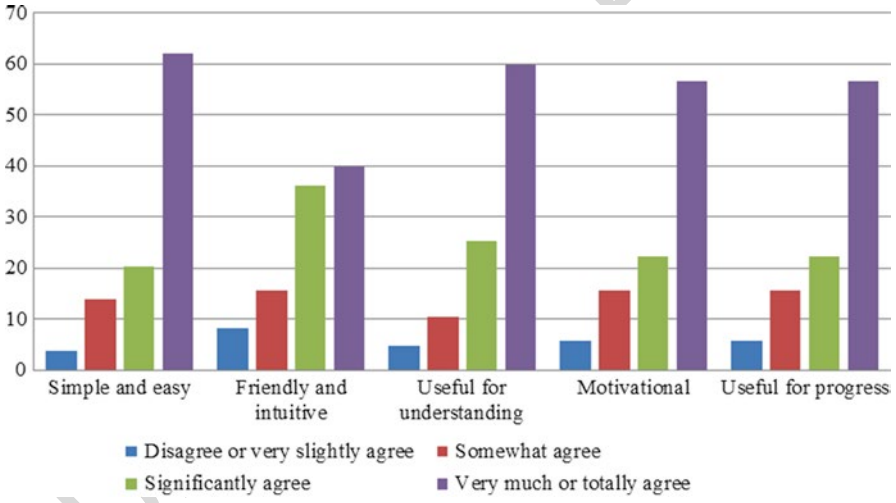


**Fig. 5.6** The students' scores in relation to the use of the EvalCOMIX® web service for self-assessment and peer assessment

### *5.6.3 Technology as a Facilitator*

Figure 5.6 shows the results when the students were asked about the use of EvalCOMIX® for self- and peer assessment. It can be seen that the students agreed to a greater extent that using EvalCOMIX® was 'useful by providing in advance an understanding of the assessment criteria and instruments as well as the precise items

that would be assessed' (M = 4.65, SD = 1.09). They also felt that using EvalCOMIX® was 'simple and easy' (M = 4.61; SD = 1.10); 'valuable because the information it provided could be used to improve subsequent tasks or activities' (M = 4.50, SD = 1.14); 'motivational in that you get the self- and peer assessments and the tutor's assessment all together' (M = 4.49, SD = 1.17) and, finally, it is 'a friendly and intuitive environment' (M = 4.24; SD = 1.19).

## 5.7 Discussion Points

This study has focused on the assessment of activities (e.g. oral presentations) or complex tasks (reports, case studies) which require students to be able to reflect, make judgements and take decisions based on agreed and understood criteria and standards, all of which are vital aspects of self-directed learning and, therefore, of sustainability in assessment.

In line with other studies in this area (Smith et al. 2013; Planas Lladó et al. 2014) it has been shown that students believe their involvement in the assessment process improves their skills development and is useful for their future employment. This perception demonstrates the importance of using self-assessment or peer assessment, as highlighted by Fallows and Chandramohan (2001), as a means of encouraging self-directed learning among university students.

The importance of having trust in the assessment process has been highlighted by Carless (2009): 86, for whom 'Distrust risks undermining the integrity of assessment practices, and may be a particular impediment to current emphases on the need for assessment to stimulate a productive student learning experience'. In this study the evidence shows that the students, despite being trained in how to do the assessment and having participated in it by making their contribution to the final marks, do not have confidence in their peers' assessments nor do they feel they are reliable. This conclusion is consistent with other experiences in similar contexts (Carless 2009). This lack of confidence makes it even more important to deliver training to students on assessment. For years assessment has been, and continues to be, something specific to teaching staff. Research illustrates the value and usefulness of having all stakeholders involved in the assessment process, but to achieve this students need to break with their current mentality, as do tutors, and become confident in themselves and their peers as trustworthy and impartial assessors. Carless (2009: 87) suggests that 'despite this threat, the development of wider assessment literacy, transparency and collaboration have been suggested as strategies to increase trust', something that several others also advocate, as Price et al. (2012), O'Donovan et al. (2004) or Liu and Li, when they insist that 'training should be provided to prepare students with critical assessment skills, and to assist them in switching roles from learners to assessors' (2014: 287).

This study has paid special attention to the analysis of the possible differences that students perceive between self-assessment and peer assessment and, except for a few small discrepancies, and despite the negative attitudes to assessment by peers

reported in some literature (Liu and Carless 2006; Kaufman and Schunn 2011) both assessment methods are perceived by students as valuable and beneficial for their skills development and their future employment, as supported by other works such as Smith et al. (2013: 58) in the degree to which 'helping students to develop their ability to judge their own and other's work will likely enhance their learning outcomes.'

Finally, one of the issues this study tried to address focused on how the students rated using web-based services for the assessment process. Liu and Li (2014): 287 describe the use of Blackboard® to facilitate peer assessment, based on the use of a peer-assessment forum but emphasise the limitations of their research: 'It would be interesting to see if similar findings would be attainable with other facilitating technology tools'. In particular, one objective of this current study was to analyse the use of the web-based service EvalCOMIX® for both self-assessment and peer assessment. The generally positive score the students gave to the use of this web service confirms the results from similar studies in other contexts, for example those obtained by Dermo (Dermo 2009) who stresses the positive attitude of students to using e-assessment.

Currently there are many different technological tools that can be used for e-assessment (Davies 2009; Nicol et al. 2014) and each of them can be either a help or a hindrance, depending on how they are used and what they are used for. Technologies facilitate and widen the possibilities associated with assessment tasks, simplify participative assessment practices and offer opportunities to provide continuous, faster (Williams et al. 2013) and more sustainable feedback (Archambault et al. 2010).

The ease with which students use technological tools and the value they ascribe to them mean it is vital to refocus the study of how technologies are used in the field of assessment, changing their perception from being simply a contributor to the process to being a means in themselves with a clear communicative aim (Haythornthwaite and Andrews 2011: 213). Consequently the next important step will be to undertake an in-depth study of the use of e-assessment to achieve a global, ecological and contextualised understanding of it, because any technological change brings with it social change and vice-versa.



## 5.8 Conclusions

Through this study the authors have sought to provide evidence of the positive view students have of e-assessment, either self-assessment or peer assessment, and of using web-based services to deliver these processes within a technological context. If these assessment methods were introduced as normal practice into university classes it would create some risk and uncertainty which on occasions might not count on the necessary institutional recognition or support or, indeed, might even be in conflict with the institution. However, as proposed by Sambell et al. (2013: 152), 'assessment should be the point where knowledge, ideas and understanding are

generated and exchanged—a process that is at the heart of the university'. The skills and competencies required in the twenty-first century are continually evolving and so education is still required to focus on developing core transferable skills, among which lifelong learning is considered fundamental. In this context e-assessment must ultimately develop from being a model based solely on the assessment of knowledge revealed by the learner into a form of holistic, authentic and fully integrated assessment (Redecker and Johannessen 2013).

It is important to remain vigilant, though, and cautious about using technology in assessment processes as technology 'per se' does not automatically deliver innovation. In fact, it often means things go backwards. Currently, therefore, the challenge is about developing tools and technological resources which are appropriate and in line with the pedagogic principles governing the implementation of sustainable assessment strategies and ensuring they are used in practice to support student learning. Assessment as learning and empowerment (Rodríguez-Gómez and Ibarra-Sáiz 2015) establishes a new reference point for assessment in Higher Education that is consistent with the context of change, but its full implementation will require a change of mentality on the part of university students and tutors.

Current projects such as DevalS[1] (Rodríguez-Gómez and Ibarra-Sáiz 2014) and DevalSimWeb[2] (Ibarra-Sáiz and Rodríguez-Gómez 2014) which focus on the professional development of academic staff and their training in assessment and on training students as assessors, that is to say on 'digital assessment literacy', will deliver new perspectives on how technology, through using web-based services such as EvalCOMIX® and serious games as training tools, can play an important role in upskilling staff and students as assessors, encouraging at the same time lifelong learning, fostering self-directed learning among students and preparing them for the transition to working life, all of which are key objectives for universities.

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# Chapter 6
# Entrepreneurship Education: A Tool for Development of Technological Innovation

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**Abstract** The theoretical and practical capacitation on entrepreneurship is a technical and scientific process of technical and scientific development that aims at developing the abilities and competences to businessmen, future entrepreneurs or potential businessmen, to promote social and economic development, generation of jobs and income, professional efficiency and business strategies. This technological development can be pointed as a propeller of the dynamic factors of development in Brazil. While Brazil moves towards development, the universities have a role of promoting agents, providing theoretical-practical support for the entrepreneurship and innovation. This work has as an aim to identify, explain and evaluate how the subject Entrepreneurship has an impact on the students of Business Administration, Engineering and Computer Science (IT) developing technological innovations generated in incubated companies that have a technological basis and graduated (companies that have finished their process in the incubators). The research has been done with incubated entrepreneurs and graduates that had followed the subject of entrepreneurship and others that had not done it. It is an exploratory practice study on a sample of 30 businesspeople, selected among incubated companies of technological basis, with less than 2 years of foundation, and graduated with less than 4 years. The result has allowed us to observe a significant percentual increase in the group that has taken the discipline. This fact shows that, for the group that has taken the subject of entrepreneurship, there is a direct relationship with the development of the technological innovation. A conclusion can be reached that the obtained result shows the importance of the subject of entrepreneurship for the democratization of



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the entrepreneur culture, expansion of the professional teaching and the technological development. The interest lies in relating the Public Policy of Technological Development, later than the promulgation of the Law of Technological Innovation (http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2004/lei/l10.973.htm) with the obtained results and to debate the strategies and practices of work in both interviewed groups, so that we can confirm that the creation of technology is really significant. The choice of the case was the result of the innovative profile of the specific legislation for the promotion of technological innovation, opening space to a new guideline in public policies.

## 6.1 Introduction

Since the 1970s, Brazil has been facing several technological and economic transformations. These transformations have been occurring in a linear manner, but following economic fluctuations and global trends. A large part of the growth and productive restructuring process that began in the 1990s promoted particularly the technological and industrial development, the service industry and the establishment of multiple companies.

Within this context, self-employment and informal jobs are increasing. Therefore, entrepreneurship has been rising due to this new reality. Simultaneously, formal education has been encouraged by education loan support and the implementation of a quota system for minorities, providing benefits to people seeking for education at universities. Even with an education system aiming at graduating and leading professionals to the labor market, entrepreneurship subjects that were adopted in the curricula of business administration, computer science and engineering courses began to offer a new option in the labor market. In this sense, the act of undertaking means a rupture with the traditionally known environment, leading to a transformation process, resulting in the identification of a contribution ability to the nation's development and society transformation.

This article analyzes this exact context. Its approach focuses on theoretical and practical entrepreneurship education as a technical and scientific development process, which aims to develop skills and expertise of businessmen, future entrepreneurs or potential businessmen to promote social and economic development, job creation and income, professional efficiency and businessstrategy.

Due to the perception of increased competitiveness among Brazilian companies, entrepreneurs are seeking greater efficiency. The "not quite" professional management was replaced by strategy and technological development.

This technological development might be regarded as a driver of the stimulating factors of Brazil's development. As Brazil is moving towards development, universities take over the role of sponsor, providing theoretical and practical support for entrepreneurship and innovation.

This article aims to identify, explain and assess the impact of the entrepreneurship subject on the development of technological innovations generated in technology-basedincubated companies and graduated companies of business administration, engineering and computer science students.

The study was conducted with incubated and graduated entrepreneurs—in Brazil, graduated companies means companies that have completed the incubation period and are ready for the market—who had attended the entrepreneurship subject and others who had not. This study assessed a group of 30 businessmen, selected among technology-based incubated companies with up to 2 years of operation, and graduated companies with up to 4 years of operation.

The study continues analyzing technology-based incubators, revealing its contribution to technology development in the country and beginning the rupture process of society's predetermined concepts. Finally, conclusions are made, and suggestions are offered for the development of future studies.

## 6.2 Objectives

This theme was chosen due to the need to assess how the entrepreneurship subject linked to a theoretical and practical learningincreases innovation potential in entrepreneurs. Additionally, measurement and explanation of new technologies related to production, management and sustainability systems, while preserving confidential and strategic data, names and developed patents.

The specific objectives of this study are as follows: categorize different types of generated technological innovations; assess potential entrepreneurs and change in corporate culture in businessmen who have already attended the entrepreneurship subject, and determine if the Technological Innovation Act (Law No. 10,973 [1] of December 2, 2004) enactment promoted development.

## 6.3 Methodology

The study conducted is descriptive and investigative. It is investigative, since studies about incubatorsof technology-based companies that are based on the conceptual point of view of the Technological Innovation Act are scarce, and aims to increase knowledge on the subject. It is descriptive, since its intention is to expose characteristics of the national technological development phenomenon, in addition to establish correlations between companies whose entrepreneurs had already attended or had not attended the entrepreneurship subject.

As to the processes used for its investigation, this is a documentary and bibliographic study, and it is also a case study, due to the significance of entrepreneurship studies in Brazil, which is an extremely important matter to further economic development.

It is documentary because it was conducted from documents made available on the electronic network. Primary and secondary sources were used in this study.

The literature search includes a set of books, magazines, articles and materials made available in the electronic network about the topic addressed in order to support the study development.

The methodology consisted of an analysis carried out through interviews and questionnaires in light of theoretical references on entrepreneurship. A questionnaire submitted to the group's participating companies was prepared. Answers were classified, organized into charts and statistically analyzed. Microsoft Excel was the tool used for the study.

However, this study presents some limitations and challenges. First, converting the entrepreneur nature into reality as regards to corporate professionalism. Second, juggling businessmen's time for interviews and questionnaires was a challenge.

This case was chosen due to the innovative nature of laws specific to further technological innovation, paving the way to a new guideline in public policies.

This study demonstrates that the entrepreneurship subject delivered not only meets legal requirements of undergraduate courses and complies with the Technological Innovation Act (2004), but it is also able to enhance the development of technologies, becoming increasingly more important for the nation's development.

The concern is to relate the Technological Development of Public Policy, subsequent to the Technological Innovation Act (2004) enactment, to the results obtained. Discuss strategies and work practices in both interviewed groups so as to confirm that technology generation is indeed important.

## 6.4 Theoretical Framework

### *6.4.1 The Meaning of Entrepreneurship*

According to etymological concepts, the term *entrepreneur* originates from the French verb *entreprendre*, which means to take charge of, be prepared to do something. Originally, the term *entrepreneur* was used to describe participants of the French military expeditions. Eventually, the term came to be used to refer to contractors of the expedition to work in exploration and civil construction. Then, economists Richard Cantillon (1755) and Jean-Baptiste Say (1803), according to Souza's account (2001), employed the term to refer to those willing to take risks, face uncertainties, perform some kind of innovation and create new businesses.

The publication of The Theory of Economic Development of Austrian economist Joseph Schumpeter, in 1911, brought a new meaning to the term entrepreneur, relating to innovation. The role of small enterprises in technological development was studied by Shumpeter throughout his life; the author believed in the importance of small enterprises in the innovation process, which he called creative destruction.

For Schumpeter (1985), the entrepreneur is someone who performs new combinations that can lead to new products, processes, markets, corporate forms or sources of supplies. Thus, Schumpeter considered creative activity as a key element to understand the entrepreneurship phenomenon. He emphasized the identification and exploitation of opportunities, such as the development of a niche market or strategy to meet any needs. Schumpeter defines the entrepreneur as a driving element of the economic system, always relating it to the innovation factor.

For Schumpeter, the essence of entrepreneurship is the awareness and improvement of new opportunities within business, it always has to do with creating a new way of use of natural resources, in which they are displaced from their traditional use and are subject to new combinations (SCHUMPETER *in* Souza 2001).

Dolabela (1999), on the other hand, defines entrepreneurship as a cultural phenomenon. Entrepreneurship is a stimulus movement to the entrepreneurship spirit and the creation of new businesses. This movement is taking shape as a professional option extremely well-regarded within the national economy. This theory is in line with the implementation of the entrepreneurship subject as a new option in the labor market.

Entrepreneurship—ability to create and build something from very little or almost nothing. Primarily, entrepreneurship is a creative act. It is energy concentration in the beginning and progression of an undertaking. It is the development of an organization as opposed to its observation, analysis or description. But it is also the individual awareness in noticing an opportunity when others see chaos, contradiction and disorder. Having abilities to discover and control resources, applying them in a productive manner (Barreto 1998).

### *6.4.2 What Does It Mean to Be an Entrepreneur?*

Entrepreneurs are individuals endowed with innate characteristics or qualities, without which these people would be just like the others. The characteristics of an entrepreneur were described by Filion (1999): aggressiveness, high energy level, self-confidence, self-awareness, self-esteem, learningability, ability to take moderate risks, ability to innovate, leadership, ability to recognize opportunities and make the right decisions, creativity, energy, flexibility, skill in the use of resources, ability to conduct situations, independence, initiative, independence and success-oriented, results-oriented, originality, optimism, persistence, sensibility to others, tenacity, tendency to trust people, tendency to regard money as a performance measure and tolerance to ambiguity and uncertainty. Filion (1999) also mentions physical attributes, popularity, sociability, intelligence, knowledge, fluency, diplomatic skill and others.

According to Drucker (1994), entrepreneurs are always looking for changes, react to them and exploit them as an opportunity, which is not always seen by others. They are people who create something new, different, they change or transform values, without restricting their undertaking to exclusively economic institutions.

They are essentially innovators, able to deal with risks and uncertainties involved in decisions to succeed in their undertaking. However, the entrepreneurial mindset is not a personality trait, since, according to him, any individual who needs to make a decision can learn to behave in an entrepreneurial manner.

Dolabela (1999) also notes that business success consists not only of the development of specific skills, such as finance, marketing, production, grant of credit incentives and/or tax incentives, but also of entrepreneurial attitudes. In this respect, education is a tool that furthers the generation of ideas and the development of new technologies.

Successful entrepreneurs plan every step of their business, from the first business plan draft to the plan presentation to investors, definition of business marketingstrategies etc., always based on the solid business insight they have (Dornelas 2001).

Innovation is the specific instrument of entrepreneurs, the means by which they exploit change as an opportunity for a different business or a different service. It can be regarded as a subject to be learned and practiced. Entrepreneurs need to seek, with deliberate purpose, sources of innovation, changes and their symptoms that indicate opportunities for an innovation to succeed. And entrepreneurs need to know and implement the principles of a successful innovation (Drucker 1994).

Currently, the entrepreneur term semantically expanded its original designation of taking risks, facing uncertainties, performing innovation, creating new business and making profits. The current understanding of what means to be an entrepreneur goes beyond its original concept, it includes needs and motivation, materializing into projects, developing technological innovation and transforming dreams in opportunities.

### *6.4.3 Incubators of Technology-Based Companies*

**IEBTs—Incubadoras de EmpresasdeBase Tecnológica [Incubators of Technology-Based Companies]**—The Brazilian Ministry of Science, Technology and Innovation (MCTI) created in 1988 the National Program to Support Business Incubator (PNI) and applies the following definition:

An incubator is a mechanism that encourages creation and development of micro and small industrial, service, technology-based or light manufacturing enterprises through further training in technical and management aspects for entrepreneurs, in addition to streamline and speed up the technological innovation process in micro and small enterprises. Therefore, it needs a physical space specifically built or adapted to temporarily accommodate micro and small industrial or service enterprises provided with a range of services and facilities such as:

- Personalized physical space for installation of offices and laboratories of each company admitted;
- Physical space for shared use, such as a meeting room, auditorium, area for product demonstration, processes and services of the incubated companies, secretariat, administrative services and lab facilities;

- Human resources and specialized services that help incubated companies in their activities, namely, business management, technological innovation management, product and service marketing in domestic and foreign markets, accounting, marketing, legal assistance, fundraising, contracts with lenders, production engineering and intellectual property, among others;
- Training/education of entrepreneurs in key management aspects, such as business management, technological innovation management, product and service marketing in domestic and foreign markets, accounting, marketing, legal assistance, fundraising, contracts with lenders, production engineering and intellectual property;
- Access to laboratories, university libraries and institutions developing technological activities (*MCTI:*1998).

According to Lundqvist (2014) and Ghina (2014), universities and their incubators are capable of training students specifically in entrepreneurship, leadership, innovation and association. In addition, performance and initiative analysis.

### 6.4.4 Technological Innovation

According to the OECD—Organisation for Economic Co-operation and Development—(Oslo Guide 2005), technological innovation can be regarded as the introduction of new products or processes or improvements made to existing products and processes. To be regarded as technological innovation of product or process, it has to be implemented and marketed—product innovation—or used in the production process—process innovation—OECD (Oslo Guide 2005).

In the case of Brazil, there is still no scientific-technological area able to properly define the real national technological interest. Thus, this study aims to understand the innovation process from businessmen' experiences, and the implementation of policies as drivers of technological development and crucial to the country's economic growth.

### 6.4.5 Technological Innovation Act

Law No. 10,973, of December 2, 2004, provides for incentives for innovation and scientific and technological research in production environment, establishing incentive measures for innovation and scientific and technological research in production environment, focusing on education, technological autonomy and the country's industrial development, pursuant to articles 218 and 219 of the Federal Constitution (1988), aiming to encourage and further the development of science, technology, and innovation.

### 6.4.6 The Brazilian Case

In Brazil, the act of undertaking in formal economy is generally seen in micro and small enterprise startups. Such enterprises are responsible for a significant portion of economic development and an important source of job creation.

This study specifically surveyed incubated or graduated companies, whose businessmen are studying business administration, engineering or computer science in universities with entrepreneurship included in the curriculum. Interviews and questionnaires were conducted through direct and individual contact with these businessmen. Each company took a survey and answered a questionnaire. On average, this process took an hour and a half and was held at the company headquarters. The survey's relevance and objectives were explained to each businessman. Furthermore, the confidentiality of interviews was made clear.

According to Richardson and Peres (1985), the researcher can explain and discuss the survey and questionnaire goals, in addition to answer any questions the interviewee may have. The questionnaire consisted of questions about the current educational level, age, gender, motivation for company establishment, the main factors to seek a technology-based incubator, level of satisfaction with these factors, expectations regarding the technological innovation act, awareness of the impact generated by the entrepreneurship subject in education and proficiency in innovation. The interview aimed at identifying the major problems faced during development or improvement of new technologies, how the university and incubator mitigated these problems, threats and challenges faced. Finally, the process of technological development, in case the company had not gone through the incubation process, would be determined.

Businessmen were free to express themselves concerning the questions and go into details, so as to provide insight about the individual experiences and the collective awareness of this study's objectives.

The data collected were handled aiming to understand the relationship between technological development and education/development of businessmen. The data collected were used for analysis, conclusions and future research recommendations.

The literature search and the Technological Innovation Act were used as a basis to structure observations made during research.

To Bailetti (2012), technological innovation is the distinguishing feature driving new businesses and solid businesses in the market wanting to expand their activities and develop products and processes.

During the study, a point not addressed was raised. A difference in technology development phases between incubated and graduated companies was noted. In addition, some did not seek any kind of benefit or incentive from the Technological Innovation Act, either due to unawareness or lack of interest.

## 6.5 Data Presentation and Analysis

The questionnaires and interviews results were organized into charts, showing the percentage share of each item in each answer, followed by relevant comments in the interviews answers.

The sample revealed that 71 % of managers are men and 22.6 % are women (Chart 6.1).

Regarding marital status, the study shows that (Table 6.1) most people are married, as can seen in the table below.

Regarding age, the survey revealed that 2.4 % are 24 years old or less, 34.5 % from 25 to 35, and 38.1 % are 36–47. And 25 % are 48 or more (Chart 6.2).

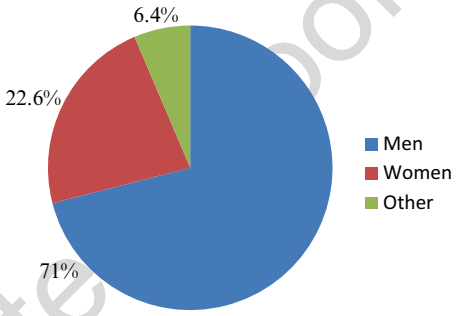



**Chart 6.1** Managers' gender. *Source*: Own data

**Table 6.1** Marital status

| Marital status | % of interviewees |
|---|---|
| Married | 75 |
| Single | 10.7 |
| Divorced | 7.1 |

*Source*: Own data

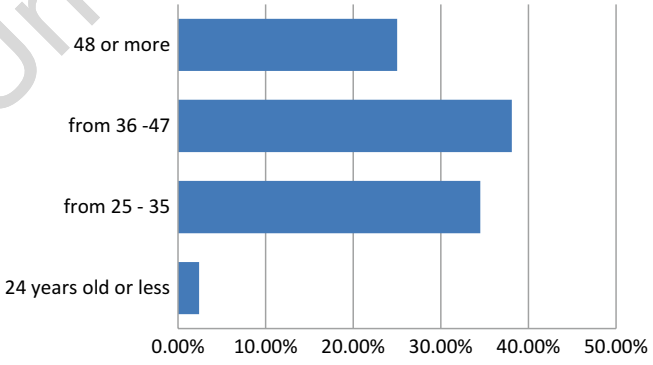



**Chart 6.2** Age. *Source*: Own data

As regards to educational level, 45 % are still undergraduates, 23.8 % are graduates and 26.2 % are completing or have completed graduate school. The survey also revealed that 27.4 % of managers are attending business administration, 36.2 % engineering and 36.4 % computer science (Chart 6.3).

As regards to birthplace, 81.4 % of managers are from the Southeast region, 17.4 % are from the South region, and only 1.2 % are from the Northeast region (Fig. 6.1).

Regarding the Technological Innovation Act, 66 % of IT companies seek for some legal incentive. In engineering companies, this percentage drops to 45 %, and to 32 % in administration companies (Chart 6.4).

Seventeen patents were generated, and nine are pending. This patent process is slow and bureaucratic. These patents were filed by graduated companies or companies leaving the incubator.

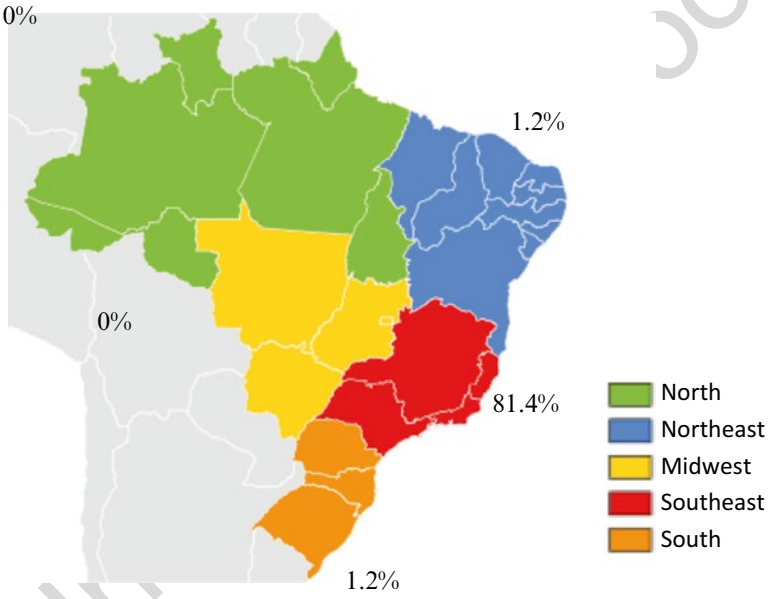
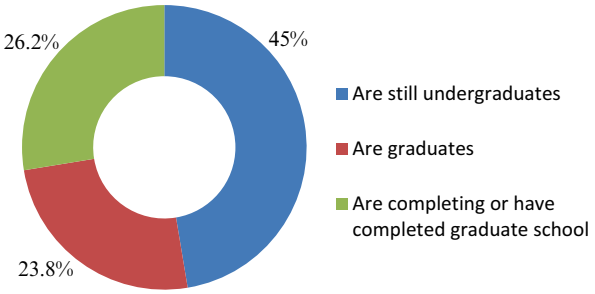



**Fig. 6.1** Regions of Brazil. *Source*: Own data

**Chart 6.3** Educational level. *Source*: Own data



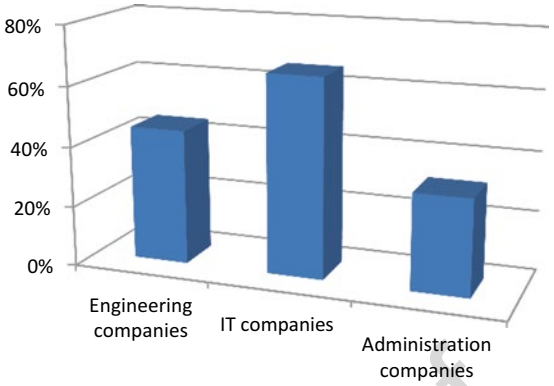



**Chart 6.4** Companies seeking for legal incentives with Law No. 10,903. *Source*: Own data

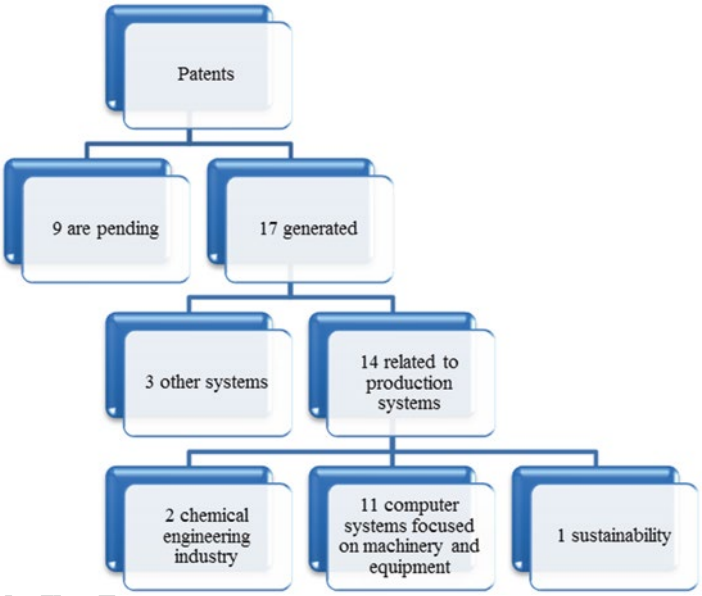



**Fig. 6.2** Generation of patents. *Source*: Own data

Of these 17, 14 are related to production systems, with 2 from chemical engineering industry, 11 in computer systems focused on machinery and equipment and 1 in sustainability. Due to confidentiality, information on patent applications is protected (Fig. 6.2).

The most important result of this study was the improvement of some management aspects, particularly planning and control, in businessmen who had already attended entrepreneurship subject associated to a theoretical and practical learning. This result confirms Wright's theories (2014), which discuses strategy and development ideas.

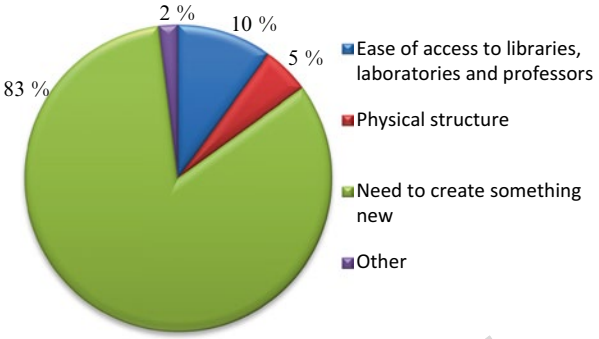



**Chart 6.5** Reasons to search for a technology-based incubator. *Source*: Own data

In addition, it was not possible to directly relate the Technological Development of Public Policy, subsequent to the Technological Innovation Act (2004) enactment, to the technological innovation generated in incubated and graduated companies with the data collected. Another aspect observed was the unawareness of the technological development policy, either due to the lack of interest by businessmen or failure to disclose the act. Therefore, even though the Technological Innovation Act was created to further a culture of innovation, it has not developed such technological innovation.

Another relevant factor identified is the number of patents generated. Regardless of law incentives, businessmen sought to develop new technologies and file patents.

Another important point raised during businessmen interviews was the act limitation to the establishment of innovations generated in scientific and technological institutions. According to the businessmen, in order to enable a process of technological development, the act should facilitate and encourage the creation of specific departments or divisions in Research & Development (R&D).

It was then concluded that the act is weak and needs more details, it requires a clear and effective regulation to become an important tool to further technological development in the country.

It became clear that the Technological Innovation Act enactment was not enough. The Technological Innovation Act implementation requires the interaction of businessmen with government actions, academy, universities, and workers to achieve its goals.

The reasons for the establishment of companies were many, such as ease of access to libraries, laboratories and professors (10 %), physical structure (5 %), but the need to create something new is a major factor (83 %) to the search for a technology-based incubator (Chart 6.5).

All businessmen who sought for benefits from the Technological Innovation Act were satisfied with the incentives, but indicated a high level of dissatisfaction with bureaucracy and difficulty to obtain them.

As regards to wage and revenue, it was not possible to determine an average number, since revenue numbers vary widely due to the companies' years of operation, the market segment to which they belong and businesses already undertaken.

The entrepreneurship subject is regarded as important and essential to businessmen. It was not possible to determine the order of preference due to the large number of technical subjects within the courses.

It can be said that the Technological Innovation Act's incentives, associated to courses offered by universities and incubators, were responsible for at least 27 successful projects. Generated innovation is not always highly sophisticated, but the development process has become more effective due to the curriculum of the entrepreneurship subject. The presented tools, the interaction between people, knowledge and information sharing were also considered as key in this process.

According to general awareness among the participating businessmen, managing a company requires strength, determination, dedication, skill, and training. "You need will and determination to learn, research and discover".

Success expectations of companies generate excitement in both businessmen and incubators.

Due to the diversity of products and processes, as well as diverse sizes and segmentation, the limits of civilized competition are respected. "There is something pleasant about seen companies reaching a functional maturity and entering the market" (an interviewee's answer).

## 6.6 Conclusions

Because of these changes in the business field that impacted the economic scenario, these companies' presence has been progressively increasing, enabling a change in the businessman's profile and in the quality of generated products and processes.

Given this scenario, one can relate the entrepreneurship subject to the continuous search for changes and new opportunities, as an effective driver of the innovation process.

Further examination as to the existence and implementation of public policies aimed at enabling technology development companies is necessary.

It becomes clear that the entrepreneurial mindset is not a personality trait. Businessmen who had not even thought about undertaking at a given moment, especially after attending the entrepreneurship subject and gaining qualification, seek to beat inertia and behave in an entrepreneurial manner. The number of new companies, the technological innovations generated and patents applications clearly show this new standard.

According to the charts presented in this study, based on the results obtained from the interviews and surveys, it can be argued that the Technological Innovation Act, the role of universities and the institutional support of IEBTs are strong drivers of the development of businessmen and companies.

Therefore, this study and its content displayed here reveal how the entrepreneurship subject and education, when properly applied, are capable of generating innovation, development, job creation and income and, above all, becoming a key condition to establish new strategies of technological development.

We conclude that providing guidance, financial and technological support to universities and businessincubators is key to stimulate the process of technological innovation. Within this context, the Technological Innovation Act represents an important tool to support technological development policies in Brazil.

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# Chapter 7
# Teaching Entrepreneurship: A Comparison Between Virtual and Classroom Teaching Contexts

**Rosa M. Batista-Canino, Pino Medina-Brito, Silvia Sosa-Cabrera, and Alicia Bolívar-Cruz**

**Abstract** The present work was motivated by the increasing importance in the competences of the entrepreneurial spirit and initiative (ESI) at all levels of education, as well as the need to expand into competence-based education. This paper studies entrepreneurship education in two different environments: virtual and classroom training. It specifically addresses teamwork competence, which supports the development of ESI competences. Thus, there is a particular interest in investigating how to better contribute to the development of ESI. However, little or nothing is known about the matter in collaborative virtual environments. This research analyses 51 group dynamics in educational environments -20 virtual groups and 31 classroom groups. It offers interesting conclusions in relation to reducing team conflict, monitoring individual and collective group performances, and facilitating cohesion. It also analyses the results of collaborative work. These conclusions are useful for both the teaching and development of entrepreneurial teams that are involved in the development of new projects. This is particularly the case for entrepreneurial teams that work in a multinational and decentralized environment.



## 7.1 Introduction

Competence-based education is generalized in the educational system. It is systematized in university education through the core, specific, transversal and general competences that are reflected in the European Higher Education Area curricula. Teamwork competence is present in almost all degrees. Together with the transverse entrepreneurial spirit and initiative (ESI) competence, teamwork generates an ideal framework for the development of the field of entrepreneurship-business start-ups.

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This work reflects on the parallels between teamwork and the work of an entrepreneurial team. It compares entrepreneurship education in two forms -classroom and virtual environments. It analyses the factors that must be taken into account for the proper development of teaching work. At the same time, conclusions about group dynamics are drawn for entrepreneurial teams. To this end, we study the subject of entrepreneurship and teamwork dynamics within two degrees -the business administration and management degree, and the labour relations degree. These are taught through the University of Las Palmas de Gran Canaria Moodle platform. A total of 51 group dynamics are analysed: 31 in the first degree and 20 in the second degree.

Under the same teaching-learning model, activities and work schema, the teamwork dynamics of both categories are described, as well as the development in the competences and attributes of the entrepreneurial teams. The differences that are found invite us to reflect on what is taught and how, in one or another, the context for acquiring teamwork competence is key in the formation of entrepreneurial teams.

With this purpose, a review of literature about entrepreneurial teams and the dimensions that characterize them is presented. As such, this paper highlights the key competences of teamwork. The second focus of this paper is on the subject of business creation-start-up, both in virtual and classroom environments. It analyses the dynamics that support the groups through their business plans. This work culminates with the analysis of the collaborative work that has been distinguished in the context of virtual and classroom teaching. This leads to interesting conclusions, both for teaching in this field and for the practice of active entrepreneurial teams.

## 7.2 The Entrepreneurial Team and Group Work Competencies

An entrepreneurial team is known as a group that consists of two or more individuals (Watson et al. 1995) -the founders of the company (Eisenhart and Schoonhoven 1990) and those that are responsible for the establishment and management of the business (Vyakarnam et al. 1997). More recently, an entrepreneurial team has been considered to be when several individuals come together to create value in a product or service (Hackbert 2004) that requires a complementarity of expertise and diversity of competences that only teamwork can obtain. In this sense, an entrepreneurial team, the promoter of an idea or business project, is a key component that best explains the success of a new business (Vinary and Tushman 1986). An entrepreneurial team provides experience and attracts investment. To analyse the configuration of an entrepreneurial team, it is necessary to consider three key variables:

**The size of the team**. Enterprises that are created by an entrepreneurial team are more successful and achieve better results than those that are formed by a single individual (Woo et al. 1989; Friar and Meyer 2003). However, having a team can

also have certain disadvantages. In this respect, Kamm et al. (1990) pointed out that the size of the team limits efficiency. This is due to the potential problems of communication and confrontation between different management styles, which can slow down decision-making.

**Heterogeneity of the team**. The differences between the members of an entrepreneurial team in nationality, ethnicity, gender or age make up demographic heterogeneity. Thus, demographically homogeneous teams have been associated with higher levels of stability (Ucbasaran et al. 2003). Meanwhile, the experiences, values and disparate attitudes of a team impede communication and stimulate interpersonal conflict (Bantel and Jackson 1989). Recently, Hoogendoorn et al. (2013) studied the relationship between the participation of women in entrepreneurial teams and the achieved performance. They concluded that egalitarian teams obtain better results in terms of sales and profits than male-dominated teams. There is also a second type of heterogeneity that focuses on the technical, human and conceptual skills of team members (Hambrick et al. 1996; Van Doorn et al. 2013). Some authors point to the fact that entrepreneurial team members have skills, experience and knowledge in different areas. This can positively influence the success of a team's performance and result in a better outcome for the new company (Friar and Meyer 2003). It can also provide further social and economic reach to enable better access to different resources that the company may need (Ensley et al. 2002; Ucbasaran et al. 2003). However, such heterogeneity can also generate uncertainty and a high degree of conflict among its members. This can negatively influence the future of the company (Amason et al. 2006). Having said this, it does stimulate creativity and new ideas when it comes to resolving conflicts and proposing better solutions to the problems of adapting to the environment (Bantel and Jackson 1989; Eisenhart and Schoonhoven 1990).

**Social dynamics**. Watson et al. (1995) analysed the success of new organizations from the perspective of the effectiveness of the interpersonal processes of an entrepreneurial team, i.e., their ability to resolve conflicts, focus on team goals, coordinate activities or share information. They showed that teams with better interpersonal processes correspond to more successful companies. However, certain disagreements may also assist in the process of decision-making, stimulating discussion and finding common ground in different points of view in order to solve problems (Cooper and Daily 1997). However, Ensley et al. (2002) did not find a significant relationship between the cohesion and conflicts of an entrepreneurial team, and the performance of new enterprises. Moreover, in Lechler's (2001) studies, he found that the majority of team members maintained good relations, which demonstrated a significant relationship between the social interaction of the members of the entrepreneurial team and the success of business initiatives. This relationship was particularly strong when the success indicator analysed customer satisfaction. Along these lines, conflict seems to be negatively related to the satisfaction of the team (De Dreu and Weingart 2003), the quality of the decisions (Amason 1996) and permanence as a member of the team (Vanaelst et al. 2006). On the other hand, cohesion and confidence are associated with a higher quality of team decisions (Carmeli et al. 2012) and promoting creativity (Gemmell et al. 2012). Et Breugst et al. (2015) noted that high levels of perceived justice give rise to positive interaction

spirals. These are reflected in an increase in team bonding, high levels of performance and willingness to take risks. Meanwhile, the negative spirals are activated with low perceptions of justice, which can lead to team members leaving the team and lower yields.

Personality variables can be good predictors of a team's performance. However, in this context, knowledge, skills and abilities are better predictors of success. Groups generate dynamics that may compromise a company's operation. For example, the effect of leadership, members who go on their own account within the group, the apathy of certain individuals or the degree of team cohesion (Hackbert 2004). However, an excessive emphasis on personal aspects can lead to forgetting or underestimating the fulfilment of tasks (Hackman and Oldham 1989). It can also reduce performance standards. Nevertheless, there is no doubt that the knowledge, skills and abilities of individuals, as well as the dynamics that the group develops, can be improved through training (Hackbert 2004). Thus, the success of teamwork training programmes depends on the realization of a precise diagnosis of the competences that are needed to work in a team. The success of such programmes also relies on a thorough knowledge of the key behaviours and dynamics of a group. According to Tannenbaum et al. (1992), teamwork training will pivot around four main axes: setting goals in the team, interpersonal relations, the role of the individual in the team and, finally, problems and conflicts resolution. Table 7.1 lists, according to Stevens and Campion (1994), the required competences of working in a team.

In the virtual environment, some of the knowledge, skills and abilities are conditioned by communication channels. The ability to listen or the identification of the non-verbal language depends on the use of collaborative media. However, the generalization of the use of these channels and the tools that are applied to it (e.g., video conferencing and chats) makes it possible to consider related skills as also being applicable in a virtual environment.

## 7.3 The Subject of Entrepreneurship: A Background in Current Content and Non-presential Training

In Europe, the publication of the 'Delors White Paper' (Comisión Europea 1993) instigated the promotion of the entrepreneurial spirit. Ten years later, the European Commission published 'The Entrepreneurial Spirit in Europe Green Paper' (Comisión Europea 2003). This projected a line of work to promote the entrepreneurial spirit in the Union. However, it was not until 2008 that the European Commission urged the implementation of the Community Lisbon Programme. This called for specific training on how to create and develop a company. In recent years, this trend has been strengthened in a more structured and action-orientated way through The Entrepreneurship 2020 Plan (Comisión Europea 2013).

Thus, the subject of business start-up responds to the recommendations of the European Union. In this context, some universities contemplate the subject matter as elective-see Liñan (2008). In 1993, at the University of Las Palmas de Gran Canaria, the subject was included in the curriculum of formal training in the diploma

**Table 7.1** Competencies required for teamwork

| Interpersonal skills |
|---|
| **A. Conflict resolution** |
| – Recognize and stimulate functional conflict and disable the dysfunctional |
| – Recognize the source and type of conflict, bringing together the team and implementing an appropriate strategy for its resolution |
| – Utilize negotiation means (win-win), especially in teams that maintain a long-term relationship |
| **B. Collaborative problem resolution** |
| – Identify situations that require group resolution and use the appropriate degree and type of participation |
| – Recognize the obstacles in collaborative problem resolution and implement appropriate corrective actions |
| **C. Communication** |
| – Understand communication networks and, where possible, use decentralized networks to improve communication |
| – Communicate openly, clearly, comprehensively and in relation to the behaviours |
| – Listen without evaluating and appropriately make use of active listening |
| – Maximize the coherence between verbal and non-verbal messages, and recognize and interpret non-verbal messages |
| – Recognise the importance and participate in rituals, greetings and casual conversations |
| Self-management skills |
| **D. Setting goals and performance management** |
| – Establish appropriate, specific and challenging goals for the team |
| – Monitor, evaluate and provide feedback about the performance of the team and each of the members |
| **E. Planning and coordination of tasks** |
| – Coordinate and synchronize activities and information between the team members |
| – Help to establish the tasks and expectations of each team member's role, and make sure that there is a balanced distribution of workload among them |

*Source*: Adapted from Stevens and Campion (1994)



in labour relations. This was soon followed by other degrees, notably the degree in administration and business management. Here, the subject matter, which was introduced in 1994, was worth six credits. Subsequently, the degree in administration and business management and the degree in labour relations incorporated the elective subject matter, start-up and business development. More recently, a number of degrees have also joined this trend.

In the specific case of subjects that are worth six credits, the content of the course is articulated around six large work modules:

1. Access to the business activity: ways, process and analysis.
2. The analysis of the environment and strategic viability of the business.
3. Commercial viability of the business project.
4. Organizational feasibility of the business project.
5. Financial viability of the business project.
6. Procedures and the entrepreneur's agenda.

Learning objectives are pursued with the content. For example, by making the student understand the reality of the business activity, its social and economic contribution. This brings the business creation process and each of its phases to light, empowering students to find business opportunities. The achievement of these objectives requires exercising the core competences. Most notably, these include: the ability to cooperate with other people and organizations, the effective fulfilment of functions and tasks of professional nature, working as a team and developing self-learning, creativity and initiative.

In the classroom environment, the experience that is gathered on the subject offers an ideal breeding ground for projecting the virtual training of this subject matter. There can be seen at the Open University of Catalonia (OUC), where there is an elective subject of six credits, which is carried out via distance learning. The distance learning subject is also six credits and has various curriculum options—see Comisión Europea (2008) and Liñan (2008). It gives a leading role to the development of business plans. This enables students to test the entire process of setting up a new business project. This option is not given in the subject that is taught by the OUC.

## 7.4 Articulation of the Teaching and Learning Process through a Business Plan: The Milestones and Group Dynamics of Virtual and Classroom Environments

Both in the virtual and classroom context, business plans are laid out as the foundations of the teaching and teaching experience. This allows individuals undergoing a training process that is as specific as that of the creation and implementation of a new business to interact with each other. This makes them participants, even if fictitious, in the whole process of the gestation, development and commissioning of a business opportunity (Borello 2000). Thus, the business plan has become the centre stage element in entrepreneurship education (Comisión Europea 2008). It is an element that transmits dynamism, enabling the entrepreneurial process to be experienced in the specific context of a classroom, rather than just as a concept.

For both categories, ad hoc work groups are configured. Each team develops their business project, which is articulated by the business plan guide. For both variants, the Moodle space is enabled. Students use IT differently, especially in the classroom. Thus, this platform is complementary in the learning process. It is not as much a central part of the teaching-learning process as it is for distance learning.

Accordingly, and in order to accommodate all of the utilities that are needed to comply with the objectives of the study, the site for this subject matter is configured for both teaching modes. This is achieved in the following manner:

1. Elements for individual work. From the beginning of the course, the student is given a complete handbook for the subject. In addition, there is a specific space for individual tutorials and for sending their work and individual tasks.

2. Elements for information and interaction of all students. These include the general subject forum and the meeting room for all enrolled students. In addition, there is a calendar on the right-hand side of the homepage, which is used as a "log book". Here, the student not only has access to the key dates that are associated with subject but also, a follow-up guide.
3. Elements for the interaction of work groups. This space is specifically created for collaborative work. Once the work groups are made up, the tutor enables a specific space for each group. Only the students of the group in question and the tutor have access to this space. It is configured for asynchronous work. Specifically for the students in the virtual mode, a meeting room is created for each group. This is used for synchronous meetings. In addition, students are given access to the Netmeeting tool in order to carry out synchronous multilateral videoconferencing meetings.

Table 7.2 summarizes the major milestones that take place throughout the subject matter and how they are resolved in each environment. In order to normalize the entire business plan development, the groups work on the teacher's pre-established formats (six). These serve as a guide throughout the whole investigation process of submitting the business opportunity. They also assist in the final report writing.

## 7.5 Collaborative Work in Different Learning Environments: Virtual vs. Classroom

Three years of continued teaching experience on the subject in virtual environments and more than 10 years in classroom environments are summarized in these pages. The benefits and limitations or disadvantages of collaborative work in virtual environments are presented. The findings that are presented are the result of the systematic collection of field data by teachers who teach the subject matter, both online and in a classroom environment. In these work notes, we used observations of a total of 20 working groups in an online environment and 31 in a classroom environment. These working groups had an average size of three individuals per entrepreneurial team. The collection of information for the analysis is systematized around the items that are included below.

With the analysis of the use of IT tools, the following statements can be made:

1. While students of both environments make use of IT tools, providing familiarity and expertise, virtual environment students take greater advantage of them. This is due to both the quantity and the quality of use.
2. The distance learning students are fully aware of the possibilities of socialization through the network in order to develop joint projects. This is a useful alternative to the classroom group work. Until now, this has been the only resource that has been used for employment or educational effectiveness.

t2.1 **Table 7.2** Milestones in the teaching and learning

| t2.2 Milestone | Classroom environment | Virtual environment |
|---|---|---|
| t2.3 Group creation | In the classroom, students are prompted to express their interest in an activity in a sector and/or particular business. Team members adhere to projects according to their preferences. A coming together and negotiation process begins with students that culminate with the creation of groups at free will | The creation of groups is encouraged under a specific thread that is created by the teacher. Students indicate their particular interest in developing a specific business idea. A coming together and negotiation process begins with students that culminate with the creation of groups at free will |
| t2.15 Groups registered | Virtual collaborative space created by group | |
| t2.16 Synchronous collaborative dynamics | In the classroom, each group has its own physical space to exchange opinions, information and work. The teacher is present and constantly assists them and addressing the issues that are raised by the work teams | A "Meeting room" is created in Moodle. In addition, students are given access to Netmeeting. Here, they can freely exchange views and information. Questions are forwarded to teachers jointly in the asynchronous collaboration space or individually in the individual tutoring space |
| t2.28 Asynchronous collaborative dynamics | An open collaborative virtual space is generated so that each group can communicate and exchange views and information, even when the members are not in the classroom | |
| t2.32 Business plan development | On agreed dates, templates are delivered through the platform and "Task Delivery" utility | |
| t2.34 Learning process evaluation | General comments in the classroom, questions and/or common errors | General group comments in the asynchronous space and individual ones in the tutoring platform space |
| t2.38 | The professor resolves the particularities of each template for corrections of the given task to each group through the platform and makes a provisional note. This is corrected after the delivery of the final template | The professor solves the particularities of each template for corrections of the task that are delivered to each group through the platform and makes a provisional note. This is corrected after the delivery of the final template |

t2.48 *Source*: Own elaboration

3. From the teacher's point of view, the enabled virtual workspaces, which are used to a greater extent by the virtual training students, provide a collaborative work journal. The teacher knows exactly who has contributed -what, when, why and how debates, conflicts and resolutions have developed. In the classroom environment, while the teacher is present throughout the process, there are issues that can be missed and not recorded. Furthermore, in the classroom environment, group dynamics cannot be as thoroughly observed.

In terms of the key entrepreneurial team variables, the teaching staff's reflections are as follows:

- Team size. Experience has shown that, the ideal number for this type of project, regardless of the mode, and complying in a natural way and without the intervention of the teacher, is three members. Fewer members hinder the normal development of a project with the proposed features and larger groups hinder the work dynamics.
- Heterogeneity of the team. The effect of this variable is disparate, even though, from the point of view of content, this is enriched by the contributions of more heterogeneous groups. This advantage is more the result of different experiences and the history of the team members, rather than their demographic profile (i.e., age, sex and nationality). The complementarity of the members also seems to be a factor that is noteworthy, including the group members' dynamics, which come from disparate working environments. In the classroom environment, students tend to belong, in general, to the same age range and provenance, and do not have an existing degree. In one environment, distance learning brings together students throughout the Spanish geography with diverse ages. Furthermore, a large number of these students have previous higher education. In terms of gender, the proportion in both environments is maintained. In any case, it is corroborated that heterogeneous groups are more creative and unique in their contributions.
- Dynamics and intra-group social interaction. A group's cohesion is measured in terms of clarity of objectives, allocation of tasks and minimization of conflict. The groups that maintain greater cohesions perform better in terms of the rating that is obtained in the entrepreneurial project, as opposed to the teams where these aspects are neglected and the conflict instates the group dynamics. This cohesion is strongly influenced by the environment or work context. As such, working on a platform forces members to make more frequent written communications. These tend to be more reflective and thoughtful, which tends to lessen conflict. This context requires less social interaction and a lower degree of cohesion. There is no doubt that, with group tasks, the degree of commitment of the group's members, in terms of completion date and content objectives, is also a key variable. However, in this study, no significant differences were found between the students in the two analysed education environments.

Finally, in the classroom environment, the competences of the interpersonal type of conflict resolution are most evident. This is perhaps because non-verbal communication leads to students experiencing a larger number of conflict situations.

However, distance learning presents another type of conflict regarding the fulfilment of objectives on time. In many cases, this forces the tutor to arbitrate and mediate. In classroom teaching, the mediating role of the teacher encourages some students to launch proposals that would not have been made in another environment. Both environments are susceptible to conflict. Furthermore, a group leader figure emerges in both environments. From the first instance, the group leader shows his management skills in particular situations. It is also true that the teacher seldom intervenes to referee measures of appeasement and understanding in a team's conflict.

However, the virtual environment aids the written communication of students to a higher degree. This is because there is little oral communication, which makes conflict restrained and meditated. Having to write their contributions in the group forum allows for a longer reflection period. Moreover, as everything is in writing, the teacher can refer back to previous reflections. This makes the students think harder about their written expressions and tone. In the classroom environment, students often neglect oral expression and do not elaborate as much on their interventions. In this environment, there is seldom a group forum that is used for the exchange of information as an optional and complementary means of communication.

In terms of self-management skills, and as far as planning and task control are concerned, there are significant differences that were not detected in this study. There is no doubt that self-management skills emerge more naturally in groups. Furthermore, given the standard delivery formats and the pressure of work schedules, such skills are rooted from the start. Team members are aware that, without these skills, the task will not be completed and the templates will not be presented on time. This would compromise the culmination of the business plan. As far as the team's performance management and that of its members is concerned, it is more evident and easier to follow in the virtual environment.

## 7.6 Conclusions

This work arises from the main objective to study the dynamics that work groups follow in the entrepreneurship subject matter framework within two differentiated education environments -the virtual and classroom environments. Useful conclusions can be drawn for competence-based education in virtual environments. In both cases, the subject revolves around the development of a business plan by grouped students in collaborative teams. These simulate and assume the functions of an entrepreneurial team. Whatever the nature of the teaching-learning competence, the process must contribute to helping to transmit and inculcate the competences that a subject matter has assigned. Given the role that entrepreneurial teams gain in the process of development of an entrepreneurial project, the teamwork competence is a crucial element. Key configuration variables of the entrepreneurial team are analysed and specific competences related to teamwork in virtual collaboration environments against classroom environments are concluded.

It is noted that a greater degree of heterogeneity in the virtual environment exists than that of the classroom environment. The latter generates more creative and unique teams, as well as a greater social and territorial reach, in terms of the contributions that are made. With respect to the dynamics and intergroup social interactions, a greater degree of cohesion in the teams is detected in the classroom environment, compared to that in the distance learning environment. This is due to the existence of a greater social interaction among members of the first category. However, the degree of commitment of its members with group tasks, in terms of meeting deadlines and content objectives, presents no notable differences. Years of experience in the subject have confirmed that, in both categories, better levels of performance and cohesion are achieved with three members. This results in better group dynamics.

With respect to the competences that are required for teamwork within the interpersonal type framework, it becomes evident that the relating conflict resolution plays a more active role in the classroom environment. However, it is true that a professor is often forced to intervene and mediate in the conflicts that are generated in both categories. As far as communication is concerned, it seems that the virtual environment reinforces the development of this competence in its writing variant. This is because it is more reflective and paused. This reduces group conflict and demands less arbitration by the teacher. On the contrary, in the classroom environment, students do not pay sufficient attention to oral expression. This is the dominant form of communication when intervening in the classroom and carrying out group tasks. It would be desirable to establish the incentives that are designed to reinforce this competence, evaluating the same in the other environment and its link to the final grade. This could be another evaluation element of the skills that are related to teamwork. Arbitration of specific measures would be required to do the same in the virtual environment. Additionally, in the classroom environment, there should be more active encouragement for teams to use the platform as a tool -which is currently complementary for training -to motivate written communication. This would reduce conflict situations.

In relation to self-management competences, which are relative to setting goals and performance management, as well as the planning and coordination of tasks, significant differences between the classroom and virtual teams were not detected. However, it can be noted that the monitoring and control of individual and group performance is much easier to implement in distance education.

This work generates practical implications with regard to the teaching of this subject and the creation of teams for the development of entrepreneurial projects in real life. Thus, it is necessary that a teacher guides the students on how to handle group conflicts, especially in the classroom environment -despite the fact that conflict and greater social interaction variables most effectively contribute to the cohesion of a group. On the other hand, it is necessary to stress the importance of written and verbal communications. These are essential in both classroom and distance project management. For the latter, within international business projects, it is becoming increasingly important. In the context of the creation of entrepreneurial teams for the creation of a company or a project, the teaching experience shows that

it is key to use written communication for decision-making and for the performance management of each team member and the team as a whole. This reduces the quantity and intensity of conflicts, and aids the effective and efficient development of the assigned tasks. The greater the informality of oral communication, the more it encourages conflict and reduces individual commitment within the team. However, it does strengthen personal relationships and the cohesion of the team.

While teams' work dynamics have been studied in different contexts for a set of variables and dimensions, in the future, it is necessary to investigate the relationship that may exist between a team's performances, in terms of the tasks that are performed during the course, and that of the final grade that the student obtains in the subject matter. It would also be interesting to detect the significant differences that exist according to the mode in which the student studies -classroom or virtual environment -and, in the process, monitor the variable gender.

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# Chapter 8
# Enhancement of Entrepreneurship in Colombian Universities: Competence Approach Plus Personalized Advice (CAPPA) Model

**Antonio Alonso-Gonzalez, Antonio Diaz-Morales, and Marta Peris-Ortiz**



**Abstract** In the countries of Latin America, the university is becoming the standard of development and economic progress, but these two dimensions cannot be understood without the promotion and support of innovation and entrepreneurship. Specifically, in Colombian university centres great efforts are being performed to encourage and train entrepreneurial skills among the student community, being this task approached from different perspectives and also with different results.

This study presents a new approach to the transmission of knowledge and contents of the curriculum based on a new skills and competences development model, which primarily give the student concepts rather than contents, and serve him well to enhance creativity, innovation and entrepreneurship skills. The new methodology should be further supported and enhanced by the establishment of a communication and support channel given by entrepreneurship and innovation centres established at the same university, which give support and advice to students throughout the entire process of creating their own companies. The ultimate goal of this model is to generate a set of tools and methodologies within the university where the students are formed not only as professionals but also as entrepreneurs, in order to complete their academic studies with their own business already established and with the skills and necessary competences for their growth and sustainability.

As part of this work, a pilot project is being conducted at Sergio Arboleda University in Bogota, Colombia, initially applied on the Marketing and International Business program, and it is expected to obtain measurable results in the following academic semesters, using internal and external evaluation criteria.

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## 8.1 Introduction

Entrepreneurship, or the process of promoting the creation of new companies, has become a national priority in many economies of developed or developing countries, to be regarded as an essential way to achieve sustainable economic development, job creation and poverty alleviation (Ndururi and Mukulu 2015). Entrepreneurship could be seen as the dynamic process of creating wealth incrementally, which is generated by individuals who provide value to a product or service and take risks in terms of time, commitment and opportunity costs (Ackerman and Cervilla 2007).

Entrepreneurship has been considered by many theorists as a single innovative initiative, being Schumpeter throughout his work in 1912, 1934, 1939, 1947 one of the first and most important researchers to associate innovation to entrepreneurship. These studies determine that the entrepreneurial characteristics are the ones that determine its propensity to develop business projects and hence also the success or failure of their productive initiatives (Rodríguez and Prieto-Pinto 2009). Besides these implications, nowadays it must be taken into account how entrepreneurship is associated with new forms and trends related to workplace culture, and thus new ways of thinking about labor, occupational and social mobility (Moreno 2012).

Promoting and supporting innovative entrepreneurship as a dynamic socio-economic development of a community implies to develop a permanent and systemic analytical thinking and an enabling environment for collective learning, to exchange experiences and collaborative work, where the institutions and relationships grow among the different stakeholders and other participants in the process. Thus, the true impact to promote entrepreneurship with innovation is related to the proper articulation of a series of elements and actors from various roles as well as the initiative to support responsibilities in the short, medium and long term (Fuel 2010).

## 8.2 Theoretical Background

### *8.2.1 Entrepreneurship, Innovation and Entrepreneur Concepts*

Firstly, the term entrepreneurship must be described. According to the program indicators venture of the Organization for Economic Cooperation and Development OECD, entrepreneurship is understood as the phenomenon associated with business activity, which is the enterprising human action in search for value generation through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets. In this sense, entrepreneurship is a phenomenon that manifests itself through the economy and in many ways with different results, which are not necessarily financial results. Therefore, entrepreneurship and entrepreneurs are considered important drivers of economic growth, employment, innovation and productivity (Sanabria-Aguirre and Hurtado-Aguirre 2013).

Secondly, the term innovation must be introduced. Briceño-Moreno and Cure (2009) define the concept using Peter Drucker's designation: both a process and its result. Furthermore, and according to the European Commission, innovation is the transformation of an idea into a product or a new or improved marketable service. However, when the definition of innovation is linked to the product, equipment, procedure, or a new or improved service launched, it refers to the result. Thus, innovation is considered when it has entered into the market as production of goods or services with a strong differentiation and it has been adapted to market needs and features occupying vacant positions due to the lack of supply.

The entrepreneurship and the innovation is performed by the entrepreneurs, who have different profiles in terms of educational level, age, gender, etc., but have common general features, including: capacity for exploration, teamwork, leadership, negotiation and relationship skills, orientation toward common goals, and personal integrity, among others. In addition, people with education are more likely to become entrepreneurs, but it is also essential to have no fear of failure, which can be reduced if support is provided by different entities since the beginning of the idea, to establish a solid foundation for entrepreneurs to allow them to strengthen through innovation and motivation (García-Gonzalez 2008). Ndururi and Mukulu (2015) concluded that to promote and encourage business success among entrepreneurs, the entrepreneur must have the necessary knowledge, skills and businessstrategies to perform in all areas of their business competently. The entrepreneur must also learn to monitor, review and analyze the feedback gained to make adjustments in the business. It is also required an awareness of learning and continuous improvement in order to overcome the necessity of success in all operations.

### *8.2.2 Overall Situation in Colombia*

Nowadays, the low growth of Colombian economy has generated a particular interest for SMEs, as potential job producers and promoters of local development. Additionally, there is an interest in increasing awareness of entrepreneurship for economic and social development of the country and to promote the entrepreneurial spirit of Colombians, in order to enhance the creation of a new generation of successful, sustainable and high impact firms (García-Gonzalez 2008).

In Colombia, government initiatives could be found in CONPES document, whose acronym means "Strengthening the National Innovation System, Technological Development and Entrepreneurship in Colombia". This document describes the most important players and instruments and the procedures for its implementation. The most important roles are focused on government bodies such as ministries and SENA (National Apprenticeship Service), as well as their interaction with universities and their associations (university-company-government). All the conditions are set to promote entrepreneurial ideas, either through a trade union support or colleges and universities through businessincubators and technology development centres (Osorio-Toro 2009).

In Colombia, there are some factors that influence entrepreneurial activity and must be studied thoroughly, as the number of existing procedures, days required to start a business, informal economy, level of education, and so on. Undoubtedly, the role to be played by government, universities, schools, non-formal education entities and chambers of commerce are very important in order to minimize any barriers that entrepreneurs face to encourage job creation, innovation and competitiveness (García-Gonzalez 2008). Law 1014 of 2006 "To Promote an Entrepreneurship Culture" has reinforced the need to build a culture of entrepreneurship that links all stakeholders, including educational institutions, from the premise that to meet the challenges of this century, education should broaden their horizons and integrate key elements for the development of an entrepreneurial mindset, while the university has to be a space that can form and implement strategies that allow students to carry out economic and social transformations (Ortiz-Riaga et al. 2013).

### *8.2.3 Role of Higher Education Institutions in Colombia to Enhance Entrepreneurship*

Gomez and Mitchell (2014) highlight three conclusions regarding entrepreneurship and innovation in Colombia: the first is the major role played by science, technology and innovation in the social and long-term economic development of nations. The second is the important role of government and local authorities to address market failures and promote an environment of knowledge generation, dynamic entrepreneurship and businessinnovation. And third, perhaps most important, it is that the strategy of science, technology and innovation must turn around businesses and entrepreneurs.

Despite a perceived high inclination towards entrepreneurship in Colombia, it is necessary to strengthen mechanisms to ensure that these intentions become planned and consistent behaviors. The task is to consolidate a true entrepreneur, formal, innovative and inclusive culture, the result of a national project and not cyclical decisions in an uncertain social and economic context (Rodríguez and Prieto-Pinto 2009). It will be a major responsibility of higher education institutions to develop and promote entrepreneurship on the existing basis of the aspects of educational content, form and conditions and for a large number of entrepreneurial talents in order to provide the constant human resources for vital and sustainable development of the national economy and all aspects of social progress (Li-li and Lian-sen 2015).

Colombian students clearly identify the entrepreneurship with values of the quality of working life. The entrepreneurship is seen as a very respectable way of exercising the profession. It is vital for all universities and public entities to continue cultivating this belief and professionalizing its promotion through specialized events and fairs, giving specific training and more exposure to entrepreneurial work in the media. In Colombia, entrepreneurship is considered as a valid way to achieve stability and safety in the working life. Although the enterprise carries certain risks economically, students perceive it as a safe option to achieve a stable income (Rodríguez and Prieto-Pinto 2009).

As an example of these initiatives in Colombia, Fuel (2010) describes the achievements of the E Park project, a strategic alliance between the University of Antioquia and the Mayor of Medellin. The foundation of the formative work of E park initiative is rooted from an education that recognizes the importance of providing a set of tools with an ontological background purpose for life, to promote an entrepreneurship vision. It includes premises for start-ups not targeted as the ultimate goal, but as a result of a transformation of the city and people, based on the creative potential of knowledge. This process has accumulated to December 2010 more than 107,697 people of the university community aware to consider entrepreneurship as a lifestyle; 4,158 people including students, graduates and professors trained in entrepreneurial and businessskills; 3,931 businessopportunities identified; 452 business plans accompanied and 220 companies supported. Efforts were directed to four elements: promotion and networking, awareness, learning, and entrepreneurship talent management. Heriot and Campbell (2005) consider critical to rethink how education is taught to promote entrepreneurship in universities, answering the questions: what is taught, why it is taught, how it is taught, how well it works, and offering leadership support.

## 8.3 Methodology

### *8.3.1 Analysis of the Current Situation to Promote Entrepreneurship within Universities*

A challenge that all economies are facing nowadays is to encourage individuals to become entrepreneurs and to equip them with the skills and abilities needed to convert opportunities into successful businesses. In this context, it discussed what should be the role of universities, considering that they should train their future graduates for generating companies and not only for employment, creating spaces to promote and exploit the entrepreneurial potential of students. Thus, it has been suggested that its central role is not only incubation but also preincubation, which constitutes a preliminary stage where the entrepreneurial culture really is impacted (Ackerman and Cervilla 2007). Efforts must be channeled to university as an active to take a leading role in the enrichment of science-society relationship, creating learning opportunities for the achievement of entrepreneurship and innovation, in order to raise levels of awareness of science and technology (Grau 2014). Entrepreneurship education is an essential element in the ecosystem of innovation (Kagami 2015). Libombo et al. (2015) discuss two important dimensions to be taken into account in terms of a favorable environment for entrepreneurship: the human capital of the individuals and the business environment in which individuals operate.

In a university context, entrepreneurship is described as a competence of the student's attitude to create meaning and context through systemic thinking. It is also defined as the ability to solve human and social problems based on their emotions, creativity, and irrational side, to adapt it to a context and seize the opportunities for

their own benefit and the society in which it is immersed, through generating a company or business. This allows to set goals and challenges to achieve by establishing a lifestyle characterized by attitudes, skills, values, competences, and knowledge where autonomy, innovation, creativity, self-confidence, ethics and technical skills are present to develop projects and business. The development of entrepreneurial skills leads the student to discover their entrepreneurial capacity to orient it towards entrepreneurship (ability to create and sustain their own business), taking into account factors both personal and ethical (development of entrepreneurship), contextual (perception of the environment) and technical (business plan, obtaining resources) (Reinoso-Lastra 2008). Kagami (2015) identifies three key factors that must be taught in universities to promote entrepreneurship: creativity, project management and team building, and business basics.

Universities' educational culture must give a great weight to the businesstraining, introducing changes in every instance of mediation (teachers, students, institutions, media content, context, and groups) to generate entrepreneurial skills and business competences and to give also meaning to the knowledge received to provide added value and professionalperformance for the students and graduates in a comprehensive and systematic way, with implications to the social benefit and immediate context (Reinoso-Lastra 2008). Entrepreneurial training must provide to graduatesskills as strategic thinking, awareness of the need for innovation, preparedness to deal with change and uncertainty, communicationskills, ability to identify new needs, among others (Hidalgo 2013). That learning should be taught at university level, resulting from a comprehensive education that meets the needs of society and the globalized world, the judicious exercise involving the acquisition of theoretical concepts and practical application developed according to the culture and the environment (Ortiz-Riaga et al. 2013).

Certainly, the university and other training agents must reformulate a curriculum geared towards entrepreneurship and a more dynamic and methodological learning process to enhance academic production and motivate more students to become promoters of change and to generate sustainable business (Hernandez-Sanchez and Rodriguez-Soto 2015). Once identified the social and educational needs to incorporate as entrepreneurial skills to promote the creation of business, universities must perform curricular transformation processes to encourage changes in undergraduate and graduate programs, incorporating pedagogical models. This will allow business development processes from the availability and regional needs, linking curricula with entrepreneurship and developing business plans. It is also important to train universityteachers pedagogically into an entrepreneurship oriented education, setting academic events, professional networks and research projects (Reinoso-Lastra 2008).

In a recent study cited by García-Gonzalez (2008) performed on 55 institutions (28 in Bogotá, 18 in Medellin and 9 in Cali) it was found that some universities offer extracurricular courses on entrepreneurship only at the end of the studies, so the opportunity for the student to start a business process from the beginning is wasted. Few universities run a training process that covers all the degree, from the beginning

until the graduation, or even that extends to the graduates. No formalized or centralized plans were found to promote entrepreneurship and there were not training programs for teachers or principals within the institution and outside.

### 8.3.2 *Proposal of a New Model to Maximize Entrepreneurship within Universities' Students*

Once the main trends on the enhancement of entrepreneurship in universities' classrooms have been analyzed (Ackerman and Cervilla 2007; Grau 2014; Hernandez-Sanchez and Rodriguez-Soto 2015; Hidalgo 2013; Kagami 2015; Libombo et al. 2015; Ortiz-Riaga et al. 2013; Reinoso-Lastra 2008), and including the studies performed by García-Gonzalez (2008) and Ndururi and Mukulu (2015) aforementioned, a new proposal to improve the outcome of those practices will be presented. This new approach has been called Competence Approach Plus Personalized Advice model (henceforward, CAPPA model) and it is based on the establishment of key competencies practices, the settlement of such knowledge with a specific tools and methodologies (indoors and outdoors), and an institutional support provided by an advisory body of the university itself, generally called Entrepreneurship and Innovation Centre (EIC). Specifically, these three different dimensions that are being explained as part of this model can be described as:

- **Competences, skills and knowledge**: the skills, competencies and knowledge that have been included on CAPPA model are grouped on four basic categories derived from the study of previous research of authors included in this study. These four areas are: entrepreneurship, analysis, personal development and second language.
- **Methodologies and specific tools**: the specific methodologies and tools used by the students serve to reinforce the assimilation and application of competences, skills and knowledge learned in the classroom. There can be tools for application in the classroom (case studies, workshops and research groups), field tools (tours, competitions, internships) or mixed tools applied in both environments (new technologies, simulators).
- **EIC Support Advice**: the Entrepreneurship and Innovation Centre (EIC) is an institutional transversal body to all college programs, that provides a full service of consultancy and monitoring to the students, so that they can realize their entrepreneurial projects and receive full support regarding issues of consulting, marketing, finance, accounting, logistics, internationalization, legal services, promotion, networking and financing. It is designed so that it can be used by any student of any university program regardless of the semester, program or experience.

As it is shown in Fig. 8.1, CAPPA model should be applied throughout the entire educational program of any degree, and its implementation shouldn't be reduced to create a specific pool of subjects related to entrepreneurship and innovation, but

| SEMESTER | I | II | III | IV | V | VI | VII | VIII | IX |
|---|---|---|---|---|---|---|---|---|---|
| CAPPA MODEL STAGES | PRELIMINARY | | | | INTERMEDIATE | | | ADVANCED | |
| CAPPA MODEL CONTENT | Competences, skills and knowledge | | | | Competences, skills and knowledge | | | Competences, skills and knowledge | |
| | Methodologies and specific tools | | | | Methodologies and specific tools | | | Methodologies and specific tools | |
| EIC SUPPORT | Initial consultancy -- Strategic planning -- Marketing strategies -- Finances and accountancy -- Internationalization and logistics -- Legal services -- Promotion and networking -- Funding | | | | | | | | |

**Fig. 8.1** CAPPA model proposal and implementation on the curriculum



to incorporate the skills, abilities, knowledge, methodologies and tools in the current subjects which are part of the curriculum. For this reason, CAPPA model implementability has been divided in three different stages: Preliminary Stage, Intermediate Stage and Advanced Stage. In Tables 8.1, 8.2 and 8.3 these stages are described with this first proposal of competencies and tools for the CAPPA model:

As it is shown in Table 8.1, this preliminary stage is developed for students of any programs ranging from first and fourth semester. Competencies, skills and knowledge are designed to be implemented as part of the subjects of academic programs, focused on the four areas previously exposed: entrepreneurship, analysis, personal development and second language. These competences of this preliminary state are the following: innovation and creativity, critical and analytical thinking, personal development and second language. They can be described as the foundation and basis of the competences of entrepreneurship that will evolve in the intermediate and advanced stages of the model. As specific tools of empowerment and settlement of this knowledge, we can define case study examples of entrepreneurial college graduates and specific workshops and events related to innovation and creativity, motivational and personal development, and business incubation. Likewise, it must be highlighted the availability and transversal support of the Entrepreneurship and Innovation Centre in these early stages of the formation of the students, since this is a service that should be available to the entire university community regardless of program or academic semester.

In Table 8.2, it is shown the intermediate stage of CAPPA model, developed for students between fifth and seventh semester, and in which the competences, skills and knowledge implemented are the following: change management and continuous improvement, problems and conflicts analysis and resolution, synergies and teamwork, and continued second language studies. As specific tools, they are based on high impact experiences and stays on national territory, use of new technologies for the assimilation of the importance of technology transfer and use of simulators, as well as participation in national and international contests and competitions

t1.1 **Table 8.1** CAPPA model proposal on the preliminary stage (first to fourth semesters)

| Preliminary stage | Area/enforcement | Subject/activity | EIC support advice |
|---|---|---|---|
| Competences, skills and knowledge | Entrepreneurship | Innovation and creativity | Initial consultancy |
| | Analysis | Critical and analytical thinking | Strategic planning |
| | Personal | Interpersonal skills | Marketingstrategies |
| | Languages | Second language | Finances and accountancy |
| Methodologies and specific tolos | Cases of study | Graduates' successful cases of study | Internationalization and logistics |
| | Workshop | Innovation and creativity events and workshops | Legal services |
| | Workshop | Motivational and personal development workshops | Promotion and networking |
| | Workshop | Business incubation workshops | Funding |

t3.1 **Table 8.3** CAPPA model proposal on the advanced stage (eighth to ninth semesters)

| Advanced stage | Area/enforcement | Subject/activity | EIC support advice |
|---|---|---|---|
| Competences, skills and knowledge | Entrepreneurship | Strategic and global thinking | Initial consultancy |
| | Analysis | Risks and uncertainty tolerance analysis | Strategic planning |
| | Personal | Ethical and entrepreneurial leadership | Marketingstrategies |
| | Languages | Second language | Finances and accountancy |
| Methodologies and specific tools | Tour experience | High impact international experiences | Internationalization and logistics |
| | Workshop | Intercultural negotiation workshops | Legal services |
| | Research group | Innovation and entrepreneurship research groups | Promotion and networking |
| | Internship | Agreements and internships on start-ups | Funding |

related to creativity, entrepreneurship or any other areas related to education. The aim of this stage is to serve as the link between competences and tools developed in the preliminary stage, and preparation for the ones that will be received in the advanced stage, which will have a more strategic dimension. The Entrepreneurship and Innovation Centre support is also available in this stage.

t2.1 **Table 8.2** CAPPA model proposal on the intermediate stage (fifth to seventh semesters)

| t2.2 t2.3 Intermediate stage | Area/enforcement | Subject/activity | EIC support advice |
|---|---|---|---|
| t2.4 t2.5 t2.6 Competences, skills and knowledge | Entrepreneurship | Change management and continuous improvement | Initial consultancy |
| t2.7 t2.8 t2.9 | Analysis | Problems and conflicts analysis and resolution | Strategic planning |
| t2.10 t2.11 | Personal | Synergies and teamwork | Marketing strategies |
| t2.12 | Languages | Second language | Finances and accountancy |
| t2.13 t2.14 Methodologies and specific tools | Tour experience | High impact national experiences | Internationalization and logistics |
| t2.15 t2.16 | New technologies | Technological transfer workshops | Legal services |
| t2.17 t2.18 | New technologies | Entrepreneurship and business simulators | Promotion and networking |
| t2.19 t2.20 | Competition | National and international contests | Funding |

306 Table 8.3 shows the advanced stage of CAPPA model, in which the most strate-
307 gic skills are acquired: strategic and comprehensive thinking, risks and uncertainty
308 tolerance analysis, ethical and entrepreneurial leadership, and second language. The
309 tools implemented in the design of this phase consist of high impact international
310 experiences, intercultural negotiation workshops, innovation and entrepreneurship
311 research groups, and agreements and internships on start-ups. The Entrepreneurship
312 and Innovation Centre support continues to be available in this stage.

## 313 8.4 Conclusions and Future Research

314 This work started with an introduction to the importance of creativity, innovation
315 and entrepreneurship in any society to achieve progress and development nowadays
316 (Ackerman and Cervilla 2007; Fuel 2010; Moreno 2012; Ndururi and Mukulu 2015;
317 Rodríguez and Prieto-Pinto 2009). The terms of entrepreneurship and innovation
318 and their meaning and importance were also described (Briceño-Moreno and Cure
319 2009; Sanabria-Aguirre and Hurtado-Aguirre 2013), as well as the most important
320 characteristics that an entrepreneur must hold (García-Gonzalez 2008; Ndururi and
321 Mukulu 2015). An exploratory analysis about the situation of entrepreneurship in
322 Colombia was conducted, as well as the institutions involved in promoting entre-
323 preneurship (García-Gonzalez 2008; Ortiz-Riaga et al. 2013; Osorio-Toro 2009),
324 and the importance of universities and institutions of higher education in the pro-
325 cess (Gomez and Mitchell 2014; Heriot and Campbell 2005; Li-li and Lian-sen
326 2015; Rodríguez and Prieto-Pinto 2009).

In the present study it has been proposed the Competence Approach Plus Personalized Advice (CAPPA) model as a set of competences, skills, knowledge and specific tools to promote and encourage entrepreneurship in institutions of higher education classrooms. To design this new model, some previous works and considerations were taken into account, specifically the ones described by Ackerman and Cervilla (2007), García-Gonzalez (2008), Grau (2014), Hernandez-Sanchez and Rodriguez-Soto (2015), Hidalgo (2013), Kagami (2015), Libombo et al. (2015), Ndururi and Mukulu (2015), Ortiz-Riaga et al. (2013) and Reinoso-Lastra (2008). The proposal, which applies to any program that wishes to generate this entrepreneurial spirit among its students, has been divided into three different stages of development, depending on the semester in which the student is, and it is based on the establishment of key competencies, skills and knowledge learning methodologies (grouped in four categories: entrepreneurship, analysis, personal development and second language), a settlement of such knowledge with a specific tools and methodologies (indoors and outdoors, such as cases of studies, workshops, national and international experiences, simulators, contests and competitions, new technologies, research groups, and internships), and an institutional support provided by an advisory body of the university itself, called Entrepreneurship and Innovation Centre (EIC).

As part of this work, a pilot project is being conducted in the International School of Business and Marketing at Sergio Arboleda University in Bogota, Colombia, initially applied on the Marketing and International Business program, but thought to be implemented in any college program in order to increase entrepreneurial skills and motivations of its students. It is also expected to obtain measurable results in the following academic semesters, using internal and external evaluation criteria in collaboration with the Entrepreneurship and Innovation Centre.

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# Chapter 9
# Game Driven Education in Finance Through On-line Trading Tools

**Raúl Gómez-Martínez, Camilo Prado-Román, and Sandra Escamilla-Solano**

**Abstract** In this paper we describe a portfolio management activity using an online virtual simulator www.labolsavirtual.com over finance subjects related to financial markets, equities, currencies and commodities, with spot transactions and derivatives. Our experience is that this activity leads to greater student involvement with the subject, enhancing the capabilities for teamwork, searching and interpret financial information, using tools and defending their investment decisions.

## 9.1 Introduction

The activity called Portfolio Management with www.labolsavirtual.com is an activity that in the frame of the EEES helps the student to develop the practical part of the subjects related to the financial markets and with the investment decision-making capacity. Participants to this lecture have used this activity in the following subjects and degrees:

- Degree in Administration and Business Management: Financial Management II
- Degree in Financial and Actuarial Economy: Stock Market I
- Degree in Accounts and Finance: Financial Products.

The activity is prolonged during the whole period of the subject and consists of managing a virtual portfolio of 100.000€ to be invested in the worldwide financial markets with different financial products, both purchase products and derivatives. This game is similar to others used in the Economical or Business simulation teaching field. There are many studies trying to measure the efficiency of the business games as a teaching tool (Raia 1966; Wolfe and Byrne 1976; Hsu 1989). According to Romero

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et al. (2010) simulation games are a very special teaching methodology because they allow the student to have a closer approach of the business reality. Thanks to these economic reality simulators, students can make decisions and observe their results evaluating their efficiency, which makes the student to be aware of the real circumstances he or she will face in his or her future business activity. This is therefore a trial and error approach, characterized by giving the student a continuous results feedback which also gives this approach a dynamical character and also for allowing them to learn through the acquired experience, improving their learning (García-Valcárcel, Tejedor, and Diéguez 1996).

The goals of the activity are:

- To assimilate the studied concepts through the practice and the application of these to an emulator very similar to the one used by professional managers participants of the financial markets.
- To work in groups, as the portfolio is to be managed by groups of several students. This makes the students to have to share work and responsibility, and at the same time reduces the number of portfolios which makes the teacher follow-up easier.
- That the student has to learn to justify and defend his or her investment decisions and the results of it.
- That the student has to learn to make reports about the performed management.
- Get familiar with software similar to the one used in the principal professional environment for this activity.
- To be independent when searching and interpreting economic and financial information which supports his or her investment decisions:
  - Macroeconomic context and national and international financial situation.
  - Relevant information about listed companies.
  - Historical data and investment products in this activity profitability evolution.
- To have a discussion based on the customer or investor/ manager relationship, different to the common teacher/student relationship, provoking an exchange of the usual papers of the participants to this activity.

Similar studies have showed that these goals are reached when a business simulation game is introduced as a teaching tool in the frame of the European Higher Education Area (Escobar Pérez and Lobo Gallardo 2005). Furthermore, the exchange of papers of teachers and students help to improve student's motivation for learning and understanding of the subject (Míguez 2005).

The contents addressed in the different subjects and which are present in the learning modules of the EFA[1] certification, which consolidate with the development of this activity, are the following:

[1] The EFA (European Financial Advisor) Certification Guide is available on http://www.efpa.es/dades/guia_certificacion.pdf.

- Instruments and Financial Markets
  - Interpreting the economic indicators in the financial markets.
- Fundamentals of Investment.
- Equity Market
  - Characteristics of the Equity Market.
  - Stock Market Structure.
    - Traded Assets
    - Members of the market.
    - Settlement systems.
    - Contracting and stock Exchange operations
      - Contracting systems.
      - Type de orders.
  - Type of stock exchange operations
  - Stock Index.
  - Introduction at the Fundamental Analytics
    - General Considerations.
    - Basic Share Performance Ratio: PER and dividend yield
  - Introduction to the Technical Analytics.
    - Concept and principal of Technical Analytics
    - Supports and resistances
    - Volume
    - Graphical Analytics
    - Indicators and oscillators
- Foreign Exchange market
  - Definition of Foreign Exchange.
  - Characteristics of the Foreign Exchange Market
- Derivatives Market
  - Financial risk concept
  - Derivative instrument concept
  - Organized market and non-organized market
  - Future market
  - Options market

Therefore, paraphrasing the philosopher, we could say that: "Who learns and learns, and does not practice what he learns, is like plowing and plowing and never sowing" (Platón 2003).

## 9.2 Activity Description

The website www.labolsavirtual.com is a teaching tool, as its own creator defines, "a stock market that lets learn to invest using virtual money". Its access is totally free and it is not necessary any technical requirement, nothing else than a browser and access to the internet. As we can see in Fig. 9.1, the user interface is easy and friendly.

Students and teacher have to sign in and the only thing they need for it is an e-mail account. When signing in, each portfolio begins with a virtual initial capital of 100.000,00€ (Fig. 9.2).

Signed in users can add contacts so that they can see all operations made by all participants to the activity, as well as the evolution of the portfolios, on a comparative of these in base at the Ibex35 as a reference. Furthermore, each user can post messages, public and private, related to an operation or asset, which makes www.labolsavirtual.com a social network for virtual investors (Fig. 9.3).

The functionality of the Challenges allows making a ranking during a certain period of time of the profitability of the portfolios participating in it. Students having an elevated profitability, higher than the Ibex35 will be making a good active management whilst the students having profitability less than the Ibex35 will be managing worse than the market does on its own.

Virtual Stock Exchange allows operations about (Figs. 9.4 and 9.5):


**Fig. 9.1** Web http://www.labolsavirtual.com/

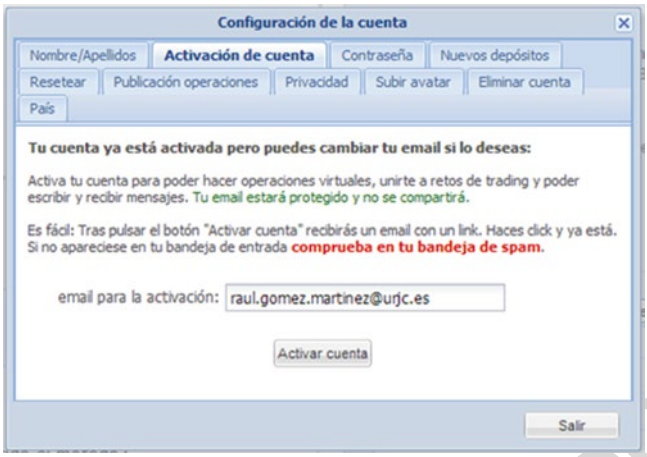


**Fig. 9.2** Activating the account first step

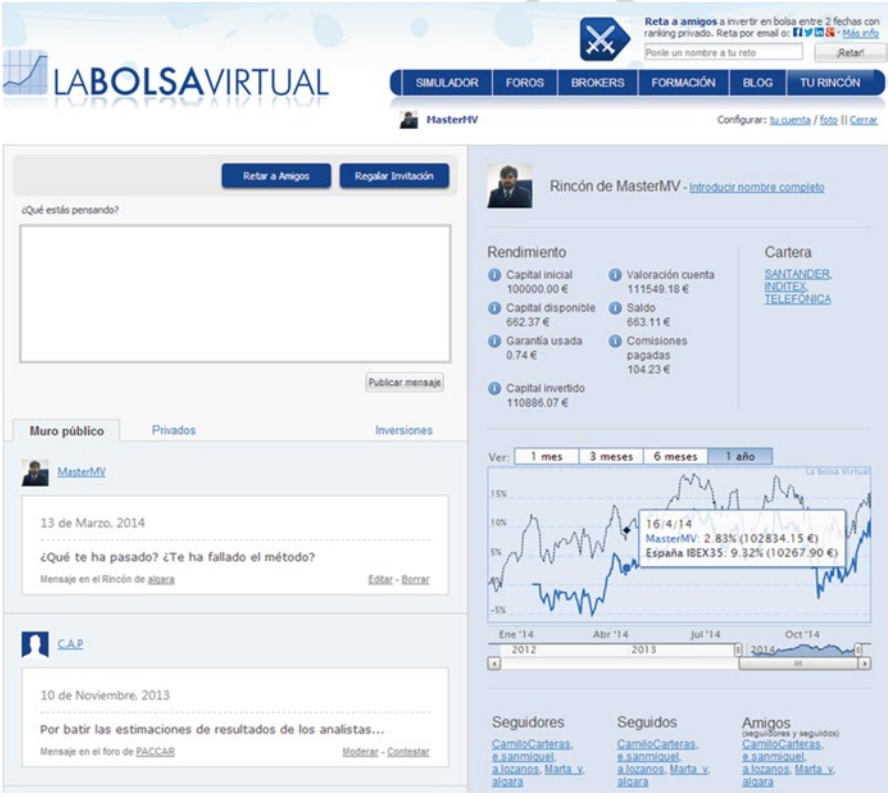


**Fig. 9.3** Activating the account second step

**Fig. 9.4** The "Challenge"


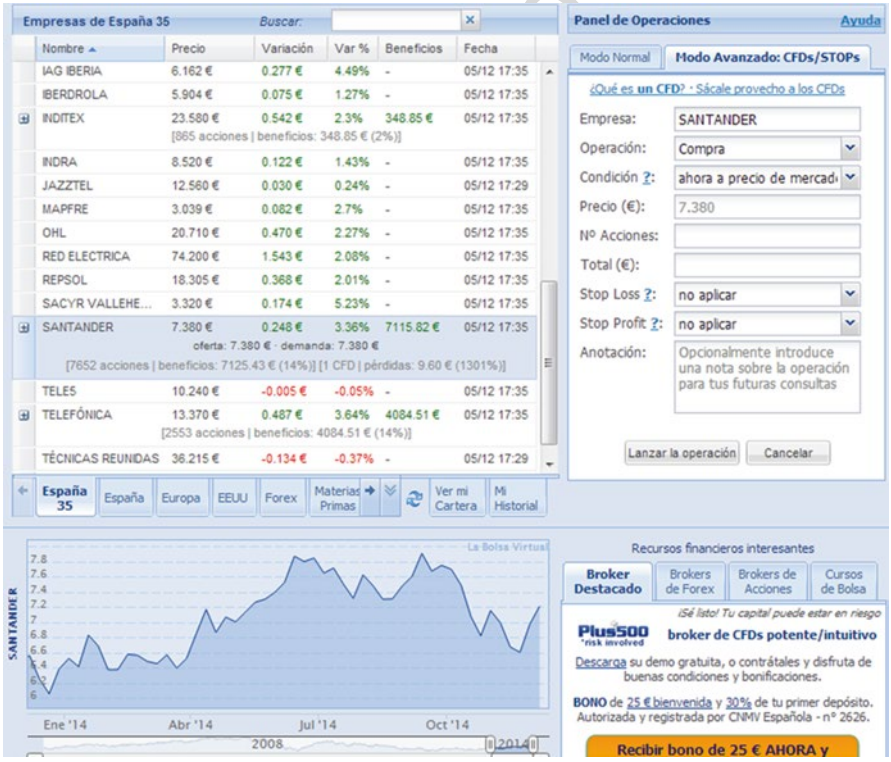


**Fig. 9.5** Operations simulator

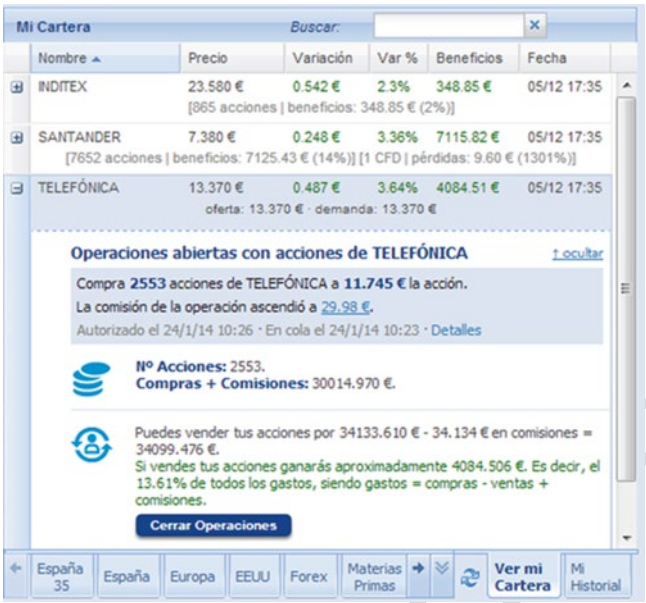


**Fig. 9.6** Portfolio Management



- Assets, of national and foreign companies, investing simulating stock Exchange and derivatives with CFDs.
- Foreign Exchange, simulating Forex operative.
- CFDs Index
- CFDs on raw materials

Furthermore, it also has functions allowing a follow-up of the portfolio, its profitability, its evolution, the orders sent to the markets, which are crossed and which are pending, as well as technical analysis tools (Fig. 9.6).

## 9.3 Hypothesis and Methodology

To assess the added value the use of a teaching tool as the trading on-line simulator described previously adds to the finances subjects, an anonymous survey through Internet was made to the students who have participated in groups (Álvarez et al. 2012; Vilches and Gil 2011): In the activity in the following subjects:

- Financial Management II from the Degree in Administration and Business Management
- Stock Exchange Market from the Degree in Financial and Actuarial Economy
- Financial Products from the Degree in Accounts and Finance

The questionnaire given is the following based on the one already used Escobar Pérez and Lobo Gallardo (2005):

- Questions about general evaluation of the activity
  - I think the experience worth the time devoted to the work
  - I think that the generalization to other subjects of this type of activities would improve the quality of the university teaching
  - Groups intervention make classes more interesting
- Questions about motivational aspects:
  - Groups intervention make classes more interesting
  - The activity has motivated me to work more on this subject
  - The activity has improved my opinion about the content of the subject (practical approach)
  - I feel more implicated in this subject than if it would be more theoretical (useful approach)
  - The activity has improved my evaluation of the degree
  - This activity has changed my point of view of the university student role as a passive information receptor
- Questions about capabilities development
  - The activity has helped me to develop capabilities as the analysis, synthesis, critics, etc.
  - The activity has helped me to develop capabilities as the computer use, document research, use of the library, etc.
  - The activity has improved my capacity of working in groups
  - I have improved my capacity of presenting, defending or debating opinions in public
  - Presentations make participation in class easier
- Questions about improving knowledge
  - The activity has helped me to link the new information or problem with what I have previously learned.
  - The activity makes me easier the use of ideas and information I already know to understand something new.
  - The activity helps me to understand, improve, enlarge and link my ideas
  - The activity drives me to ask questions and discuss
  - The activity serves to learn what other students think about a problem and consider their points of view
  - The debate between the different opinions has enriched my knowledge with alternative points of view
- Questions about the characteristics of the activity:
  - The reports presented in class by my colleagues have been interesting
  - All in all, I think that this type of activities denote an interest by the teacher into teaching

t1.1 **Table 9.1** Data sheet

| | | |
|---|---|---|
| t1.2 | Universe | 300 |
| t1.3 | Sampling unit | 67 |
| t1.4 | Geographic environment | Spain |
| t1.5 | Information collection method | For convenience |
| t1.6 | Sampling procedure | For convenience |
| t1.7 | Period of collection of information | February 2015 until April 2015 |

- During the development of the activity we discussed alternative solutions to the different type of problems

About each of these questions the student asked will give a score from 1 to 10. The higher the scores in the survey are, the higher will the added value perceived by the student be and, in consequence, more useful the tool will be in the educational context described.

Sample: The survey was given to the students of six groups in which the activity was developed in the last three academic years, in total around 300 students. The survey was open from February 2015 until April 2015 and has sought the opinions of the 67 respondents, more than 22 % of the surveyed population (Table 9.1).

## 9.4 Results

The results of the survey show that this activity was liked by the students because the average of the scores to all the questions is over 7. This can be seen because, every time the activity was proposed as optional, all students have signed in the software and made operations on it, and secondly, thanks to the high volume of operations made by the students, in many occasions, more than one operation a day, assuming the role of "trader intradía".

If we focus this evaluation from a quantitative point of view in base of the collected data, we can observe that the general evaluation of the activity has been positive with a mean and a median superior to 7 in the collected surveys (Table 9.2):

The main result of the activity is a major implication of the student with the subject, seeming sometimes that the student wishes to learn more about portfolio management and stock exchange analysis, not for improving his or her results at the final test but to beat his colleagues in profitability at "The Challenge".

Some students even ask for additional bibliography, out of the field of the subject, about technical and fundamental analysis to allow them to have a method, unknown by their colleagues, who can help them win at "The Challenge". All of this stimulates a healthy competition between the students which makes that they share experiences developing the contents of the subject. This impression is countersigned in the survey with the scores about motivational aspects (Table 9.3):

t2.1 **Table 9.2** Questions about the general evaluation of the activity

| Questions about the general evaluation of the activity | Mean | Standard deviation | Median |
|---|---|---|---|
| I think that the experience has worth the time I devoted to the work | 7,60 | 2,37 | 8,00 |
| I think that the generalization of this type of activity to other subjects would improve the quality of the university teaching | 8,03 | 2,26 | 9,00 |
| The participation of the groups makes classes more interesting | 7,36 | 2,48 | 8,00 |

t3.1 **Table 9.3** Questions about motivational aspects

| Questions about motivational aspects | Mean | Standard deviation | Median |
|---|---|---|---|
| The activity has motivated me to work more on this subject | 7,27 | 2,50 | 8,00 |
| The activity has improved my opinion about the content of the subject (practical approach) | 7,54 | 2,32 | 8,00 |
| I feel more implicated in this subject than if it would be more theoretical (useful approach) | 7,63 | 2,42 | 8,00 |
| The activity has improved my evaluation of the degree | 6,84 | 2,45 | 7,00 |
| This activity has changed my point of view of the university student role as a passive information receptor | 6,87 | 2,35 | 7,00 |



Additionally is an experience close to the portfolio management professional activity. Even though it is a web service totally free it shares the concepts followed by the business systems used by the professionals in the financial field companies, making it clearly easier for the student to get used to its imminent jump to the professional world. The development of professional capabilities has been less perceived by the student due to the results of the survey but it still receives a positive evaluation over 6 out of 10 at the questions asked (Table 9.4):

Furthermore, we can also see that students get a practical application of the concepts studied in class. Those test questions having a direct reflex with the activity are systematically correctly answered in the tests, becoming the activity a strong backing for the student's study (Table 9.5).

Finally the exchange of roles, and the fact that interlocution changes from Teacher/Student to Customer/Manager make that students become aware of the importance of forms and communication in the professional world opening the door to the development of capabilities oriented with the Emotional Intelligence and Nonverbal Communication (Table 9.6).

t4.1 **Table 9.4** Questions about capabilities development

| Questions about capabilities development | Mean | Standard deviation | Median |
|---|---|---|---|
| The activity has helped me to develop capabilities as the analysis, synthesis, critics, etc. | 7,03 | 2,58 | 8,00 |
| The activity has helped me to develop capabilities as the computer use, document research, use of the library, etc. | 6,55 | 2,42 | 7,00 |
| The activity has improved my capacity of working in groups | 6,13 | 2,58 | 6,00 |
| I have improved my capacity of presenting, defending or debating opinions in public | 6,48 | 2,47 | 7,00 |
| Presentations make participation in class easier | 6,78 | 2,53 | 8,00 |

t5.1 **Table 9.5** Questions about improving knowledge

| Questions about improving knowledge | Mean | Standard deviation | Median |
|---|---|---|---|
| The activity has helped me to link the new information or problem with what I have previously learned | 7,33 | 2,13 | 8,00 |
| The activity makes me easier the use of ideas and information I already know to understand something new | 7,43 | 2,15 | 8,00 |
| The activity helps me to understand, improve, enlarge and link my ideas | 7,30 | 2,24 | 8,00 |
| The activity helps me to understand, improve, enlarge and link my ideas | 7,27 | 2,25 | 8,00 |
| The activity drives me to ask questions and discuss | 7,03 | 2,28 | 8,00 |
| The activity serves to learn what other students think about a problem and consider their points of view | 7,09 | 2,39 | 8,00 |
| The debate between the different opinions has enriched my knowledge with alternative points of view | 6,96 | 2,39 | 8,00 |

t6.1 **Table 9.6** Questions about the characteristics of the activity

| Questions about the characteristics of the activity | Mean | Standard deviation | Median |
|---|---|---|---|
| The reports presented in class by my colleagues have been interesting | 6,75 | 2,40 | 7,00 |
| All in all, I think that this type of activities denote an interest by the teacher into teaching | 7,70 | 2,38 | 9,00 |
| During the development of the activity we discussed alternative solutions to the different type of problems | 5,87 | 2,93 | 5,00 |

## 9.5 Discussion, Conclusion and Implications

According to this activity experience, our conclusion is that applying the game described in this paper improves the implication of the student with the subject and the goals previously described are reached: (a) To better assimilate the studied concepts; (b) Work in group; (c) Justify and defend his or her decisions; (d) Make reports; (e) Use of software; (f) Independence for searching and interpreting economic and financial information; and (g) Improve the communication due to the exchange of roles.

This added value provoked by the introduction of a game in the learning process is in line with the previous work mentioned in the conceptual frame described in the foreword.

Even though we cannot say that it is generalized, we did observe cases where some students end this activity with a profession. They become "pockets" obtaining profitability managing a patrimony, in some cases coming from a heritage or a family donation. Even though we believe that some of them have lost money, at least all of the ones who told us their experience were happy and made profit.

Finally, highlight that a future line of research could be to study according to questionnaires, how many of the students agree with these conclusions and which effects of the activity are the most valued.



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# Chapter 10
# Educating for Entrepreneurship: Application to the Business Services Marketing Subject

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**Abstract** In the current economy context of Spain, where the crisis has revealed the weaknesses of the Spanish economic and production model (reduced weight of industry, excessive dependence on the construction sector, poorly competitive SMEs, high unemployment rate, and high private debt), a change in the model is becoming increasingly necessary. One possible model is entrepreneurship. A new generation of entrepreneurs is needed who are able to create and develop new businesses to solve all these problems, plus companies with well-trained human capital to operate in sectors with high added value, and to properly use new technologies to innovate and develop sustainable competitive advantages. Spain lacks an entrepreneurial culture, and neither training nor funding helps change this notion. In recent years, the high unemployment rate has served to promote entrepreneurship, especially when businesses do not require major initial investment. Notwithstanding, the fact that an entrepreneurial mindset in Spanish is missing is closely linked to the Spanish society's negative perception of entrepreneurs. The authors of this paper have attempted to change this behavior in their students by using several tools in the Business Services Marketing subject to encourage entrepreneurship.



## 10.1 Introduction

Adaptation to the European Higher Education Area (EHEA) has led to teaching methodologies being reformulated. This has motivated teachers to rethink the teaching methods used. The publication of the White Paper on Entrepreneurship in Spain in 2011 (Alemany et al. 2011) has made teachers re-assess not only the methods, but also the objectives used for such education. It is also necessary to consider if students obtain only knowledge or also skills from this teaching. We can even go a

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step further as they can acquire skills that help them get a job or use such skills to create and start up their own business. All this allows us to start with a teaching competence model that enables the introduction of entrepreneurial skills into the classroom and keys to develop entrepreneurial talent from the classroom.

Given Spain's current economy, it is important to foster an entrepreneurial culture among students from this country. After years of economic growth, the crisis has brought to light the weaknesses of our economic and production model. Therefore, a change is necessary. The Spanish mentality and factors like fear or failure, low risk tolerance, lack or little creativity, etc., make entrepreneurship difficult. Then current legislation being endorsed by one's own assets also means that people think twice before setting up any company and embarking on new ventures. New legislation on such matters, as well as incubators, angel businesses, or even crowdfunding, are initiatives that are starting to change the image of entrepreneurship. However, changes should start mainly in the classroom.

For all these reasons the authors of this article decided to devise a new approach to the Business Services Marketing subject to provide students with tools and mindset for entrepreneurship, as will be seen throughout this work. The main objective of this study was to improve the entrepreneurial vision that students have from the classroom. Another goal was to help them no longer fear entrepreneurship. The ultimate goal was to provide tools for entrepreneurship students.

This paper is organized as follows: the first section presents an introduction. The second section offers a theoretical framework with both conceptual and legislative references. The third section explains a practical application of the entrepreneurship teaching model to a particular subject. The fourth section provides the results obtained from implementing the introduced methodological changes, including a small survey and its results on entrepreneurship conducted in the classroom. The last section draws all conclusions from this work.

## 10.2 Conceptual Framework

Instead of educating on a set of specifically defined skills, this new society, toward which we move, requires more complex skills that cover knowledge, skills, attitudes and values (Marina 2010). This is the fundamental idea that drives to training in the skills which we must strive for. Based on this concept we conduct a literature review.

Some works on entrepreneurship in the literature has identified certain individual or social characteristics that characterize the entrepreneur, including desire for personal fulfillment, need for power and wealth, desire for independence and autonomy, and improvement of the family's cultural and social status (Rüdinger et al. 2014). Yet the most important individual characteristics that place entrepreneurial behavior within the entrepreneurship function are related to the entrepreneur's natural tendency to be open to both environment and external challenges, being willing to take risks, and having cognitive abilities and creativity (Baum and Bird 2010;

Cuervo 2005; Rüdinger et al. 2014). These features, linked to the ability to discover new opportunities, are essential aspects of entrepreneurship.

However with the publication of the White Paper on Entrepreneurship in Spain, it has been found that entrepreneurship is lacking in Spanish people, and that this it is linked to the negative perception that society has of it. It has also confirmed that the entrepreneurial culture, training in entrepreneurship and venture financing are three factors that negatively influence entrepreneurship (Alemany et al. 2013). For all these reasons, it is necessary to not only change financing systems, but to also address the issue from the education system in order to change this image.

Others authors (Shane and Venkataraman 2000) state that what characterizes economic entrepreneurship is the study of sources of opportunities, processes of discovery, evaluation, and exploitation of opportunities, and individuals who discover, evaluate and exploit them. Thus the above authors define entrepreneurship as an examination of how, by whom and with what effect individuals create new goods and/or services to be discovered, evaluated and exploited.

[AU1] The paper "Working Party on SMEs and Entrepreneurship" (OCDE 2009) highlights the importance of linking education and promoting entrepreneurship, and includes various programs that set criteria to generate a system to evaluate them. It also indicates that the development of curricular proposals by competences is an opportunity to evaluate the rigor and effectiveness of specific experiences and educational programs.

We owe it to David Mc. Clelland, the psychologist named "Father of competences", the successful introduction of such competences into the workplace (Alemany et al. 2013). This entails learning how to acquire not only an occupational skill, but also, more broadly speaking, a competence that will enable an individual to cope with many situations and to work in teams (Delors 1996).

Competence is also defined as the ability to respond to complex demands in order to mobilize psychological and social resources in a particular environment (OCDE 2005). Another definition of competences is the combination of knowledge, skills and attitudes that are appropriate to a given context. Key competences are those that people need for personal fulfillment and development, and also for active citizenship, social inclusion and employment (Comisión Europea 2006). The application of basic skills occurs during a process of complex mental operations, whose patterns of thought can determine and take suitable action for the situation to hand (Perrenoud 2004).

Another major change introduced by EHEA was to specifically focus student training on skills development. The idea was to prepare students for integration into the labor market and to ensure their specific expertise in their chosen field of study. It also helps students develop certain skills that can be transferred to a variety of functions and tasks that enable students to successfully integrate into social and work spheres (Barbera-Ribera et al. 2015).

Another project that also affects this particular point is the Tuning Project that aims to determine benchmarks for generic and specific skills. According to the Tuning Project (Tuning 2008), the term *skills* represents a dynamic combination of attributes—related to knowledge, and its application, attitudes and responsibili-

ties—that describe the level of proficiency a person is able to acquire. This concept is closely related to other terms with a similar meaning, such as capacity, ability or dexterity. In the Tuning Project Final Report, competencies are defined as "know and understand" (theoretical knowledge of an academic field), "know how to act" (practical and operational implementation of knowledge in certain situations) and "know how to be" (values as an integral part of how we perceive others and live in a social context).

Arguably the most important classification of skills is that proposed by the Tuning Project. This classification differentiates between specific competencies and generic skills as follows:

- Specific skills: attributes that must be learnt by students while at university and must be defined in the curricula of their qualification. These are specifically job-related competencies.
- Generic skills: skills that are common to any degree. They refer to transversal skills, common to most professions or disciplines:

1. Instrumental skills: cognitive skills (ability to understand and manipulate ideas and thoughts), methodological skills (organizational skills, strategies, decision making and problem solving), and technological and linguistic skills.
2. Interpersonal skills: skills that promote the processes of social interaction and communication.
3. Systematic skills: individual competencies related to understanding complex systems.

From all we have seen in this section, we can extract the following information of the competence concept:

- Key competences are needed to get on in life in general, particularly in working life.
- Competences are an amalgam of knowledge, skills and attitudes.
- Skills use to be trained, so that students have to learn by doing, are a major change in educational systems in general.
- The proper application of skills should lead to their effective implementation in a given situation. In fact real life needs the implementation of our competences.

Here we indicate a short summary of how skills arrive in our education system. This summary is drawn from Alemany et al. (2013): OECD initiated the PISA program (Programme for International Student Assessment) in 1997 to assess whether students have acquired the essential knowledge and skills for full participation in society when they complete compulsory schooling. The European Council meeting in Lisbon 2000 concluded that we need to define what core competences should provide learning throughout life. The Councils of Stockholm in 2001 and Barcelona in 2002 work programs "Education and Training 2010" were developed in response to the European continent "globalization and the shift to knowledge-based economies". In 2006, the European Parliament and the European Council approved a recommendation to Member States "on key competences for lifelong learning".

Our intention is to introduce a short summary to facilitate readers' understanding of the progress made from introducing competences into European and Spanish education systems.

## 10.3 Application to the Subject

A person's ability to transform ideas into action is known as entrepreneurship competence (Comisión Europea 2006). This competence is related to creativity, innovation and risk taking, and also to the ability to plan and manage projects to achieve objectives (Alemany et al. 2013). We also talk about competence as acting autonomously, as individuals' ability to control their lives responsibly and with respect, and exercising a degree of control over their lives and work (Proyecto DeSeCo 2005). There is also talk about entrepreneurship as the ability to lead oneself to change (active ingredient), and the ability to accept and support the changes caused by external factors (passive component) (Comisión Europea 2004). [AU2]

Learning to learn competence is big news in the competence proposal because it opens up the possibility of working in processes of learning and thinking strategies. We need to apply new methodologies to achieve the objectives of putting knowledge into action. Interactive methodologies encourage participants to generate their own solutions by applying concepts and theories to different situations. Teachers pass on the active role to explain all these concepts to the role of helping with what students need. Now teachers must create the necessary structures to develop skills. This is a lot of work, but one that precedes the work done in the classroom. Students learn from what they know with real tasks to ensure lasting learning over time. Teachers let pass those students who obtain autonomy and independence in their learning.

One of the authors of the present work always reminds her students about the following sentences by Confucius:

He told him and he forgot it, he saw it and understood, he did and learnt.
This is why we must "do it to learn it". This is why we advocate active methodologies.

The subject in question, Business Services Marketing, is a very practical and applicable one for students' future careers. The subject is taught in year 5 of the Degree of Business Administration. It is a core subject within the services specialty. Seventy-two students enrolled for academic year 2013/2014: 40 in the morning group and 32 in the afternoon group.

In previous years, teachers taught theoretical classes and subsequently evaluated students by an exam. Students had to draw up a Marketing Plan, which the teachers subsequently corrected and evaluated.

Last year, the first thing we did was to define the key skills that students needed to develop. This led us to define three categories of key competences:

- Skills that enable them to master the socio-cultural instruments needed to interact with knowledge. Category 1.
- Skills that allow students to interact in heterogeneous groups (cooperation, teamwork, conflict resolution, etc.). Category 2.

198 • Skills that enable to act autonomously. Category 3.

199 To develop all these key skills, we decided to use different tools. However, meth-
200 odologies are not the answer if used with no in-depth reflection because all we
201 achieve is that students see the showy use of new tools. So knowledge does not sink
202 in and the expected results are not produced. Thus we must put methodologies to
203 good use. This is done by planning, programming and using tools, and by finally
204 evaluating the knowledge acquired. We should report and analyze the causes of suc-
205 cess or failure in tasks, provide opportunities to rectify and to learn, perform, evalu-
206 ate and rectify tasks. It is also important to structure tasks by starting from the
207 simplest and then moving to the most complex ones, which helps grade their diffi-
208 culty. Finally, we should emphasize the importance of effort, and encourage stu-
209 dents' creative and intellectual processes.
210 We now go on to explain the tasks performed during the sessions and the tools
211 used in them.

### 212 *10.3.1 Activity 1: Introducing Students*

213 All the students had to introduce themselves in a maximum time of 3 min to explain
214 their strengths and weaknesses, and to explain how they think that their participa-
215 tion can help a work group.
216 The teacher first introduced him/herself to provide students with an example.
217 Then students were given 15 min to prepare their own introductions.
218 This activity helps students to, on the one hand, ask questions that they will ask
219 in the labor market and, on the other hand, to really consider what is better and what
220 is worse, and how to sell their advantages and disadvantages. It is in itself a market-
221 ing activity that helps students to conduct an internal analysis.
222 Before offering their presentations in class, groups of three people were formed
223 and each person had to perform his/her presentation to the other two people who
224 recommended the others how to improve their presentation. No negative criticism
225 was valid. Finally, each student was presented to the whole class. This activity helps
226 develop skills in Categories 2 and 3.

### 227 *10.3.2 Activity 2: Devising a Business*

228 Each individual student had to think about a new company, for which he/she had to
229 define a product/service for this company to undertake or provide, the market it
230 would target, its size, its location and the number of initial basic decisions to make.
231 To do this, each student could consult all the information he/she needed. Students
232 presented their ideas individually in a panel. Any similar ideas formed a group, but
233 the students themselves had to decide what their ideas resembled the most. Groups
234 included five people at the most. If an idea was completely different to all those

submitted, the person who devised it could choose which group he/she was most interested in joining. Group members had to accept it, or not, by stating their reasons. This activity helps develop skills in Categories 2 and 3.

### *10.3.3 Activity 3: The Aronson Puzzle*

To develop the theoretical parts of some subjects, we used the Aronson Puzzle (Aronson and Osherow 1980). Materials had to be prepared by the teacher beforehand because the subject to be worked on by the students had to be distributed into various parts as if they were pieces of a jigsaw (Mayorga and Madrid Vivar 2012). Those parts were distributed among students, and each student had to prepare his/her own. Later they met with the other students from the other groups who played the same theoretical part (Expert Group) to discuss the issue. They then returned to their original group where they put all the parts together.

This method makes the theoretical parts entertaining while helping all the group members get more involved. They had to prepare the part of the subject that they had been assigned as experts on this subject to discuss it with the other experts on this topic, and had to introduce the most important aspect of this subject to their own group which, in turn, listened and understood the other parts of the topic as a whole. When the subject ended, students did a test to verify the knowledge they learnt on this subject. This activity helps develop skills in Categories 1, 2 and 3.

### *10.3.4 Activity 3: LEGO© Serious Play©*

The LEGO© Serious Play© rules were explained. Each person had to build his/her own ideas with LEGO© bricks and explain them to the other participants. No-one could criticize anyone's ideas. Next this tool was used to develop SWOT (Strengths, Weaknesses, Opportunities and Threats). In fact only Strengths and Weaknesses were analyzed, which is something they all knew very well from the Faculty where they study. One group studied strengths and another examined weaknesses. First each person had to individually think about strengths or weaknesses (depending on group ownership) and express them with shapes. Second everyone explained his/her ideas, taught his/her shapes and gave explanations.

Once everyone had explained all their ideas, these were combined into a single model (one for strengths and one for weaknesses), and the most important one was left in the center of the composition. The other ideas were placed outwardly in concentric circles according to the importance the group conferred them. The model should act as a single model per group. Students could remove portions of the model or integrate two models into one. These decisions had to be made through a consensus by students as a group. The class was divided into two groups of ten people. This activity helps develop skills in Categories 2 and 3.

### *10.3.5 Drawing up a Marketing Plan*

Each group of five students (the groups previously formed in Activity 2) should devise a marketing plan for a service company, which they should define. They were given a guide for preparation purposes. The basic steps were:

- Phase 1: Analysis and diagnosis:
  - Situation analysis.
  - Situation diagnosis.
- Phase 2: Strategic Decisions:
  - Setting goals.
  - Strategies and resources.
- Phase 3: Operational Decisions:
  - Specific action plans.
  - The marketing plan's self control.

While devising the marketing plan, groups prepared three partial presentations (one per phase), where the other students could suggest ideas to enhance their approach. By this marketing, plans were improved through collaborative work. In the last (final) presentation, during which the entire work was illustrated, a peer evaluation was made, in addition to a teacher's assessment. Previously we developed a rubric by consensus, which all the students participated in. This activity helps develop skills in Categories 1, 2 and 3.

When the course ended, a survey on entrepreneurship was organized. The next section presents some survey results.

## 10.4 Results

When the course ended, a survey of students who had taken the course (72 students) was organized. Some questions were to classify students, some were about the entrepreneurship concept, and others were on entrepreneurship in general and asked if they would invest in the project that was conducted by a classmate.

Most students were aged 23–25 years, although there were older people because they were studying their second degree and some worked. Most students were unemployed and only studied, but 25 % of the class had a job.

When asked whether there were any businesses within their family, only one third answered that there was. When asked who believed in the statement "An entrepreneur receives a high social status", only 42 % answered affirmatively. When asked if they had considered the possibility of developing an entrepreneurial project, only 33 % answered affirmatively.

When they were asked if they knew someone who had started a business in the last 2 years, 50 % answered they had. When asked if they were already doing or

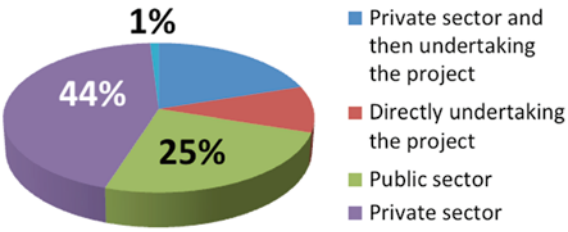


**Fig. 10.1** How do you see your possible career? *Source*: Own

intended (2 years) to start a new business in the short term, only 6 % answered yes. However as to whether they saw any need or possibility of starting a new business in their own personal setting, affirmative answers increased to 25 %. Finally, when asked if they would be willing to invest in a classmate's project they considered feasible, 75 % said they would (Fig. 10.1).

The questions and answers of this survey helped us to frame entrepreneurship in the classroom, and to see that it is still in its early stages.

## 10.5 Conclusions

In Spain the current situation may encourage more people to consider entrepreneurship because the economic crisis makes traditional alternative occupations more complicated. Thus educational institutions should start encouraging entrepreneurship through skills that help personal autonomy, leadership, innovation and other business skills. This should enhance self-esteem and the basic trust of students, their motivation and spirit of excellence, sense of responsibility, decision making, communication and negotiations skills, teamwork, involvement, creativity, planning, sense of ethics, social responsibility and management aspects, such as economic, financial, human resources, and labor and strategies, such as marketing and business communication.

It is sometimes stated that entrepreneurs are born. However it is true that there are often ideas that can lead to entrepreneurship which remain only as ideas given lack of the knowledge about the tools to develop these ideas, sometimes due to fear of failure, and other cultures like the American one, which better takes this in its stride.

If we help our youths by providing them with the necessary tools for entrepreneurship, and if we begin to change the image of entrepreneurs from within, this will lead to an entrepreneurial culture which will, in turn, lead to more entrepreneurship, which will become a self-powered circle.

From the results of the conducted survey we see that the core of entrepreneurs from the classroom is still very small. There are many people who wish to further their education by working in other companies to then launch into entrepreneurship. Yet these numbers are still very few compared to those obtained in American universities.

Educating for an entrepreneurship society is to stimulate creativity and respect for others' ideas. Not only listing the contents that students must learn should be proposed, but also equipping them with the skills and competences needed for their future development. The idea is to enhance experiences in the entrepreneurship context for students to learn entrepreneurship from within. This is the only way we will change the perspective toward entrepreneurship.

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# Author Queries

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# Chapter 11
# Work and Study Habits in the Interconnected Age: What It Means for Businesses of the Future

**Dag Bennett, Diana Pérez-Bustamante, and Carmelo Mercado-Idoeta**

**Abstract** In the context of continuous connectivity, big data, and information overload the purpose of this study was to investigate the work and study habits of contemporary students. This project was an exploration of how students order their environments and manage their work and how this affects their academic performance. The main finding is that most students work in distracting surroundings and engage in many activities while studying. However, the more activities they engaged in, the worse their academic performance. The finding is consistent with research showing that using two (or more) cognitive processes simultaneously has a negative impact on both the effectiveness and the efficiency of carrying out tasks. Moreover, many students are not aware of the negative effects of distraction, or fool themselves that they can actually multitask because we also found that the most distracted students were the least good at predicting their own results. There was also a big difference between men who trusted to their personalities and luck for results and women, who took a more strategic approach and were more likely to achieve the results they predicted.

## 11.1 Introduction

This study was sparked by a visit to a computer lab where students worked on assignments. Besides working, students did many things such as texting and emailing—and their computer screens had many non-work-related windows (Youtube,

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FaceBook, etc.). Students switched between computers and mobiles, and between various applications and sites. When an instructor asked if they should concentrate on their work, students responded that they really were working and this was just the way they did it—while socializing and entertaining themselves. Though it is not surprising that students give high priority to socialising—university is meant to be about more than just learning (Pascarella and Terenzini 2005)—the way in which they work and the learning environment they create for themselves seems to place learning only on a par, at best, with other activities.

This connectedness is aided by the ubiquity of devices that connect—a recent survey found 78 % of UK students owned smartphones, 85 % laptops, and 33 % netbooks or tablets (University of Bristol Student IT survey 2014). These devices are used to listen to music, email, social network, play games, surf, and even to access academic services. In the UK household Internet access reached 86 % in 2014 (Office for National Statistics 2014). These figures are in line with a large (n = 36,950) US-based (ECAR) study (Salaway et al. 2007). In Europe, the US and much of the rest of the world young people are connected all the time.

**The Research gap**: In the context of continuous connectivity, the purpose of this study was to investigate how students organize their environments outside the classroom and to assess how this affects their learning. We assume that much of what is normal inside the classroom is also normal outside, so in effect we sought to examine the effect of spreading attention, or distraction, on studying. Previous work in this area has mostly been in narrowly defined studies, e.g. Kirschner and Karpinski (2010) looked at Facebook's effect on academic performance, Lesiuk (2005) examined the effects of music on performance, Rosen et al. (2011) and Clayson and Haley (2013) studied texting in classrooms. But to our knowledge little research has been done outside the classroom where students are in control of their environment and their time. Only one small qualitative study by Winter et al. (2010) noted that while graduate students cited multitasking as a benefit of e-learning they also found switching between activities distracting, so some employed "boundary management" to separate activities.

## 11.2 Adaptation and Technology

Today's university students grew up in the digital age and they generally have more of everything than their parents did—especially ICT. Given their different circumstances it is natural for young people to behave differently to previous generations. The idea of human adaptability has led some observers to speculate that exposure to masses of stimuli drives young people to acquire new skills, to learn in new ways (Veen and Vrakking 2006) and to develop advanced relationships with technology that endow them with 'natural' abilities (Prenksy 2001; Beastall 2008). Prensky (2005) held that babies even develop multitasking strategies via technological familiarity that enable them to navigate new and complex spatial environments.

Later studies (Bullen et al. 2011; Ebner et al. 2008; Kennedy et al. 2008; Kvavik 2005) questioned whether newer generations are better with technology, e.g. Kvavik (2005) found that "most students do not recognize advanced functions of applications they own and use…" and passively consume information rather than learning from it. Other studies show that students mostly have only superficial abilities with technology, often limited to basic skills, e-mailing, text messaging, and Internet surfing. In short, familiarity with technology and frequent usage do not necessarily confer sophisticated or useful skills for learning or studying.

**Divided attention or multitasking**: It is of course possible to appear to do several things at the same time, e.g. attending a lecture while texting or networking. This type of behavior gives people the idea that they can actually multitask effectively. While attractive, this idea has been repeatedly challenged by research showing that multitasking is a bad strategy for performing tasks well or efficiently (Kirschner et al. 2006). People can multitask only basic, habitual, automated tasks, where thinking plays no role.

When compared to serial processing rapid task switching results in poorer learning and overall performance of all tasks, decreases the efficiency of performing each task, raises the number of mistakes and extends the time required to complete all tasks (American Psychological Association 2006; Ophir et al. 2009). "Multitasking" is therefore a misnomer because what people do, indeed all they are capable of doing, is rapid serial task switching.

## 11.3 Capacity Constraints in Information Processing

Research on the limitations of human information processing shows that even those who have grown up in input-rich environments are unable to perform simple tasks effectively when coping with multiple inputs (Chun et al. 2011; Rosen et al. 2011; Wood et al. 2012). At heart, the issue of distraction and task performance is about how much information a human brain is capable of processing. This is described in Mayer and Moreno's (2003) metacognitive model whose research-derived theory of learning and information overload is widely used for understanding how multitasking in a multi-media environment can affect the learning process. The model makes three key assumptions about how we process information:

1. The human information processing system for multimedia environments has two channels (or modalities)—auditory and verbal (Paivio 1986; Baddeley 1998; Mayer 2001);
2. Each channel has a limited capacity for cognitive processing (Chandler and Sweller 1991; Baddeley 1998) and;
3. Meaningful learning requires that substantial cognitive processing occur either in the visual or auditory channels (Wittrock 1989), including building connections between learning modalities and consists of selecting, organizing and integrating the presented material. These processes include paying attention to the

> presented material, mentally organizing it into a coherent structure, and integrating the material within existing knowledge. The end result is that something is understood, learned, and remembered beyond the short term. Meaningful learning is when something learnable (e.g., a fact) is understood in the context of other knowledge. 'Meaningful learning' contrasts with 'rote learning' in which information is acquired without regard to understanding (2000).

Learning however, may be inhibited when processing demands evoked by a learning task exceed the processing capacity of the cognitive system—Mayer and Moreno's (2003) term for this is "cognitive overload". Capacity restraints in turn are determined by the limitations of working memory—in which all cognitive processing occurs—that can handle no more than perhaps two or three novel or discrete elements at one time (Baddeley 1998). This number is far below the number of interacting elements that occurs in most substantive areas of intellectual activity.

Mayer and Moreno (2003) discuss three types of cognitive demand: Essential processing, incidental processing and representational holding and show that learning is only possible when all three of these processes are engaged. They lay out five overload scenarios that can impede learning.

In the current study the conceptual framework is extended to a context where students confront far more information than they can process (Chun et al. 2011) and develop screening mechanisms to determine whether to process information further. The significance of this self-defense strategy lies in what it reveals about how a mind is organized (Mathews 1997) with the key constraint being the capacity limitation of memory. When broken down into discrete elements (digits, words, etc.) researchers find working memory is limited to between four to seven elements (Miller 1956; Cowan 2001). This is important because for something to enter into long-term memory (to be learned) it must be processed through working memory—the greater the capacity of working memory, the greater the learning.

Stimuli differ in terms of strength or attention-getting potential. Loud noises, flashing lights or catchy song phrases may 'capture' attention. But the ability to over-ride or tune out strong stimuli differs between individuals, and this difference is related to their working memory capacity. The effect of too many stimuli combined with capacity constraints in cognitive processing is likely to be imperfect or slowed learning. Even those highly experienced at processing multiple stimuli simultaneously will find their learning hindered. Altogether the evidence on cognitive limitations and learning physiology suggest that distraction and switching amongst multiple stimuli hinders learning.

## 11.4 Self-regulated Learning

Observing that students have preferences in the way they learn, Paske (1976) introduced the terms learning strategy and learning style. 'Strategy' refers to the way individual tasks are tackled, while 'style' refers to general preferences in relatively

stable behaviour patterns. The educational literature (Hawk and Shah 2007) contains many definitions for styles of learning that include: extroverted ⇔ introverted, sensory ⇔ intuition, thinking ⇔ feeling, judging ⇔ persuasion (Myers 1962), activists, reflectors, theorists and pragmatists (Honey and Mumford 1992), visual, auditory, read/written and kinaesthetic (Fleming et al. 2001), deep strategic, surface, apathetic (Entwistle 2000) and so on. Our purpose here though is to show that there is a vibrant debate surrounding how to define styles of h learning. That debate will continue as we move into an ever more complex world.

Bloom's (1956) pioneering work identified three domains of learning; cognitive (knowledge, or 'knowing/head'), affective (attitude or feeling/heart) and psychomotor (physical manipulation to develop skills, or doing/hands). This led psychological and educational theorists into a synthesis centered on holistic learning that is compatible with modern cognitive and metacognitive theory. Palinscar and Brown (1984) suggested that motivation is governed by basic principles of cognitive psychology and should be conceived of in information-processing terms. A major theme in this area is self-regulated learning (Pintrich and Zusho 2002) where self-regulated students approach learning tasks with confidence, purpose, and resourcefulness (Cassidy 2011).

## 11.5 Research Questions

Previous studies (Wood et al. 2012; Rosen et al. 2011) support the idea that learning requires sustained attention and is impeded by distraction (Mayer and Moreno 2003). The cognitive model provides a strong theoretical base to suggest that distractions inhibit learning and our assumption is that non-study activities while studying will reduce course marks. Similarly, living with many other people or working in paying jobs may increase cognitive demands and lower marks. Furthermore, we expect self-regulated students to be more focused on achieving expected levels of academic results.

This study was designed to lay the groundwork for further research and pedagogical investigation by addressing five basic questions:

1. What activities do university students engage in while they are studying (reading, researching, writing, etc.)?
2. What is the relationship between the total number and the varying types of non-study activity and final course marks?
3. Is there a relationship between the number of other people with whom a student shares living space and final course results?
4. Does working in part-time paying jobs have an affect on course results?
5. Are students able to predict how well they will perform academically?

## 11.6 Methodology

Data were collected from 414 postgraduate students in the business faculty at a large, public university. A survey with open response items asked for information about the activities respondents usually engaged in while studying (reading, researching, writing, doing coursework, etc.). It also asked about the number of hours per week of work in paying jobs, how many people shared their living space and what they predicted their course marks would be. Respondents used only student numbers and at the end of each semester the student ID numbers provided the link to final course results.

**Variables**: Activities engaged in while studying were assessed from open-ended question that asked respondents to list the activities they generally engage in while doing schoolwork. The intent was to assess the work environment students create for themselves. Since this might change depending on the task at hand, e.g. students might study more at the end of a semester before an exam, the survey was conducted mid-semester to assess general or usual study habits.

The academic results achieved by students depend on many factors, one of the most important of which is previous results (Cohn et al. 2004; Yang and Lu 2001). The entry requirement for students in this sample was a 2.2 degree classification at bachelors level (US GPA of 3.0). But since over half the respondents had foreign degrees, it was not possible accurately depict previous results across the range of marking schemes, making it impossible to control for previous academic results, except to say that all students had attained the entry standard.

Entry requirements included proof of ability in English—e.g. English Language Testing Service (IELTS) of 6.5 or higher. In this study we also had information on the respondents' mother tongue that we included in the analysis. As with academic performance, the great variety in English testing regimes made it impossible to quantify English ability. This was not a serious issue as previous work on the predictive validity of IELTS scores among international students found no correlation between scores and outcomes (e.g. Cotton and Conrow 1998; Dooey 2002).

The effect of crowded living and academic performance has been little studied. Here we asked how many other people shared living space with the respondent, "Living space" meaning bedroom or common areas like living rooms and kitchens. In dormitories students often have their own bedroom, but share a kitchen and living room with other students creating potential social interaction and distraction. We defined the term "living space" to include common areas.

We gathered information about the predicted overall course mark by asking students to predict the mark they anticipated at the end of the semester. They were directed not to say what they 'wished' to achieve, but to realistically estimate what they thought their results would be. We then asked for the reasons they had for making their prediction.

**Procedure**: Validity evidence for the questionnaire was provided by reviewing it for: (1) Clarity in wording, (2) relevance of the items, (3) use of standard English, (4) absence of biased words and phrases, (5) formatting of items, and (6) clarity of the instructions. Four graduate students and a faculty member reviewed the questionnaire and on their comments, it was revised prior to use.

Participants were recruited by asking for volunteers to complete the surveys in class. Thus, the sampling method was a convenience sample. At the end of each semester, correlations were calculated between variables and multiple regression analysis was performed to examine the relationship between extra-study activities and academic performance. Open-response items were post-coded and analyzed using Qualitative Data Analysis (QDA), (Caudle 2004) to examine the meaningful and symbolic content of qualitative data and identify interpretations.

## 11.7 Results

Of the 414 students in this research 218 (53 %) were female, and 196 were male (47 %). The mean age was 23.6 years with a standard deviation of 3.0. Respondents came from 38 countries, with the biggest proportion from the UK (34 %), followed by France (10 %) and Thailand (7 %). English was the mother tongue of 40 % of respondents, 11 % French, 7 % Thai, and so on.

Shared Space—Respondents lived with a mean of 2.9 other people. 26 respondents (6 %) lived alone, 12 % lived with one other person, 25 % lived with 2, 27 % with 3, 21 % with 4, 7 % with 5 and 2 % lived with 6 or more other people (the maximum was 8 other people).

Paid work—Fifty-six students (14 %) did not have part time paying jobs. The 86 % who did have jobs worked between 4 and 33 h per week, with a mean of 14 h.

Non-study activities—Most students engaged in activities while studying, e.g. 217 (52 %) listened to music or the radio while studying. 18 % ate, drank or smoke, and only 4 % claimed to do nothing else while studying. These activities are labelled non-distracting in Table 11.1 since they require less attention and have fewer attention-grabbers than social networking, texting or computer games.

Activities described as 'distracting' are at the bottom of the table. While they may not require constant attention, they do require shifts of focus and active involvement, for example in responding to a message. In addition, social networks, SMS and on-line games often have signalling devices such as ring-tones and screen pop-ups that attract attention—and so distract from whatever else a person is doing. These are difficult to ignore and cannot be considered as background or white noise.

Tabulating final unit marks against activities revealed a clear relationship, shown in Table 11.2. At the top of the table, the few students who engaged in no other activities while studying averaged final course marks of 65 %. Table 11.2 shows that as the number of non-study activities rose, the average final mark fell. Note that the

**Table 11.1** While studying what other activities do you engage in?

| | % | |
|---|---|---|
| Listen to music, radio | 52 | |
| Eat/drink/smoke | 18 | Non-distracting |
| Nothing | 4 | |
| Facebook/other social network | 52 | |
| Texting/SMS/talking on the phone | 49 | |
| Youtube/video/other computer video | 31 | Distracting |
| TV/DVD | 16 | |
| Computer games | 12 | N = 414 |

**Table 11.2** The number of activities and final course marks

| Number of activities | Final course mark | | |
|---|---|---|---|
| 0 | 65 % | | |
| 1 | 62 | | |
| 2 | 59 | | |
| 3 | 55 | | |
| 4 | 50 | | |
| 2.1 | Average | 58 | N = 414 |



50 % average mark for students engaging in four activities is just at the passing level, (some were below 50 %). When correlated the relationship between number of activities and final marks was $r = -0.53$ (significant at $^*p < 0.01$).

The relationship between activities and final results—the more activities, the lower the mark can also be seen in Fig. 11.1 which shows the spread of marks across the different levels of activity. Viewing the data in this simple way gives a clear indication of the negative relationship between the number of activities and final marks

Table 11.3 is a correlation matrix between all assessed variables. Significant results (t-test, *p, 0.01) are shown in bold. The bottom row shows the correlation between distracting activities and final results is $r = -0.505$. This finding is consistent with research showing that attempting to pay attention to multiple stimuli decreases learning (Marois and Ivanoff 2005; Wood and Cowan 1995). The result is also consistent with studies on multitasking in the classroom (Junco and Cotton 2012; Rosen et al. 2011; Wood et al. 2012; Clayson and Haley 2013).

Other significant results were a negative correlation between the number of people in shared space and final results, i.e. the more flatmates, the lower the overall mark. More flat-mates or family members as a source of distraction can also be seen in the positive correlation between distracting activities and the number of people in shared space. In contrast the second figure in the bottom row in Table 11.3 shows no relationship between hours worked and final course marks.

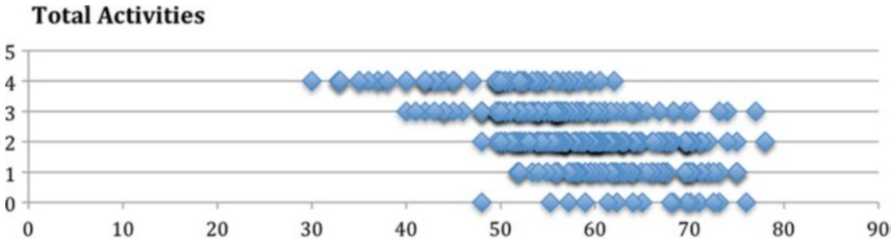


**Fig. 11.1** The more activities engaged in, the lower the final mark (n = 414)

t3.1 **Table 11.3** Correlations between final marks, part-time work and shared space (n = 414)

| t3.2 | | Age | P/t hours | Live w/ | Distracting | Non-distracting |
|---|---|---|---|---|---|---|
| t3.3 | Age | | | | | |
| t3.4 | P/t hours | 0.029 | | | | |
| t3.5 | Live with | 0.009 | −0.020 | | | |
| t3.6 | Distracting | 0.011 | 0.093 | **0.134** | | |
| t3.7 | Non-distracting | 0.023 | 0.094 | 0.025 | −0.017 | |
| t3.8 | Actual result | 0.075 | 0.008 | **−0.314** | **−0.505** | **−0.194** |

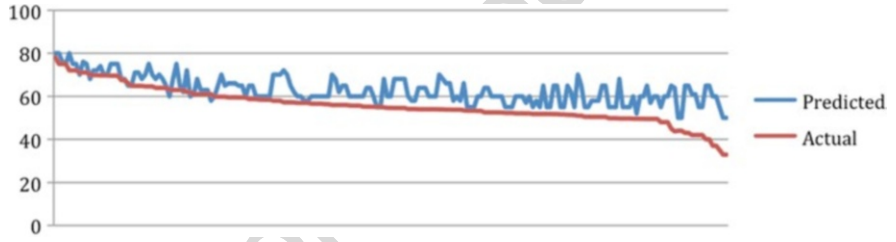


**Fig. 11.2** Male predictions were generally higher than Actual Marks



### *11.7.1 Self-predicted Results* 284

Students' predictions of their final course marks averaged 61 % and ranged from 50 to 75 %. The predictions were made in week 4 of each semester, by which time students had a good grasp of the subject matter and assessments. Responses were divided between male and female, and the predicted results plotted against actual results as shown in Figs. 11.2 and 11.3. 285 286 287 288 289

Some predictions were off by up to 30 points. The divergence between actual and predicted results was greatest at the lower end, and no-one predicted they would fail. Overall, the Mean Average Deviation (MAD) of actual vs. predicted marks was 5.7 points with a standard deviation of 5.2. However, the MAD for women was 290 291 292 293

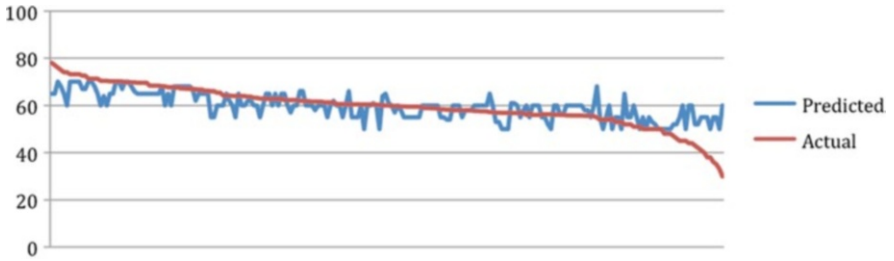


**Fig. 11.3** Female predictions were more accurate, but tended to undershoot

t4.1 **Table 11.4** On our predicted course mark?

| t4.2 | | Women | | Men |
|---|---|---|---|---|
| t4.3 | I always get this mark | | | |
| t4.4 | I got it last semester | 30 % | Historical | 18 % |
| t4.5 | It's my average mark | | | |
| t4.6 | I'm brilliant, I'm very clever | | Personality or providence | |
| t4.7 | I'm praying, I put my faith in god | 22 | | 60 |
| t4.8 | Please please please | | | |
| t4.9 | I'll work 4 h a day on it | | | |
| t4.10 | I'm very organized | 48 | Strategic | 22 |
| t4.11 | I know what it takes to get this mark | | | |



294 significantly lower at 4.3 than for men at 7.8. It was also clear that students who
295 achieved higher marks (on the left of the tables) predicted more accurately. Another
296 striking finding is that nearly all men over-predicted their marks, but women tended
297 to under-predict theirs, especially at the upper end. Men and women also gave dif-
298 ferent reasons for their predictions. Nearly half of all women predicted their results
299 on strategic (self-regulated) grounds, while 30 % gave historical reasons. Sixty per-
300 cent of men on the other hand, based their predictions on personality or providence
301 (passive, or non self-regulated) grounds (Table 11.4).

## 302 *11.7.2 Regression Analysis*

303 To determine the relationship between the independent components and the depen-
304 dent variable 'Actual' results, Actual was regressed on the variables for Sex
305 (dummy), mother tongue (dummy), Age, P/t hours, Live W/, Distracting, and
306 Non-Distracting. Since the t statistics for Sex and Mother tongue were less that
307 +/−1, so not significant in determining the value of final results, they were removed
308 and the regression run again. The F statistic for the second regression is F = 47.779

t5.1 **Table 11.5** Regression on actual results B (n=414)

| t5.2 Independent variables | Coefficients | Standard error | t | P-value |
|---|---|---|---|---|
| t5.3 Age | 0.227 | 0.114 | 1.997 | 0.046 |
| t5.4 P/t hours | 0.072 | 0.047 | 1.542 | 0.124 |
| t5.5 Live w/ | −1.429 | 0.228 | −6.264 | 0.000 |
| t5.6 Distracting | −5.098 | 0.421 | −12.109 | 0.000 |
| t5.7 Non-distracting | −2.981 | 0.578 | −5.150 | 000 |
| t5.8 Multiple R | 0.607 | | | |
| t5.9 $R^2$ | 0.369 | | | |
| t5.10 Adjusted $R^2$ | 0.361 | | | |
| t5.11 Standard error | 6.878 | | | |
| t5.12 Observations | 414 | | | |

t6.1 **Table 11.6** ANOVA

| t6.2 | df | SS | MS | F | Sig F |
|---|---|---|---|---|---|
| t6.3 Regression | 5 | 11302.98 | 2260.597 | 47.77904 | 7.34E−39 |
| t6.4 Residual | 408 | 19303.93 | 47.31356 | | |
| t6.5 Total | 413 | 30606.92 | | | |



and the adjusted R square measure of 0.361 is a satisfactory result. Table 11.5 shows that the variables with greatest affect on results are Distracting and non-distracting activities. The number of people in shared space is also significantly associated with actual results. On the other hand, part-time hours and age had very small effects (older students achieved slightly higher results than younger ones) (Table 11.6).

## 11.8 Discussion

The main purpose of this investigation was to examine how self-controlled work environment affects academic performance. Specifically to (1) describe the non-study activities that university students engage in while studying, (2) examine whether differences exist in the academic performance of depending on the number of activities, (3) determine if there was a relationship between the number of other people in shared living space and academic performance, (4) determine whether time spent on part-time paid jobs had an effect on results, and (5) assess whether students were able to predict their own performance.

The main finding is that most students engage in numerous activities while they study and there is a significant negative relationship between the number of activities and academic results. Students who engaged in no activities achieved the

highest marks, while those who engaged in the most had the lowest marks and some failed to pass. The overall finding is consistent with research suggesting that implementing two (or more) cognitive processes simultaneously can have a negative impact on both the effectiveness and the efficiency of carrying out tasks.

Dividing attention between activities can result in cognitive overload. An explanation using Mayer and Moreno's (2003) framework shows that cognitive processing functions can be stressed by spreading one's attentions too widely and this can make deep learning difficult. When the activities were divided between distracting and non-distracting types, distracting activities were highly negatively correlated with overall marks ($r = -0.53$) while non-distracting activities had a less strong association ($r = -0.19$). Overall it appears that each distracting activity costs the student about five points in overall results and each non-distracting activity costs about three points.

This may be a slight over-simplification because not all 'tasks' or activities require the same attention or effort. Music for example may have high or low arousal qualities (Furnham and Strbac 2002) with differing effects on concurrent task performance. Some of the highest-scoring students in this study listened to music while studying and this could have improved their mood, attitude and concentration (see Lesiuk 2005) or served as white noise (Rauscher et al. 1993) potentially improving task performance.

In contrast, a variety of activities such as texting, on-line games and social networking (Facebook, Twitter, Tumblr, etc.) with their built-in attention-capturing mechanisms are much more demanding, or at least interrupting. These 'always on' tools have the power to engage and hold attention. In addition, the demands for attention they embody, and the anxiousness of anticipation of receiving a call text or message is in itself a distraction and has been described as 'infomania' (Zeldes et al. 2007) a term that captures the artificial sense of urgency in 'personal' communications and networking.

The third research question was whether sharing living space with a higher number of people would reduce overall marks, and here the result was a strong negative correlation. This is a new finding. Crowded conditions can easily be seen to be hard to work in, especially if the crowded flat is active and noisy. It appears that sharing space creates distraction within the living space itself, as in music, TV, and additional social interactions.

The fourth research question of whether working at part time jobs would lower the overall result had a surprising negative result. This might be explained by the fact that work is different from distraction or cognitive overload in that it reduces the time that a student can invest in studying and may also be fatiguing, rather than decreasing the quality of study time. In any case, there was no discernible relationship between hours worked and results.

The fifth research question about whether students are aware of the effects of spreading their attention across extra-study activities was addressed by how accurately they predicted their results. Overall predicted results were within 5.7 points but women were more accurate with a MAD of 4.3, and while men almost always

over-predicted with a MAD of 7.3. It appears that women predicted more accurately because they based their predictions on what they do or have done (historical or strategic basis), rather than on their personality traits or divine intervention. Men on the other hand, are overconfident in their predictions, which are based on personality traits.

That men are overconfident, or over-optimistic has been studied in other contexts, e.g. Barber and Odean (2001) discuss male preferences for higher risk in stock market strategies, Croson and Gneezy (2009) review gender differences in economic experiments and identify male affinity for higher risk preferences, and Grinblatt and Keloharju (2009) find that overconfident investors and sensation-seeking investors (mostly male) trade more frequently. Perhaps the over-prediction of results is akin to over-optimism in stock-picking.

Perhaps of more relevance here is that women tended to show more self-regulated learning than men did. This can be seen in the reasons they gave for predicting their own results, a task at which they were better than men. In other words women were more results-oriented, better organized, and better at controlling their work environment.

This study raises a number of questions; with current technological trends that take computer and Internet accessibility to new highs, it has never been easier to engage in multiple activities. As availability and access to affordable technology increases, and students' comfort level and experience in using it rises, it is inevitable that the use of all manner of entertainment and networking devices will increase as well. This is perhaps the greatest danger for current students who have always been connected—they see it as normal, or even habitual, and may therefore perceive studying as the added activity.

Some findings beg additional questions. For example, do students compartmentalize their web-time, or spread it evenly while engaged in other activities? Do they deliberately switch applications off, or on? If so, when, and why? If students recognize that they are spreading their attention, do they attempt to control it? Control of course implies the recognition of need for control.

Many students have part time jobs, or live in crowded flats but they seem less affected by these types of distractions. This may be because the time lost to work or crowded living does not affect mental activity or focus during studying time, whereas voluntary distractions do. It may also be that students are more aware that crowding and working can be a problem for studying and take some action to mitigate.

Educators and employer should also be aware of both the benefits and costs of going along with existing behaviours. For example, on-line delivery, web-casting, webinars, and so on are all ways to bend technology habits towards educational ends. At the same time however, such delivery ultimately falls into a multitasking environment where it must compete for attention. Multi-media delivery therefore comes at a price. This price is just beginning to be recognized, but from this study it is clear that the price of dividing attention and devoting precious cognitive capacity to distracting activities is a high one.

This study's implications are profound for employers because this was a study of habitual behaviour. It would be very surprising if today's students do not take their work and study habits with them when they go to work. Of course, work may not be unsupervised, nor the work environment entirely within the control of younger workers, but their orientation to technology, information gathering and processing and ICT in general are habitual and hard to change.

### *11.8.1 Limitations*

The limitations of this exploratory study begin with the sample being drawn from a population of students at a single, large, public university. The accuracy of responses may also be questioned, e.g. respondents were asked to recount the activities they typically engage in while studying and their ability to accurately report such information is unclear. Future work could record logging data to determine the veracity of the self-report (though this could involve privacy issues).

Are other measures involved in academic performance such as amount of time spent studying and length of time without distractions relevant? And while activities were described here, no attempt was made to quantify time devoted to any activity. Most social networkers admit that spending "too much time" on-line can have downsides to both work and academic performance (there are even apps that monitor and restrict social networking time). This suggests other issues around motivation or control could be important to time and effort allocation (Hu and Kuh 2002).

Finally, the division between distracting and non-distracting activities is somewhat arbitrary and made on the basis that music has only one dimension while music videos have both sound and images, and so YouTube is more distracting than listening to a CD. But it may be that a favourite album or video have equal powers to distract or engage attention. Nor do we know whether music with words is more distracting than music without. Music can also be employed to enhance or alter a mood, or to provide white noise or screen out other sounds.



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# Chapter 12
# Experiential Activities: A Tool to Increase Entrepreneurial Skills

**Diana E. Woolfolk-Ruiz and Mónica Acosta-Alvarado**

**Abstract** This chapter addresses the experiential activities in the classroom as an effective tool to increase the students' entrepreneurial skills and the importance to integrate hands-on activities into the program design and course content. We found there are several courses not related to the business planning area that encourage innovation skills. The research showed to what extent hands-on activities influence the intention to start a new business among undergraduate students. Through our research, we noticed that experiential activities, plus the participation of students in extracurricular activities, nourish their entrepreneurial spirit.



## 12.1 Introduction

Nowadays one of the major challenges for universities among internationalization of the curriculum and the inverted expectations of students and universities is to shift from passive modes of learning and teaching towards experiential forms, establishing closer contact between the business world and their students (Kozlinska 2011).

Katz (2003) poses that training and education focus on entrepreneurship are one of the achievements of the modern education system. According to Katz (2003), the first entrepreneurship programs were offered in 1940. In the mid 50s, the programs offered by the colleges were very specialized, and due to this reason, the Ford Foundation and the Carnegie Foundation made the decision to conduct studies to meet the needs of companies and required skills and business practices. Later in the sixties, it was observed that graduates of business schools had broad, technical knowledge; analytical tools; and expertise in problem solving which focused on the middle and upper part of the organization, but in the late 70s and early 80s, new needs arose, and lack of understanding and preparation to be an entrepreneur, along with management abilities gaps, forced both public and private universities to seek to introduce new courses that were relevant to the needs of emerging industries. These innovations are focused not only on the program content,

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but also on the program delivery by the academic staff. Lundström and Stevenson (2005) highlighted the role of institutions in proposing that entrepreneurial education should be integrated into the program content for all levels, from elementary school to university. A number of researchers had advised that entrepreneurship education should desist from teaching knowledge on business creation and focus on experiencing entrepreneurship, making the linkage between their students and the business world (Haase and Lautenschläger 2011) and developing their students as practitioners (Higgins and Elliott 2010). Kolb's Experiential Learning Theory suggests emphasizing the central role that experience plays in the learning process (Kolb 1984) and points out that in entrepreneurship learning and teaching this becomes vital (Corbett 2005; Heinonen and Poikkijoki 2006; Govekar and Rishi 2007; Robinson and Josien 2014).

The Experiential Learning Theory (ELT) is conceived by its author as "a holistic integrative perspective on learning that combines experience, perception, cognition and behavior" (Kolb 1984, p. 21). Kolb defines learning as "the process whereby knowledge is created through the transformation of experience" (1984, p. 38). Later on, Kolb and Kolb (2005) stated that "enhancement of experiential learning in higher education can be achieved through the creation of learning spaces that promote growth producing experiences for learners", and according to Dewey's educational philosophy, there are experiences that promote or inhibit learning (Dewey 1938; cited by Kolb and Kolb 2005) the importance to design and generate entrepreneurial learning experiences that truly promote learning.

However, it should be noted that traditional education differs from entrepreneurship education. Authors like McMullan and Long (1987) state that entrepreneurship programs should be very different from a typical program of business. This is supported by Hynes (1996), whose research suggests that entrepreneurs need a broader perspective and learn specialized subjects. Due to this reason, traditional business education is perceived as ineffective in a new business scenario. According to a team of scientists from Babson College, USA (Lange et al. 2014) believes that neither taking entrepreneurship courses nor writing a student business plan will enhance the operating performance of a student/alumni's business. For them, the experience that a student obtains in the real world before they start a new venture is the key to enhance their performance when they are in the startup process and when they are operating their own business.

In Olele and Uche's (2012) research, which was conducted through data obtained from 150 randomly sampled students to analyze the contents of the entrepreneurship curriculum, they established that the strategies used for teaching/learning entrepreneurship education were not experiential, and that the activity oriented enough to enhance active participation of students; they argued (Olele and Uche 2012) that this is one of the reasons for students' misconceptions of entrepreneurship education. It further showed that the focus of the curriculum content was basically only on entrepreneurship learning skills. Pavlov's research (2014) also establishes the need of practicing in real conditions for the entrepreneurship learning in addition to specific knowledge acquired from theory.

Succeeding this introductory section, this chapter is structured as follows: a review of the literature relevant to the topic; exposition of the methodology adopted; analysis and graphs of the sample analyzed with discussion of our results; and presentation of the conclusions.

## 12.2 Theoretical Background

Recently, research has shown the importance of the integration of hands-on activities into the program design and course content. Scholars have consistently emphasized that action is a central construct to understand entrepreneurship (Baron 2007; McMullen and Sheperd 2006).

Interactive and experienced-based learning are preferable methods in entrepreneurship education (Potter 2008). Porter and McKibbin already suggested in 1988 that "a more proactive, problem—solving, and flexible approach rather that the rigid, passive-reactive concept, and theory-emphasized functional approach" is needed. The authors suggest "experimentation" in order to learn how to deal with problems entrepreneurs frequently need to solve.

According to Rasmussen and Sorheim (2006), entrepreneurship education requires experiential components for it to be effective. This approach is supported by Neck and Greene (2011), who stated that experience replaces education. In the conducted research, the authors found that experience enriched the course content rather than replaced the education received. This was also reinforced by Higgins et al. (2013), who advocated that practice, can contribute to entrepreneurial development, which is different from traditional approaches.

There are several options to develop hands-on activities within the class. Students can learn through site visits, and through this activity, the students visit the facilities and the professors encourage learning by situating the students in an action place (Cooper et al. 2004). Some studies maintain that the process of collecting field data with which to validate their business ideas is perhaps the single most effective way for students to build empathy for what it is like to be an entrepreneur (Neck and Greene 2011; Jones et al. 2012). From the perspective of Bliemel (2014), the activities done by students outside the classroom transform homework into fieldwork, making the course content more attractive and the learning outcomes more effective. Moreover, Cordea's (2014) research findings showed that entrepreneurial extracurricular activities have real learning benefits for students; they raise self-confidence and provide the required skills to engage in new business creations. Skills such as the ability to be creative, active critically thinking, recognize opportunities and work effectively in a team are highly important to entrepreneurs but can be challenging to teach and learn. Robinson and Stubberud (2014) suggest that emphasizing hands-on activities and self-analysis in entrepreneurship education rather than writing a business plan is more effective; it also has a long-term effect, according to Lange et al. (2010).

Authors such as Haase and Lautenschläger (2011) and Bliemel (2014) stated that learning by working on the student's own business ideas, being supported by exposure to guest speakers, and having guidance by mentors is another hands-on activity that brings about good results. Guest speakers from the industry will also help students to engage in a specific industry and clarify doubts they could have regarding the industry or the business the speakers work in Jones and Matlay (2011). It is important to mention that while stories might be exciting and motivating it is unlikely that students encounter similar situations or circumstances that are comparable with the situations described by guest speakers (Fiet 2001). Souitaris et al. (2007)) reinforced the use of guest speakers as a strategy, and they stated that inviting guest speakers could be effective to increase students' inspiration—an emotional element important to increase the intention towards self-employment. Action-based entrepreneurship trainings are particularly effective in promoting entrepreneurial action (Barr et al. 2009). Action-based entrepreneurship training has become a popular method to train students in entrepreneurship (Asvoll and Jacobsen 2012). According to Potter (2008), there seems to be an agreement that interactive and experienced-based learning are preferable methods in entrepreneurship education.

Through the implementation of the experiential learning, the teacher's role moves from being directive to coaching, while encouraging and questioning (Draycott et al. 2011). The solution to building empathy for entrepreneurs and teaching "know-how" is to get students to actually do and experience what real entrepreneurs would do and internalize the "know-what" based on their own first-hand experience (Jones and Matlay 2011). As Robinson and Josien (2014) stated, "when a task is performed it is referred to as experience," and they also established that experiential education seeks to model the behaviour of the actual task or practical work with the expectation that the affective and cognitive aspects of the experience will emerge along with the behaviour (Robinson and Josien 2014). They further suggested "that fundamental assumptions of experiential education apply to many types of activities" (p. 177). These types of activities could include, among others, extracurricular activities (Cordea 2014) and simulations and gamming (Mayer et al. 2014; Armer 2011; Thatcher 1990) agreeing with these last types of activities, Dutton and Stumpf (1991) stated that in general, the experiential learning activities are design to teach complex principles through the use of behavioural activities supporting the use of simulations and games for entrepreneurship learning and skills. Robinson and Stubberud (2014) further demonstrated in their study the effectiveness of these kinds of activities in developing "soft skills," such as thinking in a creative way, networking and working in teams, and critical thinking that an entrepreneur will need.

According to Fayolle (2013), entrepreneurial research emphasizes the importance of active, experiential, learning by doing, and real-world pedagogies. Few studies compare the effectiveness and efficiency of different teaching methods. A privileged place is given to the business plan development and the functional knowledge supporting the new venture creation process (Honig 2004). Scholars

have also noted that many entrepreneurship trainings put a strong focus on developing a business plan, but they lack a method that involves active engagement by the participants (Honig 2004; Pittaway et al. 2009). The development of the business plan is not enough; there is no difference in the intention to create a new business after taking a training based on the development of business plans. Entrepreneurs who initiate more start-up activities and who are more active in the process of starting a new business are more likely to successfully launch one (Carter et al. 1996; Kessler and Frank 2009; Lichtenstein et al. 2006; Newbert 2005; Lange et al. 2014). Another innovative approach to teach entrepreneurship in undergraduate programs was presented by Moriguchi et al. (2014) in a Brazilian case study, which was based on practical works in order to "stimulate students to look for market opportunities in several business areas, by highlighting the learning process of how to know, how to do, how to be, and how to deal with innovation in products and processes" (p. 10); this method considers a systemic vision in order to build the knowledge by means of interdisciplinary and multidisciplinary subjects. In addition, it emphasizes the importance of self-learning and the use of their new enterprise incubator established on campus to offer idea implementation through a students' pre-incubation project.

Shepherd and Douglas (1996) suggest that entrepreneurship education should not only teach the discipline or the functions of entrepreneurship but also develop the spirit of entrepreneurship. This is one of the reasons why experiential learning experience could encourage the entrepreneurial spirit among the students. Besides what was stated by Shepherd and Douglas (1996), through active learning, the action principles are connected with concrete behaviour. Thus, more concrete action knowledge is generated with beneficial effects for taking action (Frese and Zapf 1994). Also, Frese and Zapf (1994) established that through active learning, the students get real-life feedback, which helps them to better understand what the action principles mean and how to apply them. This refines and improves their action knowledge, and thus, contributes to taking action.

According to Müller (2014)), conducting experienced-based learning is quite challenging. Besides confronting students with real-life experiences, it is necessary to link experiences in education. As Dewey (1938; cited by Kolb and Kolb 2005) stated, experiential learning is the "idea that there is an intimate and necessary relation between the processes of actual experience and education". Neck et al. (2014) highlight that "entrepreneurship education is exploding and new approaches are needed not only to keep up with demand but also to keep up with the changing nature of entrepreneurship education". Fiet (2001) argues that with the exception of discovery and idea generation, topics covered in entrepreneurship education programs mainly come from established literature in strategy and organization theory. Edelman et al. (2008) analysed the contents of dominating entrepreneurship textbooks as a proxy for what is being taught and compared it with the activities reported by nascent entrepreneurs in the Panel Study of Entrepreneurial Dynamics (PSED). The authors found that what is emphasized in textbooks is sometimes disconnected from what entrepreneurs are actually doing.

## 12.3 Methodology

To accomplish the purpose of this study, as a first phase, we analyzed several articles regarding experiential learning, entrepreneurship learning activities, entrepreneurship learning/teaching approaches, and methods and strategies. In addition to the academic articles and research studies analysis, questionnaires were administered as a second phase. The population for this second phase of the study was comprised of 150 undergraduate business students from the School of Business and Management of a private University located in Northwestern Mexico. The students come from various academic programs: Bachelor of Business Management, Bachelor of Marketing, Bachelor of Accountant, Bachelor of International Business and Bachelor of Graphic Design, studying their final year of University. The School of Business and Management undertakes a 4-year undergraduate program.

The purpose of the questions posed to the students is to identify activities that have an effective impact on students to increase their intention and motivation to create a business.

### *12.3.1 Questionnaires*

Questionnaires were used to collect students' answers. There are different types of questionnaires that are based on possible options of obtaining answers. One kind is known as open-ended questions, where the researcher presents the questions and no restriction is placed on how to answer; another kind of questionnaire is called forced-choice, where the researcher indicates the possible answers in advance and asks its respondents to select only one answer among those listed. It is important to remark that the questionnaire applied contained both options for answers with multiple choice answers and open answers.

### *12.3.2 Sample*

A questionnaire was drafted and applied to a final sample of 150 students during the months August to December of 2013. The students were selected according to their career, mostly business students.

The students who were selected to answer the survey where a group of students in the final year of their career who belonged to the College of Business Administration.

The questionnaire was applied to 150 students in their final year of studies. The entire sample represents university students considered to be potential entrepreneurs. As for the distribution of the sample by areas of knowledge, the predominant areas include the three Schools of Business and Management at CETYS University, where

the careers correspond to: public accounting, business manager, marketing manager, international business, and graphic design. These students represent the three campuses of the CETYS University System, which is an institution, located in Mexico.

The business students that responded to the questionnaires were as follows: 45 students from the Ensenada Campus, 54 from the Mexicali Campus, and 51 from the Tijuana Campus; 16 students from Bachelor in Business Management, 31 from Bachelor in Marketing, 65 from Bachelor in International Business, 12 from Bachelor in Accounting, 25 from Bachelor in Graphic Design, and 1 student from Bachelor in Organizational Psychology.

## 12.4 Results

This graph shows how the family environment motivates students to start their own business, with 64 % of the students surveyed considering their family circle as a positive example of entrepreneurship (Fig. 12.1). This result is consistent with the empirical evidence presented by Scott and Twomey (1988), where there is a clear relationship between the role of parents and the influence they have towards starting a business. In 1994, Dyer supported this evidence, citing that entrepreneurs come from families where either the father or mother is self-employed. So children of entrepreneurs are more inclined to look at entrepreneurship as a more acceptable option than working for someone else. If the students have a family role model to follow, there is a high possibility of participating in the family business (Fig. 12.2).

Based on results of the focus group conducted by Carter (1998) regarding intentions of graduated students to start a new business, the findings indicate that graduates considered it important to first gain some experience before starting a business. In addition to this, they required previous work for acquired knowledge in a specific sector to start networking.



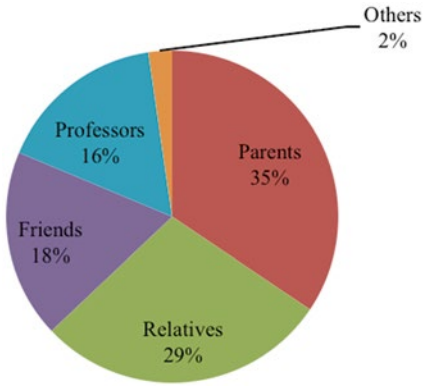


**Fig. 12.1** Positive example of entrepreneurship

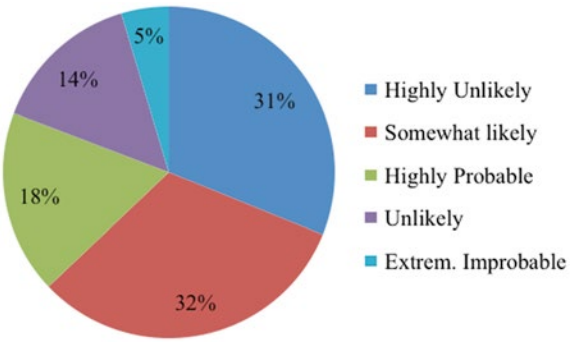


**Fig. 12.2** Chance of starting their business in the next 5 years

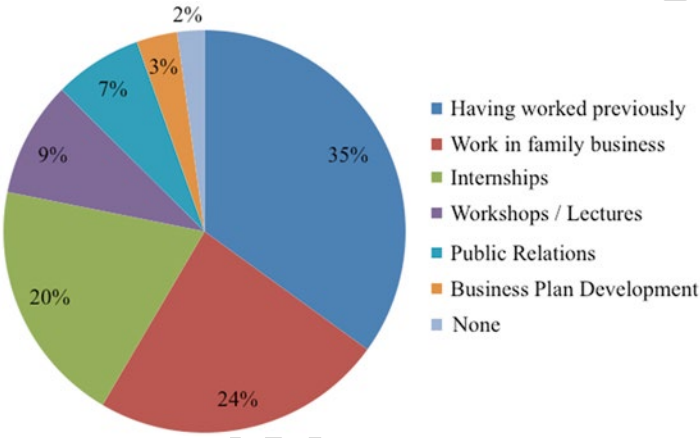


**Fig. 12.3** Perception of activities outside school they consider help start a company?

Based on the results of this graph, we have two positions that make us infer that the points made by Carter in 1998 are not far from reality: 36 % of the results perceived as inconceivable to start a business in the next 5 years, while 32 % see it as something likely. The sum of both responses: 68 % allows us to infer that while students intend to start a business, they consider that not having enough experience increases the chances of success (Fig. 12.3).

According to Brockhaus and Nord (1979) having work experience and previous training influences a person's decision to start a business. This statement supports the results of the survey where having worked previously is the variable that shows a higher incidence among students to consider a crucial factor to start a business. This same answer relates to working in a family owned business, which is considered to provide experience with the business environment, and both responses are linked to the fact that students completing their internship acquire knowledge in business within the business sector. These three factors summarize that 79 % of responses, allowing us to highlight the fact that experience gained in the work field

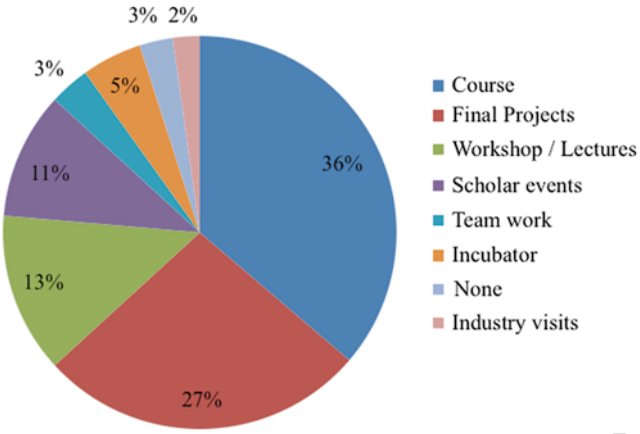


**Fig. 12.4** Perception of activities within the school they consider help start a company?



inside a company, triggers the decision to create a company. The results match with the points made by Matthews and Moser (1995), who found a statistical relationship between work experience in small businesses and the interest in having their own business. This matches up with the study by Scott and Twomey (1988) who posed that one of the most influential elements to start a business is the work experience that an individual has. Sandberg and Hofer (1987) state that previous entrepreneurial experience in family businesses is also considered an important factor to success in the field of entrepreneurship.

One example of the need, importance, and impact of employment and practice in the entrepreneurship learning/education field is the one stated by Zhun and Xuyang (2014). In their study of the employment and entrepreneurship practice education system in China for college students, they cited that it has provided "college students with a platform to have a career planning through competition, and entrepreneurship program contests." One example mentioned in their article is the "Challenge Cup" competition, where students obtain experience from the employment that it provides, but they also learn certain abilities they will need as entrepreneurs. This kind of competition stimulates them to create a business, and in addition, they develop practical experience and psychological quality in higher practice through formal education (Fig. 12.4).

Galloway and Brown (2002) suggest that it has been shown that individuals who take courses related to entrepreneurship show higher intention of starting a new venture. Usually universities have at least one course within the undergraduate program. Due to this fact and the high impact that courses have, it is critical to start developing experiential learning activities within the course. Degree programs comprise different materials through the application of final projects, which detonate on students the intention to start a business.

One example of the practice-based proceedings that universities can implement in their entrepreneurship courses is the one described by Kontio (2010) from the

strategy of Turku University of Applied Sciences (TUAS) that successfully combines entrepreneurship, applied R&D, and teaching. They have implemented three phases that can be integrated into a student's study plan, and if he or she decides to focus on entrepreneurship, that will help them to acquire and develop the knowledge and skills they will need as entrepreneurs in a practical manner throughout their program. The first phase is "What is entrepreneurship," where the students acquire the basics of business operations by solving certain problems in small multidisciplinary groups by using problem-based learning. Then, they move on to the second one called "Learn real entrepreneurship in safe environment," where the students create or join existing co-operatives and run a real business. And the third phase is called "Become an entrepreneur," where students can exploit business ideas they might have and start their own business under the guidance of a personal mentor. This University also runs specialized student competitions to support initiation of new ideas (Kontio 2010).

In addition to this, some institutions have an incubator that supports efforts posed by the authors, and is found in several schools. In addition to this, some institutions have an incubator that supports the efforts posed by the authors and it is found in several schools. As Moriguchi et al. (2014) case study describes, the authors explained the Business Administration Bachelor's Program offered by the Faculty of Management and Business at the Federal University of Uberlândia, in Minas Gerais State, Brazil, where they offer the implementation idea with a pre-incubator project, in addition to the practical method approach used in the courses, in the university's new business incubator, which is located on campus. The activities mentioned above are the most common activities that universities deployed within undergraduate courses. Solomon (2008) found in the 2004/2005 National Survey of Entrepreneurship Education that business planning (44 %), classroom discussions (43 %), guest speakers (28 %), case studies (26 %), and lectures by business owners (26 %) were among the most popular teaching methods. Müller (2014) concluded after analyzing different pedagogies that entrepreneurship education is comprised of a variety of pedagogies including traditional activities and cases, experiential–oriented pedagogies, such as simulations or on-site visits and practice-oriented elements. According to Müller (2014)), both traditional and experiential-learning pedagogies bring benefits and challenges to educators and students (Fig. 12.5).

One aspect to consider is the way that academic programs are deployed to encourage entrepreneurship. Based on the results of the survey, we identified that universities promote entrepreneurship through several courses, not only through the one that is known as "Entrepreneurial Development or Business Plan Development". An example of this is in the field of management where different areas that compose a company are analyzed. Occasionally, they have guest speakers, and the students usually present an integrating project of application at the end of the school year. In addition to what has been done in this area, students in business programs, who are in their final year at the university, develop a business plan within the entrepreneurial courses content, and it is presented to judges representing the business sector for evaluation. Those projects that are identified as having potential usually are suggested to continue to develop through the business

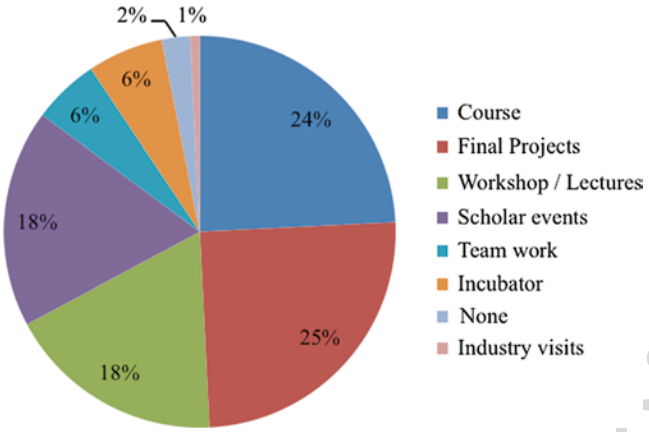


**Fig. 12.5** Perception of activities with the greatest impact on the intention to start a business?

incubator. These activities represent two out of the four types of approaches posed by Jerome Katz (2003) to deploy the venture, which allows us to infer that the institutions are moving in the right direction. However, it is important to highlight the fact that these activities are conducted informally, that is, the actions are not considered in the program of the subject, so the results cannot be controlled by the institution and/or there is no way of monitoring this. Despite this, derived from the results, the main challenge is to increase the number of courses that promote the creation of a company and to formalize their activities and increase the number of students who use the services of the incubator to develop a project.

The students surveyed present a tendency to start a company due to the courses they took during their school year. This matched the point made by Kolvereid and Moen (1997), who analyzed the relationship between students who have entrepreneurship studies and the possibility of starting a business. Added to this relationship, it highlights the fact that those students whose parents or close family has created a company show a clear intention to start a business.

## 12.5 Conclusions

Through the research, it has been shown that the incorporation of the entrepreneurs course within the business programs and deployment of entrepreneurial activities in students' last year at the university will effectively impact the intention of creating companies among undergraduates; therefore, it is imperative to establish strategies in order to carry out activities that encourage entrepreneurship, and these activities must be experiential learning activities.

An element not previously considered that was identified as a result of the research is the perceived importance in students regarding impact of internships,

which relates to the issues raised by Cohen and Levinthal (1990) by linking the acquisition of new knowledge to promote actions that trigger starting a company.

It is recommended to link all activities related to entrepreneurship during undergraduate studies, and, in addition to this, it is necessary to expose the students to the business incubator since the beginning of their undergraduate studies. According to Fayolle (2013), including active learning, experiential activities, learning by doing, and real-world pedagogies within the program content gives special importance to all levels of education. Our findings highlights the relevance of including different types of experiential learning activities or practical learning activities to the entrepreneurship learning strategies, courses and programmes, in order to enhance entrepreneurship learning outcomes in students.

If we want our students to be more active and proactive regarding the creation of new businesses, the professors must offer more experiential activities instead of traditional pedagogies, such as lectures and presentations. In order to go further within the entrepreneurship arena, scholars must make changes and accept new educational environments and ways of learning.



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# Chapter 13
# Fostering Entrepreneurship in Higher Education, by Problem-Based Learning

**P.I. Santateresa**

**Abstract** This research describes the methodology used in the teaching of the subject market research, focused on problem-based learning, where the purpose is to think during development of research, through the practical application of market research in Tourism degree. The results show that this method increases the motivation of students, inviting them to become more involved in the process and approach the professional reality. The quantitative study of the results of the evaluation surveys and satisfaction of the subject, we observed that a collaborative methodology sustained in problem-based learning increases student motivation and it allows teacher to improve the quality in teaching. In their last academical year, students are more professional concerns, recording to the education reforms are committed to integrate the promotion of entrepreneurship in the classroom, the project pretends to work as a team for a tourism based company, holding in problem-based learning.

## 13.1 Introduction

New social and labor demands, requires that the individual has developed proactive capabilities, those so-called entrepreneurial skills you can call: creativity, verbal and written communication, critical thinking and teamworkability (Oosterbeek et al. 2010). This requires, to a continuous transformation in the educational process that takes into account the acquisition of competencies that improve the employability of graduates and that the evaluation assess the evidence of acquisition of such skills. In turn, this implies that the teacher is the engine of changes in attitudes and values in students, for this there has to be established educational models constructivist supported on methods of learning (Jonassen 2000).

Entrepreneurship is considered as a general attitude of facing everyday life; attitude can be very useful in all daily chores and, of course, in the workplace. At the

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same time, it is also interpreted as the ability to transform ideas into action, the ability to create, innovate, implement, plan and manage projects of all sizes, with the intention of achieving certain objectives.

An overview defines the entrepreneur as an individual, who organizes and implements a new idea for a particular purpose, whether gainful or not, characterized by generating creative and innovative solutions, face problems or difficult situations (Toca Torres 2010).

In 2006, concerning that the new jobs requiring higher levels of those with the most manpower training in Europe, European officials began recommending eight key competences for lifelong learning, where one is the sense of initiative and the entrepreneurial spirit (European Council 2006). In Spain, following the recommendations, it is set in the Education Organic Law (Organic Law 2006), there are eight basic skills for inclusion in all curricular programming, being very similar to the European final and moving entrepreneurship competition "Autonomy and personal initiative".

Autonomy and personal initiative are understood as the ability to be able to imagine, undertake, develop and evaluate actions or individual or group projects with creativity, confidence, responsibility and critical sense (Organic Law 2006).

Basic Spanish legislation on education includes among its goals, to get the students to develop entrepreneurship, which is why the law, which came into force in 2009, opened the door to advances in this area. In the preamble of the Organic Law of Education (LOE), entrepreneurship as one of the objectives to be achieved by the education system includes:

> "Third, it has set the goal of opening these systems to the outside world, which requires strengthening the bonds of working life, research and society in general, developing entrepreneurship" (Organic Law 2006, p. 17160).

Moreover, the Education and Training program 2010 of the European Commission and Council (2004) defines entrepreneurship as the ability to induce changes oneself and the ability to accept those produced by external factors, combining the active ingredient and liability. The European Union insists on the ability to innovate and to accept innovations as well as assume the risks of action.

However, in the LOE (Organic Law 2006), autonomy and personal initiative is interpreted as the great competence of the action. Competence on the one hand refers to the acquisition of consciousness and application of a set of values and inter-personal attitudes, and on the other hand includes the ability to choose its own judgment, to imagine projects and to take the necessary actions to develop personal choices and plans, both of them of a personal level, as social and labor.

Also, the educational reform promoted by the Organic Law LOMCE to improve the educational quality, has among its main objectives to stimulate the entrepreneurial spirit of students, emphasizing that aspect at each stage of education (Organic Law 2013). Thus, as you advance in the formative stages, entrepreneurship takes a more entrepreneurial vision, but without defining how to work from the university, where the teaching of entrepreneurship is not sufficiently wide-

spread, being mostly trained on entrepreneurial skills in business and economic studies (Martín et al. 2013).

Therefore, this paper attempts to describe the effort of teachers to develop by a collaborative methodology of problem-based learning and expose its main results after the experience in the 2013–2014 year. It is proposed a research project based on the concepts of collaboration, teamwork, communication and responsibility (Carrió 2007). Members of the team must contribute to a greater and lesser extent, equally using ICT tools to support collaborative teaching.

The importance of competency-based learning and collaborative learning is addressed in the first part of the article, to then present the main technological tools collaborative applicable to the case and bring out the teaching-learning which is intended to encourage these skills based on problem solving . Third, the case study and the main results exposed after application, to finally draw conclusions obtained after the observation process.

## 13.2 Competency-Based Learning and Collaborative Learning

From the pedagogical point of view, the most characteristic feature of the EHEA—European Higher Education Area—is the acceptance of university education named: Competence-based learning (Villa and Poblete 2008). Competence is understood as a set interrelated and interdependent knowledge, dexterity, attitudes and values, which must be purchased in order to train students on specific skills, their ability to apply them in different contexts,personally and professionally integrating them into their own attitudes and values, in its own way of acting (Villa and Poblete 2008).

Also, the European Commission (2010) has made a strategic proposal for sustainable growth and employment for 2020, which highlights based on knowledge and innovation, in order to achieve high levels of employment growth, and to encourage it projects in which the new skills for new jobs are developed. These new skills required by companies have been investigated over the years, taking into account business needs within the current university education.

Among the various investigations in this regard it stresses that published by the *Fundación Universidad-Empresa* (Martínez 2009), which indicates that companies believe that the expertise provided by the universities are adequate, despite claiming the renewal of certain content, in order to adapt them to new professional and labor contexts, while also point out that cross-cutting issues should be strengthened as the acquisition and development of skills and instrumental, personal and systemic skills, the improvement of language skills and the direct acquisition of practical experience in real working environments.

In this regard, the competence-based learning means establishing the powers deemed necessary in today's world, as goals to be achieved on schedule. This type of education is characterized by a personal learning system that combines theory

and practice away from the previous system, based primarily on memorization. Learning is more constant and systematic and students must face a greater role, so that the methodology is enriched to see increased monitoring both individual and group by teachers, which focuses on the organization, monitoring and evaluation of teach students (Villa and Poblete 2008).

In the other hand, the basic premise of collaborative learning is consensus building through cooperation by group members, which requires students to take on new roles and develop different skills to customary in traditional classrooms (Barkley et al. 2005). Collaborative learning environments seeks to promote spaces which give developing individual and group skills from discussion among students, they remain responsible for their own learning. It is intended that the organization of information conducive to the growth of the group (Lucero 2003), although the best way for students to build new knowledge from what they know is that their own knowledge is discussed in groups. The need to articulate and explain their ideas to the group leads to that these are formulated in a more concrete and precise way, which are fostering the ability to listen and synthesize information.

Although some authors have exposed different standards of collaborative learning and cooperative learning, both models are grounded in constructivist epistemology and so many more that share aspects that differentiate the (Panitz and Panitz 1998). It is considered that the cooperative learning in teaching-learning process will be more structured by the teacher, there is a predefined structure of activity, while in collaborative learning is attributed to the student more individual responsibility and therefore, the structure of activity is generally freer (Zañartu 2003).

To reach that students can build knowledge is necessary, but not sufficient, they must to experience and develop cooperative learningskills that will enable teamwork. However, in certain phases of the project, it is necessary that the teacher has a more interventionist in establishing lines of work attitude, while at other times; the students are the ones that touch your creativity give more staff at the totality of the project.

Also, we are faced with a computer-aided collaborative learning. The use of ICT encourages and promotes collaborative learning, as they stimulate interpersonal communication, using tools both asynchronous and synchronous, allow students to share information and work on joint documents which facilitates decision-making, you can track the individual and collective process, and students can display their work much like the rest of the team, there is also a large cognitive flexibility as each participant can choose their own path and pace of learning according to their level (Calzadilla 2002; Vinagre 2010).

## 13.3 Information Technology and Communication (ICT) Collaborative

The new means of information and communication allow the student to learn to planned and manage themselves, to make decisions during the educational activity, with a situation that favors the development of a range of skills such as is generated: critical attitude, self-employment, initiative and collaborative work; which form part of the new European Higher Education EHEA (Uceda and Barro 2008).

In this article it is evident as teaching staff, employs a collaborative learning approach based on the use of the tools offered by Google such as Gmail, Google Drive, Google Calendar, and Hangout, and the use of an application preeminently synchronous as Skype, that allows students to have access to their e-mail, documents folder online, virtual diary, chat; including the outcome of evaluation from any computer or device with Internet access. These tools are free to use for the users and allowing an intuitive operation, they just need a computer connected to the Internet. These tools let teachers to encourage student participation so that the student is placed in an active role in the training process.

The question that may occur and which acts as a major drawback to this proposal, is to what extent the documents that are shared with students are copyright of the own user or shared with Google. The answer lies in the document Privacy Policy Google (2015), which expressly states that carry out the processing of personal data only in accordance with the provisions of this Privacy Policy, that is, when we use their services. The servers automatically record information that your browser sends whenever you visit a website. These records may include information such as your web request, Internet Protocol address, the type and browser language, the date and time of your request and one or more cookies that may uniquely identify your browser or in notifications. Additional inclusion in certain services, and in addition in another section includes: "protect the rights or property of Google or our users" and expressly states that only shares personal information with other companies or individuals that are unrelated to Google when it has the consent of the user. The latter gives us confidence that everything that we work with different tools, Google will safeguard our intellectual property.

The application of these tools in the classroom is very wide; with the Google Calendar you can make a schedule of the subject where appropriate to the performance of tasks, delivery of work, dates indicated etc., and how you can share this calendar with others, all pupils in class will have access to information on dates and deadlines.

Using Gmail is widespread among Internet users and is also frequently used among students, with this application you can have a personal e-mail account via webmail and chat Hangouts with contacts added. As for Google Drive is a file processor that allows the creation of text documents, spreadsheets, presentations, forms and drawings. In addition, this tool can work on the same file to several students at the same time, and integrates instant messaging module to facilitate communication between users who are viewing the file.

Skype is an application that lets you communicate via chat, voice call and video call, with those who have installed on their computer and have an active user, in turn incorporates an option to share the screen among the partners, so that you can see the virtual desktop with which student teachers to communicate at that time, and at the same time to give support or help. Similarly, the teacher can also show the screen to students.

Although this is not a collaborative ICT tool if we review the use of PSPP software, to develop the analysis of statistical results through analysis of both univariate and multivariate, used in the final phase of the research developed by students. This tool is free, it was designed as a free alternative to SPSS (Statistical Package for the Social Sciences), and so many of the routine tasks-analysis of variance, linear regression, testing the parametrical- are performed successfully, against other permissive free software (Nie et al. 1975).

Note that, the group of students who will face these ICT tools are "digital natives" (Prensky 2001a, b) which are already computer literate and possess a high degree of intuition to understand the use of new tools ICT, so your sight before this technology is positive, as it serves for learning the essential skills and perform the tasks demanded by teachers and management is not a challenge.

The problem may arise if between students "digital immigrants", which offer a curve of experiential learning much higher are the "digital natives", to which it shall explain in greater detail, and make from teaching staff increased monitoring effort, the proper use of ICT.

Also, according to Prensky (2010), the students need to employ new tools, find information in a meaningful and creative context, while teachers should be used to question, advice and guide, providing context and giving rigor and meaning, as well to measure the quality of the results. To do this, make use of these collaborative tools require an essential skill in the reality in which we live, increasingly important and used throughout the learning process.

That is why, about Bloom's Taxonomy (1956), which still remains a key when it comes to setting objectives learning tool, authors like Churches (2008) have conducted a review of it, updating the era digital, explaining the use of ICT tools, such as those proposed in this paper, enable collaboration and therefore help in teaching and learning in the twenty-first century, in which the students learn based on recall knowledge, understand and use this knowledge applying skills; analyzing and evaluating processes, results and consequences, in the frame of develop, create and innovate (Churches 2008).

## 13.4 Problem-Based Learning

Between the perspectives of cognitive learning and situated learning, there are a variety of theories about learning. Many provide interesting aspects to understand the teaching, but none offers indisputable answers. In this context, we understand that an eclectic approach is more practical because it leaves teachers free to adjust

their approach to the characteristics of the context in which it is located. Therefore the approach we propose emanating from different sources.

The learning as exploration and discovery has a number of key processes identifiable. These include reflection, abstract conceptualization, active experimentation and actual experiences. According to various authors, involved in entrepreneurshipeducation use different learning processes and the student is an active producer of his own knowledge and the teacher is limited to guiding students and encourage discussion between them (Löbler 2006). Program content therefore obey student demands arising in actual practice the process.

The problem-based learning (PBL), is a learning system that requires the student to be involved in the teaching oriented framework, but that does not focus on the teacher as the key to explain the contents and solve the problem. The elements necessary to carry out is a problem that requires a comprehensive study, previous knowledge to be activated to reflect on the problems, questions that arise from the difficult and the motivation to seek sources of information to answer them (Moust et al. 2007).

The problem-based learning is a technique used in constructivist learning environments in which the methodology is a problem that students must solve, and it must get information and to properly implement the concepts learned (Jonassen 2000). The basic premise of problem-based learning, collaborative learning integrates, this being raised as consensus building through cooperation by group members, which requires students to take on new roles and develop different skills to the usual in traditional classrooms (Barkley et al. 2005). Collaborative learning environments seeks to promote spaces which give developing individual and group skills from discussion among students, they remain responsible for their own learning. It is intended that the organization of information conducive to the growth of the group (Lucero 2003), although the best way for students to build new knowledge from what they know is that their own knowledge is discussed in groups. The need to articulate and explain their ideas to the group leads to that these are formulated in a more concrete and precise way, which are fostering the ability to listen and synthesize information.

The student through prior knowledge, and establishing meaningful relationships with the context to which it faces, recognize their knowledge, which is more effective than acquiring facts analyzed and/or applied. It is easier to learn something if you know situations in which this knowledge can be applied in a particular context, which acquires relation to that context, that is, integrate what they want to learn what you already know is more effective to learn the fact memory (Vinagre 2010). In PBL the student should be able to study for him or herself without being constantly fed by the teacher, which requires discipline and teachers should also pay regard to affordable for students.

In the case of students, with this research project it powers to require the competences based on the teaching guide of the degree (ANECA 2004), forming a significant space of teaching and learning based on the development of specific skills as generic, in order to consolidate the integral and entrepreneurial training of future graduates in Tourism (Table 13.1).

t1.1 **Table 13.1** Generic
t1.2 competences developed
t1.3 through the research project

| Generic competences | |
|---|---|
| Use of ICT | t1.5 |
| Oral communication | t1.6 |
| Written communication | t1.7 |
| Communication in foreign languages | t1.8 |
| Teamwork | t1.9 |
| Conflict resolution | t1.10 |
| Lifelong learning | t1.11 |
| Commitment and ethical responsibility | t1.12 |
| Initiative, innovation and creativity | t1.13 |
| Leadership | t1.14 |

## 13.5 Case Study

Given the range of considerations presented in previous sections, from the teaching staff of Florida University, the methodology of this study is part of the collaborative learning and problem based learning, this being carried out by small teams of students, 4 to 5 members, who must work together in the successive phases of the project, making use of ICT collaborative tools such as Google Drive, Google Calendar, Gmail and hangout while to facilitate student-teacher communication, you have the Skype application.

This research is divided into a series of activities created by the teaching staff in order to develop a "Market Research" to solve a problem to study, proposed by the teaching staff. Of course these activities are scheduled as phases that are part of the final work, so that students facing each of the activities and objectives to be achieved in the short term to achieve the long-term work, per semester.

Content resources to use are, in some cases, selected by teachers and other by the students, but at all times be supervised by this teaching staff. These resources depend on the specific needs of students within the context of each activity and objective analysis, all to be based on collaboration between students and the use of ICT tools.

Thus, the work of Market Research is configured with the aim of responding to a problem from based on a research—working with an methodology based on actions, through guided and coordinated by teachers of the subject "Research of tourist markets" the third year of the Degree in Tourism.

As seen in Table 13.2, with this project specific competences, under the teaching guide of the subject "Market research", in connection, it develops from the "Libro Blanco" proposal (ANECA 2004).

Therefore, a significant space of teaching and learning based on the development of both specific and generic skills, in order to consolidate the integral and entrepreneurial training of future graduates in Tourism is formed, as well as to contribute to learning research methodologies from an empirical point of view based on the action.

Each lecturer develops a specified way of teach in the didactic guide of the subject, with the utmost to contribute to the development of both generic competences

t2.1 **Table 13.2** Specific competences in market research

| t2.2 | COMPETENCIAS ESPECÍFICAS |
|---|---|
| t2.3 t2.4 t2.5 | Knowing how to design and to plan a commercial research, appreciating the value that the report contributes to the company in relationship to other agents of the company and its environment/destination |
| t2.6 t2.7 t2.8 | To know when it is appropriate to determine to apply the secondary information to solve a problem and identify valid sources of information from which to draw relevant to the resolution of a problem framed in tourism information |
| t2.9 | Design tools for primary data, distinguishing between qualitative and quantitative techniques |
| t2.10 | Know how to design and execute surveys and implement a sampling plan |
| t2.11 t2.12 | Knowing in what consists the coding and data filtering, and managing statistical analysis programs to obtain results |
| t2.13 | Knowing how to interpret the results and to know the steps to produce a final research reports |



and specific, which takes shape strategy in achieving the objectives that the students must reach the end the subject.

To achieve these objectives, in the didactic guide the method is expressed as the teaching-learning techniques selected for this. Since the present case study addresses the methodology of problem based learning, the techniques are used as part of a collaborative structure in which students of small teams help and encourage learning, it is expected that students also learn and help his teammates (Pujolàs 2008).

The resources used for this purpose are divided into two groups: physical and virtual. On the one hand the physical resources such as facilities and supplementary materials, compared to virtual, as mentioned earlier ICT tools. All these resources are defined under a comprehensive planning for the proper development of the methodology. The students have at their disposal a classroom or studio work, which provides computer equipment to develop its activities as well in the classroom; teacher can make use of flexible and highly mobile equipment, so the students can work together comfortably.

Outside the classroom, without the presence of the teacher, the students who qualify, have free access to multiple computers equipped for unlimited use in classroom library hours, which can be accessed without reservation and simply with your username and password of the student they have free access.

In this case, in those subjects in which it develops this program, it requires that students attend weekly class, being at that time the main learning space, but this time must be complemented with other space and non-contact times (Villa and Poblete 2008), in which the teacher is not physically located. For this, the use of ICT tools such as Gmail, Hangout or Skype, which are not only used to achieve the methodological development based on partnership is required, and the development of skills, such as teamwork and the use of ICT, but these tools will increase the ease of communication between teachers and students in times where there is no physical closeness (Castillo et al. 2009). The students contemplate the use of virtual mentoring as a flexible and open learning, as the students are who take the initiative to

contact the teacher in seeking advice or support in their decisions. This virtual mentoring to occur in conjunction with a complementary face contact, is part of the so-called e-learning blended, this mode of teaching includes spaces outside the classroom so that students can continue their learning. It also requires a strategic change in education as we had understood at the moment and benefit from the advantages of both classroom teaching.

Monitoring and learning, is probably the most critical phase of this model of teaching and learning, because both, students and teachers are included into a system that requires the teaching staff to offer the students a continuous feed-back of its evolutions, in order to explain which have been its progress, or help themselves, made their own assessment of how they are developing their project. Also, the teaching staff should control the process in order to advice and counsel in each case, guiding and correcting errors (Villa and Poblete 2008).

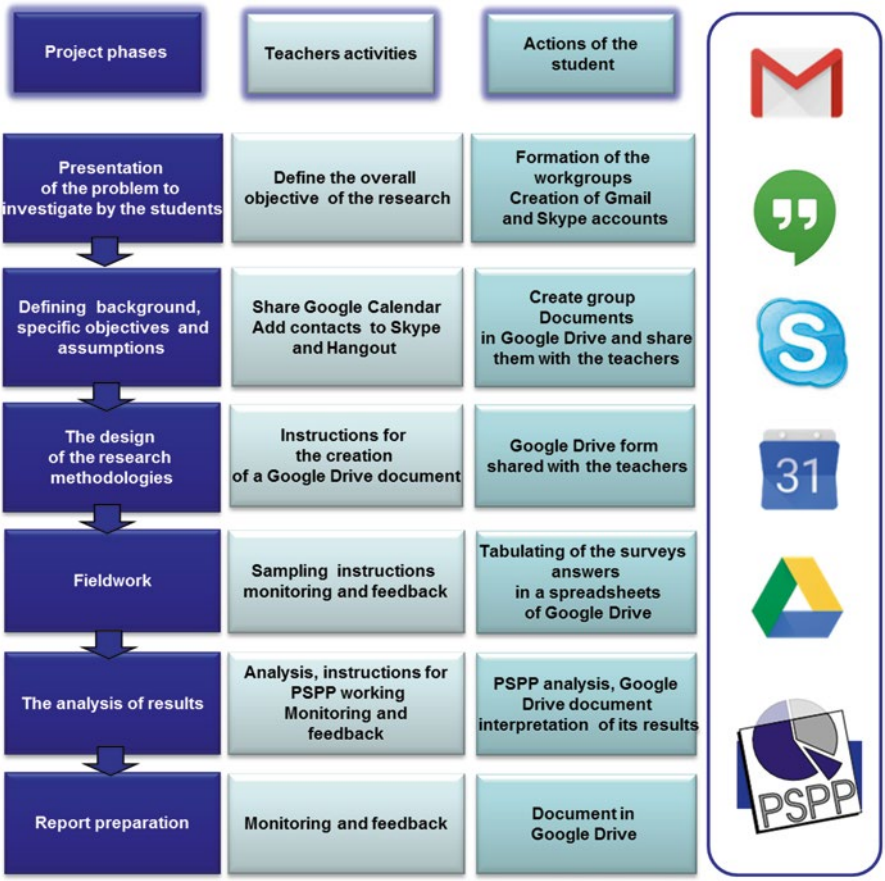


**Fig. 13.1** Project phases and actions to be undertaken by students and teachers

In order to achieve this monitoring, planning research work is structured in various stages of preparation of the final work. The students were divided arbitrarily into groups of 4–5 people for the development of work, being aware that the final delivery of the same shall be made upon delivery of each of the previous phases of work on the date indicated by the teaching staff.

The research project consists of the following general phases (Figure 13.1):

I. Background and objectives of the research: To the student, there will be proposed a general objective of the research in order to collect information from secondary sources, in order to explore the research problem and define the main background of the problem. After synthesis of the background, the students come to define the specific objectives of its research and its hypotheses.
II. Research Methodology: Defining the methodology to be used for obtaining the information given in the specific objectives, using qualitative and quantitative techniques, which involves the design of a structured questionnaire.
III. Fieldwork: To Define the sampling method, later to survey the sample through various methods of contact, whether personal or on-line.
IV. Tabulation and Analysis: The Students will create a database with all answered surveys; analyze it later using the PSPP statistical program.
V. Report preparation: The Students will prepare a report made by the previous phases of research, including conclusions and future research in relation to the results.

To achieve these phases students and teachers employs ICT tools outlined above; it is advisable to previously count each individual e-mail with a Gmail account in order to gain access to all the tools online Google offers free performing the following work instructions:

– Creating a document on-line through Google Drive tool provides multiple advantages on this issue can highlight especially three:
  (a) The students can produce a document collaboratively, as they can be shared between multiple users editing the document, so they are able to build information between all.
  (b) This document, to be shared with the teacher allows it to access and edit it so that it can track and record made relevant comments, so that students can improve during the process of drafting the document.
  (c) Once completed this document it is published online for anyone to access it through your browser.
– During the development of activities by Google Calendar, teachers determines delivery dates for each of the tasks and share these events with students through their Gmail account, so that every student has access to the temporary schedule project, and in addition, they can have their own personal online calendar and access of its partners and project collaborators, so as to facilitate self-management and team work.
– Furthermore it is contemplated that about 40 h of work are outside the classroom schedule, the students may resort to the use of onlinecommunicationtools from

the use of your Gmail account the e-mail and/or chat, Hangout, and the Skype application as a form of chat, call and/or video to contact the teachers. Thus increases the student-teachers communication flow either synchronously or asynchronously.

While the process students also have the opportunity to contact the teachers at any time to answer their questions via Hangout and Skype, while sharing both online document that will shape the final report form with the survey design, such as the spreadsheet in which the surveys were tabulated answered, both the team and the teacher can have instant access and constant feedback on the progress of the process.

Each project phase in turn replicates cyclically key moments in action research, the students carried out once the project stage gets feedback from the teachers, so that you can modify the proposal before moving to the next stage, and so on, making improvements that can be applied in the proposed tasks each process. This feedback stage is critical, because without further reflection that the students made for the implementation of improvements, we would not be talking about an action research methodology, but a simple application of methodology based on problem-solving research.

## 13.6 Results and Student Satisfaction

The present study aims to investigate the difference between the results obtained in the courses 2012–2013 and 2013–2014, after application of the learning methodology described in previously, during this last course. These results indicate that there is an improvement in student satisfaction, more positively evaluating the learning process and the acquisition of skills than in the previous year.

To obtain the necessary information, we chose to use the learning assessment surveys used in Florida University for the assessment of projects. This survey consists of a Likert Scale Ratings, which is weighing whether the student appreciates this methodology in achieving the objectives set, such as: improving their training, skills development, promote the connection between in environment, complement their personal development and make the learning process more attractive.

The sample was made up of students who integrated two separate groups of undergraduates of Tourism in the academic years 2012–2013 and 2013–2014. This comparison is given by the significant difference in the 2012–2013 course methodology of problem-based learning in a real context, while during the 2013–2014 course, the same was used.

The scale of assessment of different items making up the scale gives the students the opportunity to indicate between of 1–10 their level of agreement with each of the indicators. With all this the average obtained in the valuation of these items, was 4.7 points in 2012–2013, while in 2013–2014 a significant improvement in 7.4, just in one academic year an improvement of nearly 3 points was obtained.

t3.1 **Table 13.3** Results of student satisfaction with the integrated project

| t3.2 | | 2012/2013 | 2013/2014 |
|---|---|---|---|
| t3.3 | Average rating of the research project | 4.7 | 7.4 |
| t3.4 | Integrated project improves my training | 5.0 | 7.5 |
| t3.5 t3.6 | Develop competencies and skills necessary for your professional future | 5.0 | 7.8 |
| t3.7 t3.8 | Promotes the connection to the current socio-economic environment | 5.0 | 7.2 |
| t3.9 | Complements your personal development | 5.6 | 7.2 |
| t3.10 | It makes the process of learning more attractive | 3.1 | 7.2 |

As it can be seen in Table 13.3, the greatest improvement was on-line in the item "makes learning more attractive", with an average of 3.1 points going to get a 7.2 in the further course. On average all items have improved by at least 2 points comparing to the previous year.

The results obtained after the application of this methodology in the 2013–2014 course, indicate that there is an improvement in the acquisition of entrepreneurial skills of students, and has been demonstrated as a sustained constructivist methodology in problem-based learning and collaboration, increases the motivation of the students, while to the teachers it allows them to improve the quality of teaching.

Regarding to the acquisition of the competences, the scores of students improved on average by one point, with a rating average of 9 points out of 10, while in the previous year, 2012–2013, the average had been 8.2 points.

Moreover, co-evaluation among students, which were taking 4 indicators assess 0–3 points were scored themselves and to other colleagues performed: execution of tasks, active participation, active listening and planning. In this sense, there was improvement in the assessment of the indicator related to the "planning, organization and distribution of tasks", from 2.5 in the previous year to an average of 2.75 in 2013–2014. Besides the students, in an individual speech, he would argue against the teachers, why were evaluated in this way and to reflect on how in the course of the project had developed their competences. The students agreed that they greatly improved their communicationskills, planning and organization as well as specific competences they learned their area of expertise, in this case organizing trips and cultural heritage.



## 13.7 Conclusions

In the search for adaptation to the mode of teaching and learning marked by the new European Higher Education Area, Florida Universitària has conducted similar experiences to the project proposed in this paper, in each of their degrees in order to adapt the program to the new educational reality.

The quantitative study underpinning this study is based on a comparison of the results of the evaluation surveys of the subjects of the last years, being a descriptive approach, showing how this methodology assesses students mainly because it is closest to the reality and improve their employability.

The application of these techniques of collaborative learning shows that student motivation is fueled by other than traditional learning methods (Barkley et al. 2005). For students, the use of ICT tools used to organize personal learning and be given a portfolio and/or journal in which to perform the required tasks and receive feedback and to communicate (Landeta 2010).

In conclusion, the present proposal hopes to achieve meaningful learning with competence development set at the beginning of the work, with a greater role of students in their own learning. With all this, the student adopts professionalskills adjusted to the new reality of the labor market in relation to new qualifications demands by businesses.

As future research is to be noted, as far the use of the proposed ICT tools, has been free and with a privacy policy favorable to the user, but should not be ruled out changes in this regard in the near future by the supplier of these applications, so that the control and review of the provider's policies throughout the process is recommended.

Moreover, within the recommendations to promote methodological changes that have indicated authors as De Miguel et al. (2006) highlight the effort involved for educators this methodological change, and as it becomes important to be motivated and recognized as the success of this change depends on the commitment made by the teachers staff, which becomes relevant reviews of motivation and incentive systems associated with targets.

This experience has been very enriching for the students as they are developing skills that virtually all their curricular profile required by this project. Through both qualitative assessments and quantitative (personal interviews and surveys) student, you can see how the tendency is that they students doing a project based on the reality of the sector make a better appreciation of the development of its own powers, so this trend shall be demonstrated in comparison with the results of the assessments made in previous years, with more theoretical projects.

Finally, consider the need to propose specific actions for specific situations, such as cases in which the student's academic routine may be affected by work circumstances, academic irregularities and other specific personal situations that might prevent the regular performance of the research work beyond the problems that may arise a result of the interaction between members of the same group (Barkley et al. 2005).

Definitely, it is one of the measures to be taken at any higher education, would be to introduce entrepreneurship and self-employment to all university students in their early years, trying to reinforce this training through seminars and additional courses volunteers.

Many countries have initiated programs to develop this competition, emphasizing the business aspect, but the traditional vision of schools, focusing more on the transmission on cultural innovation, say that does not create the right climate for the

development of competition. Therefore, we need innovative schools and teachers to become entrepreneurs students, but showing that autonomy is the main aim and aspects such as self-employment just happens to be one of its applications.

It is proposed as a future line of research, including a collaboration and research to develop along other higher education, as can be graduate studies in engineering, in which the same type of company serve them as vehicular element along all courses, serving as a reference point for the application of the concepts taught in each of the subjects of the race.

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# Chapter 14
# Best University Practices and Tools in Entrepreneurship

**Alberto Vaquero-García, María de la Cruz del Río-Rama, and José Álvarez-García**

**Abstract** Universities are currently experiencing significant changes in their mission, which have gone from carrying out traditional activities (like teaching and research) to promoting creative, innovative and enterprising capability that enables them to generate economic and social value through the transfer of knowledge. With this activity we are not trying to place universities in high positions in the top national and global rankings of research, or obtain a high level of scientific productivity, but what we are trying to do is use what is generated by universities in a way that is useful for the productive fabric. Therefore, universities have the responsibility of promoting economic and social development through the generation of knowledge, which is applicable to the production process, being susceptible of commercialization and exploitation by companies and institutions. All this will enable universities to play a strategic role as a competitive advantage to improve knowledge. One of the actions that can be put into practice is the promotion of entrepreneurship. The methodology applied, based on case studies, will allow us to know the development of entrepreneurship activities of a University. This analysis will allow us to find out the most appropriate tools to improve entrepreneurship from the University classroom. Among other initiatives, the results of business incubators, spin-offs, Chairs of entrepreneurship, advice to entrepreneurs and the role of business angels will be assessed. The approach of this article will allow analysis and reflection, both from a theoretical and practical perspective of best practices and tools of entrepreneurship. The transfer of knowledge is the third pillar upon which the activity of universities should be held. Taking into account the experiences of other countries that have decidedly supported the transfer of knowledge, especially the United States and United Kingdom, it can be confirmed that the universities with the greatest future projection are those which consider that the third mission should be more and more present. This article aims at defining the actions that are being carried out in Universities and their potential benefits to entrepreneur-



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ship. The implications of this article are of interest, both from a theoretical and practical perspective, since the results are widely used in the university entrepreneurship reality. The results will help determine the best practices and tools and to what extent they will be used in institutions of higher education. In addition, this article is to point out the role of universities in the field of entrepreneurship, to determine which different instruments can be used and which good practices and tools should be performed.

## 14.1 Introduction

The Royal Academy of the Spanish Language (RAE) defines undertaking as implementing and starting a work, a business or commitment, especially if it involves difficulty and danger. Using the same source, an entrepreneurial person would be one that implements difficult and hazardous actions with determination. Entrepreneurs are therefore, people with a clear mission to create new initiatives and promote projects that require effort and perseverance.

At present, more than 40 % of entrepreneurship is developed by people with university education. Therefore, this activity should have special attention from institutions of higher education, since universities are training the majority of entrepreneurs.

It is therefore not surprising that in recent years universities have been trying to promote what is known as their third mission and, within it, the promotion of the enterprising capability.

Thus, it is necessary to indicate what actions should be carried out to improve entrepreneurship in universities. This is precisely the aim of the chapter. To do so, and following this introduction, the second section establishes the concept of entrepreneurial university. The third section focuses on defining university entrepreneurship within the task of teaching, research and knowledge transfer. The fourth section identifies some of the best international practices in entrepreneurship. The fifth section performs a similar exercise for Spanish universities. The sixth section provides a set of recommendations. This chapter ends with some conclusions.

## 14.2 The Concept of Entrepreneurial University

Entrepreneurship has an important social connotation, as it enables to create wealth and employment, which benefits not only the entrepreneur, but society as a whole. Also, if this activity is done from a public institution of higher education, the above economic effects are even more relevant.

The concept of entrepreneurial university emerges with Clark (1998), who defines it as a flexible organization that interacts with its social and economic envi-

ronment, adapting to changes and seeking additional resources for its funding. According to this author, an institutional and personal transformation that allows universities to adapt to new requirements is necessary. Other authors such as Etzkowitz (2004), O'Shea et al. (2007), have tried to identify the elements that must be present in entrepreneurial universities. Thus, the entrepreneurial university must be an organization capable of adapting to competitive environments, seeking excellence in all its activities (Guerrero and Urbano 2012; Kirby et al. 2011). In Barnett (2000) and Antoncic and Hisrich (2001), it is stated that the entrepreneurial university, should not only promote entrepreneurship, but should be able to develop competitive behaviors and strategies, especially with public and private entities, in order to improve collaboration and cooperation levels.

Nevertheless, there is some fear of excessively encouraging entrepreneurship from university classrooms because it could generate the commercialization of public institutions, an issue that is not compatible with the promotion of knowledge, which is one of the objectives of universities. So, if too many human and material resources are devoted to this activity, capacity in teaching and research is lost, which are the most traditional functions of the university.

However, it is more likely that the same that happened with research at the time, which perfectly integrated with teaching, to knowledge transfer, will also happen (Etzkowitz 2004). The results seem to support this approach. So, more and more universities are becoming involved in economic development (Hoskinsson et al. 2011; Rothaermel et al. 2007).

To achieve this goal, it is necessary for universities to make this responsibility theirs and for university managers to include promoting entrepreneurship in their governance programs. Therefore, it is necessary for universities to design policies and programs to improve the entrepreneurial skills of students and graduates (Clark 2003; Napolitano and Riviezzo 2008; Gibb 2012). Table 14.1 identifies the elements that should be strengthened in universities, in order to improve their enterprising capability.

The benefits of university entrepreneurship are obvious. So, as progress of practical relevance to the socioeconomic fabric is achieved, the capacity to create and generation of initiatives is strengthened. Secondly, if the university focuses on entrepreneurship, development of basic and applied research will be encouraged, since a greater orientation of the university activity to the reality will be achieved.

Thirdly, a greater adaptation of teaching to the reality will be achieved, as thanks to entrepreneurship, a teaching methodology based on case studies can be used more extensively, bringing not only the student closer to a more realistic situation but in addition, teachers will use more applied and real teaching.

Fourthly, thanks to entrepreneurship, results with more practical significance will be produced. Thus, companies can request specialized or postgraduate courses from universities, more tailored to their needs. This activity will be complemented by the development of joint programs of research and transfer.

Finally, entrepreneurial universities will have a supplementary source of funding to traditional resources and at the same time, this will mean an additional public funding justification, as the social return of the university activity will be much higher.

**Table 14.1** Elements that strengthen the enterprising capability of universities

| | |
|---|---|
| Egresados<br>Graduates | Graduates with strong entrepreneurial spirit should be achieved. This objective should be present in all the educational offer and not just in the business and/or technical oriented one |
| Teaching staff | Entrepreneurship among the teaching and research staff should be encouraged, as well as teaching and research |
| Businesses | The relationship with the business fabric in activities of mutual interest (agreements, technical assistance, research and transfer, etc.) should be strengthened and at the same the business side of universities (business incubators, technology-based companies, *start-up, spin-offs*, etc.) should be reinforced |
| Obtaining resources | Entrepreneurship enables universities to obtain supplementary funds to traditional sources of funding |
| Diffusion | Universities should enhance their ability of transfer and practical application to the environment |
| Community services | Whilst maintaining the functions of teaching and research, universities should reward entrepreneurship because such activities have a clear return for society |
| Opening to the environment | The integration between university activities and the socioeconomic fabric should be stimulated |

*Source*: http://www.emotools.com/media/upload/files/universidad_emprendedora.pdf and own data

## 14.3 University Entrepreneurship in the Teaching, Research and Knowledge Transfer Framework

Based on the triple mission that the university should have (teaching, research and knowledge transfer), it is possible to identify a set of strategies aimed at improving its enterprising capability (Guerrero and Urbano 2012).

In relation to the teaching activity, it is clear that one of the most important functions of universities is to achieve the best education for their students so they get a good job. The main challenge of entrepreneurial universities is to also be able to generate employers. To do so, it is necessary to support entrepreneurship programs, both internal and in collaboration with other entities (confederations of employers, chambers of commerce, business incubators, etc.).

In relation to the research capacity of universities and to encourage the entrepreneurial spirit, it is necessary for universities to reach agreements with public and private organizations on projects, research, technical assistance, etc. This task will affect university budgets, the number and quality of publications and research contracts.

Finally, in the field of knowledge transfer, programs for entrepreneurs based on public and private actions related to entrepreneurship, continuing training programs, grants and aid to entrepreneurship and social research in entrepreneurship, like the GEM[1] report, should be focused on. Furthermore, the creation of business incuba-

[1] As the GEM Spain http://www.gem-spain.com states, the GEM observatory of the entrepreneurial activity aims at analyzing the phenomenon of entrepreneurship.

tors, *spin-offs*, patents, licenses, *start-up*, technology-based companies, networking with other universities,[2] etc, should be encouraged.

Based on the previous framework, university entrepreneurship activities are varied in nature. In the first place would be the promotion of an innovating culture, highlighting among others, the dissemination of cases and experiences of entrepreneurs, through workshops, seminars, conferences, debates and sessions where entrepreneurs instruct students about their experience; networking of former entrepreneurial students to communicate their experience; facilitate the relationship of the university community with entrepreneurs; determination of the entrepreneurial profile of students in order to improve their career guidance and identify their training needs and offer programs that allow monitoring and evaluation of entrepreneurial projects.

Secondly would be advice for new entrepreneurs, highlighting the creation of entrepreneur observatories, which enable to channel the exchange of experiences and ideas and support new entrepreneurial initiatives.

Thirdly, there would be activities to enhance new business initiatives. These include, above all, business incubators and *spin-offs*. The former aims at boosting enterprises that are in the early stages and with great growth potential, by providing a range of services including advisory, search for financing sources, enterprise networking, etc. As for *spin-offs*, they are based on exploiting an initiative conceived within the university.

Fourthly, there would be programs for university entrepreneurs. Within this set of actions we can point out all the initiatives in collaboration with business organizations: business stimulation and advice workshops, entrepreneur clubs, research projects, training courses, etc.

Finally, awards and competitions for entrepreneurs can be mentioned, that seek the promotion of entrepreneurship and the most innovative and viable proposal, as well as its impact on the economy, transfer capacity, employment generation, etc. Table 14.2 summarizes the main actions aimed at improving the enterprising capability from universities.

## 14.4 Case Study: The International Experience

At international level, the experiences and best practices in entrepreneurship in higher education institutions of the Anglo-Saxon world are crucial to understand the interest generated by this initiative for universities in recent years. Both in this section, focused on analyzing some of the best practices in entrepreneurship at international level, as the following section, where examples for Spanish universities are developed, the aim is to systematize innovative methods that enable new experiences of cooperation between universities and the enterprise.

[2] For example in Spain, there is the OTRI Network (Network of Offices of Transfer of Research Results) or the employment workgroup of the RUNAE (University Network of Student Affairs).

t2.1 **Table 14.2** Activities aimed at improving the enterprising capability from the University

| Activity | Strategies with the business fabric | Strategies with the administration | Actions in relation to university governance and management | Results |
|---|---|---|---|---|
| Academic | Business practices | Support programs | University-enterprises offices | Improvement of human capital |
| | Training programs tailored to needs | Grants and aid to study | | Creation of entrepreneurs |
| Research | R+D activities | Research policies | Transfer offices | Research projects (creation of knowledge) |
| | Research contracts | Associations for researchers | Research parks | Transfer of knowledge (publications, patents and licenses shared) |
| | Licenses and patents | | | |
| | Assistance contracts | | | |
| Entrepreneurship | Associations of entrepreneurship | Policies to promote entrepreneurship | Business offices | New products and services |
| | Awards for entrepreneurship | | Business incubators | University entrepreneurs |
| | Professorships of entrepreneurship | | | |

t2.25 *Source*: Guerrero and Urbano (2012) and own data

The selection of cases was made according to the following parameters: effectiveness of the initiative, its innovative nature, transfer of results and the ability to replicate good practice. Although the casuistry is extensive,[3] only four references were selected: Harvard University, Stanford University, Babson College and the University of Cambridge.

### 14.4.1 *Harvard University*

Harvard University is an institution of higher education in the USA with great interest in entrepreneurship. In all postgraduate degrees with economic content, students are required to take a course in entrepreneurship (for some undergraduate degrees it is the same case), as a starting point for developing new businesses. Its methodology consists of the study of cases, where those responsible for the major US companies talk about their experiences to students. This activity is carried out in person, or through *online*tools, especially through its virtual campus (Harvard University 2015).

Besides, Harvard University requires teaching and research staff to have strong commitment to teaching, research and knowledge transfer, especially in all issues

[3] See Fundación Universidad Empresa (2012)

related to the promotion of entrepreneurship. Moreover, Harvard University has an "immersion" program, by integrating teaching into business schools with field-based learning. This involves "business trips", where students can collaborate with teachers to explore possible initiatives in some countries.

Harvard also has the innovation laboratory i-lab, an initiative that promotes entrepreneurial activities and entrepreneurship in the MBA. In addition, there is a wide range of courses in entrepreneurship, the creation of entrepreneurial enterprises and management and promotion of the entrepreneurial spirit during the 2 years of the training program.

### *14.4.2 Stanford University*

As is the case of Harvard University, Stanford University is another obligatory reference on university entrepreneurship in USA. Stanford University pursues eminently applied training in entrepreneurship, with teachers and researchers who are experts in entrepreneurship and with entrepreneurs.

Undoubtedly, its proximity to Silicon Valley and the consideration of Stanford University as a business center, makes it, de facto, an incubator of initiatives. In addition, Stanford University has been making a strong commitment to the use of new technologies, especially social networks in the learning process of entrepreneurship. One of the most innovative practices is the *Stanford Entrepreneurship Corner*,[4] a free repository of resources for teaching and learning about entrepreneurship. In this *web*, there are about 3000 videos and *podcasts* on entrepreneurship and interviews with successful entrepreneurs. Some of the topics are creativity and innovation, detection of business opportunities, product development, marketing and sales, finance and venture capital, leadership and new challenges, economic globalization and business promotion.

It also has initiatives developed by the *Stanford Technologic Venture Program*[5] (STVP), among which are informal counseling with entrepreneurs of established companies, a grant and aid program for research in entrepreneurship and training in business management and finance, creativity and innovation, organizational leadership, innovation and strategic change, entrepreneurial thinking, venture capital, etc.

Another activity is the *Stanford-EndeavorLeadershipProgram*,[6] which offers 1-week training to promote innovation and creation of enterprises with high growth potential. In this case, participants are prepared, selected worldwide, in the field of strategic alliances, entering new markets, fundraising, entrepreneurial mindset, etc.

Finally, it should be noted that Stanford University annually provides $ 1.2 million to *StartX*,[7] a separate accelerator of *start-ups*. To participate in *StartX*, at least

[4] See http://ecorner.stanford.edu/

[5] See http://stvp.stanford.edu/

[6] See http://www.gsb.stanford.edu/programs/custom/endeavor

[7] See http://startx.stanford.edu/

one of the promoters of the initiative has to be a student or graduate of the university. Besides, with this initiative, entrepreneurs are offered training, a social network of former students and there is a job exchange.

### *14.4.3 Babson College*

Babson College is one of the most recognized worldwide institutions in entrepreneurship.[8] Its training program focuses on the students' need to establish real businessinitiatives from the first year of training. Moreover, as entrepreneurs perform and think differently, entrepreneurship should be part of the knowledge acquired.

Boston College has the Foundations of Management and Entrepreneurship[9] program, which enables a 1-year immersion in the business world, where students will create, develop, launch and operate a business activity. In addition, there is an accelerator of new companies where business innovation is encouraged, with space in the university incubator and counseling programs. A very new activity is Rocket Pitch,[10] where students can launch their business ideas to teachers, entrepreneurs and investors in 3 min with three transparencies; it involves convincing of the feasibility of the idea presented, in a short space of time and with limited resources (Boston College 2015).

In addition, Boston College periodically offers training seminars for university graduates, on business creation, development of entrepreneurial teams or training of entrepreneurs, risk capital decisions and business growthstrategies.

In the past few years, Boston College has been collaborating with universities around the world to offer intensive entrepreneurship programs to learn to undertake.[11] They aim at promoting entrepreneurship, innovation and creativity. The learning methodology focuses on the analysis of cases, experiences of other entrepreneurs, group projects and direct participation of the student.

### *14.4.4 University of Cambridge*

The University of Cambridge is one of the most recognized institutions in entrepreneurship in the UK. Among other activities, there is a postgraduate degree in entrepreneurship, focused on perception and entrepreneurial skills, detection of business ideas, case preparation and business management.



[8] See http://www.babson.edu/Pages/default.aspx

[9] See http://www.babson.edu/Academics/undergraduate/academic-programs/fme/Pages/default.aspx

[10] See http://www.babson.edu/Academics/centers/blank-center/venture-accelerator/rocket-pitch/Pages/rocket-pitch.aspx

[11] See http://www.babson.edu/executive-education/custom-programs/clients/Pages/santander.aspx

Furthermore, the University of Cambridge has Enterprise Tuesday,[12] one of the most successful training programs in entrepreneurship, being reference for other universities in the UK, which aims to introduce participants, in a very practical way, into the business world (University of Cambridge 2015).

Another noteworthy experience is Ignite,[13] which is an intensive 1 week program for new and experienced entrepreneurs with the aim of establishing business ideas for the business world. With this initiative, practical training by experts in entrepreneurship, business leaders and mentoring is offered, in order to provide the tools to transform an idea into a successful company.

In addition, the University of Cambridge has the Enterprisers program: what are you waiting for? where business tasks are simulated, there is interaction with entrepreneurs and practical training in entrepreneurship is guaranteed. Finally, with the Enterprisewise[14] program, which is a course aimed at master and doctoral students in the scientific and technological field, to develop skills in entrepreneurship.

## 14.5 Case Study: The Experience in Spain

Still without having the development of Anglo-Saxon countries, the promotion of entrepreneurship is becoming an activity with certain development in Spain.[15] Each university, to a greater or lesser extent, is committed to this initiative. By using the methodology described in the preceding paragraph, the casuistry of the Autonomous University of Madrid, Polytechnic University of Madrid, Polytechnic University of Catalonia, Polytechnic University of Valencia, University of Extremadura and University of Vigo will be analyzed.

### *14.5.1 Autonomous University of Madrid*

In the entrepreneurial area, the Autonomous University of Madrid has the Centre for Entrepreneurial Initiatives to promote entrepreneurship and self-employment[16] (CIADE). The CIADE offers a comprehensive service of support in all business phases, from initiation to consolidation (Universidad Autónoma de Madrid 2015).

Among its activities can be noted: awareness-raising sessions where roundtable discussions or conferences are held in collaboration with institutions that provide entrepreneurship services and training of entrepreneurs and advice in developing

[12] See http://www.jbs.cam.ac.uk/entrepreneurship/enterprise-Tuesday/

[13] See http://www.jbs.cam.ac.uk/entrepreneurship/ignite/

[14] See http://www.cfel.jbs.cam.ac.uk/programmes/enterprisewise/

[15] See Red Emprendia (2012)

[16] See http://www.ciade.org/

business projects, where tools and techniques are guaranteed for the new initiative and its development until its start-up.

In addition, the Autonomous University of Madrid holds an annual award for the university entrepreneur,[17] which aims to stimulate the enterprising capability of the students. The winners receive a cash prize, which will be used to launch the initiative, and free accommodation in the university business incubator for a maximum period of 1 year.

It also has the Impulsa program that aims at promoting the entrepreneurial spirit at university level. This initiative is funded by the Social Council of the university. There is also the University Entrepreneurs Club, which seeks to promote the consolidation of companies that are born in the university environment, mainly spin-offs. Among other services offered are *networking* and social space, *mentoring* and career support for growth, training, funding and professional consulting services.[18]

The School of Social Entrepreneurs was also developed, aimed at providing those who have an idea or a social project, information services, counseling and assistance.[19] Finally, there is the Insertion Project for Green Entrepreneurship,[20] which consists of promoting businessinitiatives related to the environment, which also consider the integration of disadvantaged groups.

### *14.5.2 Polytechnic University of Catalonia*

The Polytechnic University of Catalonia has an innovative program to promote entrepreneurship.[21] Its activity is aimed at: (i) students, who have guided talks with entrepreneurs and companies and institutions, specific courses of regulated training in innovation management, projects, business creation and management skills, training conferences in management skills, management of end-of-degree projects, career advice and resources for business creation, access to the contact network Innova and business ideas competitions; (ii) teaching and research staff, with training courses, help in financing projects, conferences and training seminars, advice on the patentability of technology and support in the patent process, commercialization of research results, etc.; (iii) enterprises and socio-economic agents, with exchange of experiences, contact with other entrepreneurs, access to training, etc. and (iv) to society, promoting the dissemination of technological innovation, entrepreneurship, quality job creation and transfer of knowledge from the university (Universidad Politécnica de Valencia 2015).

Furthermore, the Polytechnic University of Catalonia has a physical *coworking* space for entrepreneurs, where there is also advice and tutoring to analyze the via-

[17] See http://www.ciade.org/6-2/6-2-1

[18] See http://www.ciade.org/club-carpe

[19] See http://www.ciade.org/6-1/6-1-1

[20] See http://www.ciade.org/proyectos/3-2-3

[21] See http://www.upc.edu/emprenupc/espacio-de-emprendimiento?set_language=es

bility of the entrepreneurial project and develop management skills. Annually, there is a contest for projects of technological or innovative nature rewarded with cash prizes and a trip to Silicon Valley.

Furthermore the Polytechnic University of Catalonia participates in *d'Emprenedoria Universitária*, a network that seeks to promote entrepreneurship and entrepreneurial talent detection in Catalan universities. The aim of this initiative is to encourage entrepreneurship in the university community, the creation and promotion of innovative ideas in business projects, growth and consolidation of business initiatives and to generate knowledge in order to improve entrepreneurship.[22] To achieve this, it has workshops and seminars, online[23] courses, a summer campus,[24] a forum for knowledge[25] and publications related to entrepreneurship.[26] There is also an *alumni* network, who are former students collaborating in promotion activities and facilitating the access of university students to employment.

The Polytechnic University of Catalonia has the *Estudia y Emprèn* program, which aims for students to apply the knowledge gained in the development of new products and services for their commercialization.[27] Finally, the *Accel*[28] program aims to accelerate the process of business creation and especially introduce enterprises to potential investors.

### *14.5.3 Polytechnic University of Madrid*

At the Polytechnic University of Madrid, the *Actuapm*[29] program has been operating for a number of years, which aims to create companies with high growth potential. To do so, continuous monitoring is performed from the initial stage to the constitution of the company, analysis of the viability of the project, advice, aid in writing up the business plan, training tailored to the needs of the team and seeking of funding.

The Polytechnic University of Madrid also promotes the Business Creation Competition UPM,[30] aimed at students and teaching and research staff interested in

[22] The *Start Campus* Program enables the implementation of these activities in the different campuses of the seven Catalan public universities, the University of Vic and the institutions affiliated with the Pompeu Fabra University and the Polytechnic University of Catalonia.

[23] In 2012, over 2000 students took these courses.

[24] This activity involves a group of students being concentrated for 2 days in one of the campuses of the network to develop an entrepreneurial product and learn to work together.

[25] This activity involves a congress where the network's aim is to promote entrepreneurship

[26] The network develops an important activity on university entrepreneurship, eg. the observatory of university entrepreneurship which measures the evolution and magnitude of entrepreneurship in Catalan universities. For more complete information, please consult the report of the Observatory for Entrepreneurship in http://cieu.eutdh.cat/archivos/obseu_2011.pdf

[27] See https://pinnova.upc.edu/empren-upc

[28] See https://pinnova.upc.edu/accel-2014/view

[29] See http://www.upm.es/portal/site/institucional/menuitem.e29ff8272ddfb41943a75910dffb46a8/?vgnextoid= 99dee0b825a92110VgnVCM100000fdbf648aRCRD

[30] See http://www.upm.es/portal/site/institucional/menuitem.e29ff8272ddfb41943a75910dffb46a8/?vgnextoid=24a0f3032e93f110VgnVCM10000009c7648aRCRD

starting a business, promoting entrepreneurship and encouraging innovation and supporting the generation of businessinitiatives that enable innovative businesses and with growth potential. The awards consist of an allowance, participation in the training program and settling into the pre-incubator of university enterprises.

It also has an extensive training and counseling program,[31] to assist participants in developing a business plan and start a business, to help complete and consolidate teams in a viable and competitive business plan and develop and test viability plans. Thus, among other activities there are courses, seminars or conferences on business creation, business plan development, financial management, taxation, venture capital, etc.

### *14.5.4 Polytechnic University of Valencia*

Entrepreneurship at the Polytechnic University of Valencia is managed by the IDEAS Institute for the Creation and Development of Enterprises. Its mission is to develop an entrepreneurial culture, stimulating these activities for the entire university community, especially in innovative and technology-based companies. Besides, the IDEAS Institute is responsible for guiding and advising the university community on entrepreneurship.

Among the services provided, the following in particular are included[32]: dissemination of entrepreneurial culture through lectures, events for entrepreneurs, awards and competitions, with the aim of spreading the entrepreneurial culture; advice for business creation and a single point for spin-offs in the UPV; support for the development and consolidation of companies, consisting of seeking funds, ICT consulting services, business presentations, expert committees, meetings, etc.; training for entrepreneurs and business people, where courses for entrepreneurs and business people are performed and organized in business management, business development and management skills; technical consultancy and training to external entities and other universities related with entrepreneurship and finally the *StartupUPV*, which is the entrepreneur program at the Polytechnic University of Valencia.

### *14.5.5 University of Extremadura*

The University of Extremadura has been developing the *Emprendorex*t program with 33 training activities related to entrepreneurship and innovation, and with a practical approach and closely linked to ICTs. This program also has the support of entrepreneurs and professionals, who supplement academic teaching.

[31] See http://www.upm.es/institucional/Investigadores/Apoyo/OTRI/CreacionEmpresas/Servicios/Formacion

[32] See http://www.ideas.upv.es/servicios/

Furthermore, the University of Extremadura has a Directorate of Corporate Relationships with Enterprises and Employment,[33] which has been organizing the University and Entrepreneurship National Meeting, where entrepreneurs from different Spanish universities participate, and have Chairs dedicated to promoting entrepreneurship. During these meetings the best practices in this field are presented, in order to share initiatives. The University of Extremadura[34] also has an Entrepreneurship Chair, affiliated with the Vice-chancellor for Students and Employment, which develops activities for training and employment.

### *14.5.6 University of Vigo*

The University of Vigo (FUVI) Foundation is the entity responsible, among other issues for the advice to entrepreneurs at the University of Vigo, in addition to managing the technology-based employmentinitiatives program. It is also responsible for promoting, enhancing entrepreneurial activities in this university.[35] In particular, on employment and entrepreneurship issues, FUVI manages extracurricular, academic practices of students and technologically-based employment initiatives (IEBT), participating in the pre-incubator of enterprises (INCUVI[36]) project. By means of these activities, support and advice in developing business plans, implementation of projects and technical reports necessary for creating IEBT is provided. The FUVI also conducts seminars on labor counseling, transversal skills and entrepreneurship to improve the employability of students and the creation of business initiatives (Universidad de Vigo 2015).

The University of Vigo has the management of a specific area, the area of employment and entrepreneurship, which depends on the Vice-Rector of Students, which as well as collaborating with the FUVI, acts as an intermediary between employers and graduates, offers a comprehensive service of information, advice and training for employment guidance and analyzes the labor market situation through permanent contact with social and economic agents.[37]

In addition, the University of Vigo collaborates in Entrepreneurship projects with the Technological Park of Galicia (Tecnópole) and various Chambers of Commerce and Industry and Employers' Confederations of the three university campuses. It regularly participates in the *Startup Pirates* program, an activity that also takes place in Portugal, Croatia, Slovenia, Holland, Poland and Brazil, which

[33] See http://www.unex.es/organizacion/servicios-universitarios/secretariados/sol

[34] See http://www.unex.es/

[35] See http://www.fundacionuvigo.es/index.php?option=com_content&view=article&id=14&Itemid=15&lang=es

[36] This project is to reward the improvement of entrepreneurial initiatives with the availability of space at the University of Vigo or collaborating entities so they can develop their project, for a maximum period of 1 year.

[37] See http://emprego.uvigo.es/emprego_es/informacion/funcions/

aims to help potential entrepreneurs to develop business ideas in a week.[38] At the same time, entrepreneurship courses are offered in all three campuses. There is also specific postgraduate training in entrepreneurship, the Master in Business Creation, Management and Innovation Management.

## 14.6 Recommendations

As can be seen, promoting entrepreneurship from universities is becoming a reality. However, despite the progress, it is necessary to identify a set of recommendations to improve its situation:

1. It is necessary to continue strengthening the entrepreneurial spirit from the university. Thus, it is necessary to qualify the university community as part of its training. In all degrees there should be subjects that prepare students for entrepreneurship. It is necessary for teaching and research staff to be trained in entrepreneurship, for which it is necessary to have courses, seminars, etc. It is essential to spread the entrepreneurial task among students, for example, through meetings of entrepreneurs, participation in conferences, meetings and events in entrepreneurship. Finally, we must encourage students to propose their projects.
2. Secondly, the reality shows that there is no single model of entrepreneurial service and activities, but that each university has attempted to use its resources to offer the best service. However, there is a lack of coordination and cooperation between universities. If this is achieved, the results could be improved and synergies be created between entrepreneurial services.
3. Closely connected to the above recommendation, effort is necessary in each university to improve coordination between all entrepreneurial activities. It is necessary to improve internal mechanisms to combine efforts, since sometimes several vice-rectorships, area or service directorates may be performing similar services in entrepreneurship.
4. Finally, it is necessary to point out the lack of support from public administrations to encourage entrepreneurship in Spain. While there are private institutions that support these initiatives, this does not appear to be the case for public administrations. It is true that both in the University Organic Law (LOU) and the Amending LOU,[39] the role to be played by universities in the field of transfer in general (Articles 1, 39 and 41 of the consolidated text) is stated, but nevertheless, development of public initiatives in entrepreneurship has not been detected.

The same can be noted for the contents of Law 14/2013, of 27 September, of support to entrepreneurs and internationalization.[40] Thus, in the preamble of the Law as in Article 5, it states that higher education institutions should promote university

[38] See http://galicia.startuppirates.org/about-us/startup-pirates-galicia/

[39] See http://www.boe.es/buscar/pdf/2001/BOE-A-2001-24515-consolidado.pdf

[40] See http://www.boe.es/boe/dias/2013/09/28/pdfs/BOE-A-2013-10074.pdf

entrepreneurship initiatives to bring young students closer to the business world. Furthermore, it also indicates that universities should encourage the initiation of business projects by providing assistance to potential entrepreneurs, while encouraging encounters. However, this statement of intentions will need public support from the authorities with educational competence, which so far, is insufficient.

## 14.7 Conclusions

As it has been possible to see, the Spanish university is trying to approach the reality of its environment. The ability to listen to social demands and to respond to the requests that are made is increasing. Greater involvement of institutions of higher education in environmental problems has been detected, which enhances the ability to transfer from the university to the business world and society in general.

Most of the Spanish public universities state in their strategic plans that they are institutions open to their environment, their commitment to economic progress through the creation and transfer of knowledge and scientific and technological development and innovation. Spanish universities are attempting to be an innovative reference in the transfer of science and knowledge. It is therefore not surprising that entrepreneurship has an increasing presence in the governance of universities.

The previously mentioned does not prevent stating that there is still a long way to go regarding university entrepreneurship, if the Spanish situation is compared to American and British universities. There is a lack of coordination, both internally and externally, in promoting this activity in institutions of higher education in Spain. Moreover, the actual support of public administrations in education in entrepreneurship in Spain is limited.

Furthermore, it is necessary for Spanish universities to take into account other international experiences and good practices that are having great success in the field of entrepreneurship. This is without doubt the most important challenge in the next few years for the Spanish university system, in order to encourage entrepreneurial activity.

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# Chapter 15
# Innovation in Entrepreneurship Education: Developing Competitive Advantages for MBA Students

**Ricardo D. Álvarez Rodríguez and Jorge A. Wise**

**Abstract** For the last decade entrepreneurship education has grown to become a major discipline in several universities and colleges, particularly in the United States, Europe, and other developed nations. Nevertheless, comprehensive entrepreneurship programs are starting to be implemented in higher-education institutions across emergent economies as well. Everywhere around the world, entrepreneurship students need to gain skills and knowledge that can help them get started and have better opportunities to succeed with their ventures. At CETYS Universidad, a private non-for-profit school in Mexico, an Entrepreneurship Concentration MBA program was designed and developed around the Entrepreneurial Life Cycle and Entrepreneurship Process frameworks. The program is intended to build entrepreneurship competencies in MBA students, nurture an innovative mindset, and help them increase their entrepreneurial self-confidence and capabilities. It is the first program of its kind to be offered in the northwest region of the country, and one of the few in Mexico.



## 15.1 Introduction

It doesn't matter if it is a large or a small enterprise. If it is a family-own business, a nonprofit organization, or a spin-off from a large corporation or a university lab—it is not that important. The main issue is that it started somehow as a new venture, which is one of the ways how modern society creates wealth, generates jobs, and

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promotes economic growth. If entrepreneurs don't launch new startups, it becomes very difficult for current companies and institutions to keep up with increasing social demands and ever-changing customers' needs.

Entrepreneurship is powerful and over the last 10 years, diverse factors have transformed this once understated concept into a roaring force of new businesses generation across the globe. From the 'lean startups' to 'entrepreneurial communities', the 'entrepreneurship bug' has spread to even the most recondite places. From Moscow to Singapore, and from Mexico to Mumbai, entrepreneurship is the hype and entrepreneurs are on the rise.

Starting a new business is not an easy task. It requires certain skills, knowledge, and an everlasting commitment in order to succeed. Failure numbers are a reminder that embracing a new venture is a very risky shot that not everyone is willing to take. According to Shikar Ghosh from the Harvard Business School, about 75 % of all start-ups fail in terms of being unable to meet revenue projections and cash payback to venture capital investors and shareholders (Gage 2012).

Nurturing entrepreneurship and cultivating a proactive mindset is what entrepreneurship programs in different graduate business schools across the United States and abroad are attempting to do. Entrepreneurial activities are gaining momentum everywhere. In several emergent economies as well, unstructured efforts by educational institutions, local governments, private investors, and entrepreneurs are finally starting to reach a common ground in which new business creation and increased employment are now possible.

## 15.2 Entrepreneurship Programs in Higher Education

As a way of promoting an entrepreneurial mentality and help soon-to-be entrepreneurs gain the necessary skills and competencies to have a better chance with their future ventures, a large number of schools are now incorporating more business planning courses, innovation and creativity workshops, new ventures development programs, and undergraduate and graduate entrepreneurship minors and majors. Nowadays, more than 3000 universities and colleges (around 65 % of total U.S. degree-granting institutions) offer entrepreneurship courses as compared to only a few three decades ago (Morris et al. 2013).

The majority of higher-education institutions and colleges in the United States started offering only a few, spare, entrepreneurship-related courses such as business planning or new product development, and some are still doing so. But more and more, schools are now designing comprehensive entrepreneurship programs for undergraduates and MBA students, or even specialized master and doctoral degrees in entrepreneurship (Morris 2014).

Universities and colleges in developing countries and particularly in Mexico, are beginning to embrace entrepreneurship in the same way that American schools did 20 years ago, offering only a couple of courses in small-business management, business plan writing, or introduction to entrepreneurship. However, cultural differences and economic conditions appear to be moderators of new venture development courses, where new business creation is often understood as self-employment or necessity-based initiatives to survive (Alvarez and DeNoble 2006). Still, an increasing number of universities in the country's largest metropolitan areas like Mexico City, Guadalajara, and Monterrey, and even in some mid-size communities, like Tijuana or Mexicali in Baja California, are developing new entrepreneurship programs, and in some cases, undergraduate and graduate entrepreneurship degrees (Arreola and Cardini 2014).

## 15.3 Entrepreneurial Education Framework

### *15.3.1 The Entrepreneurship Life Cycle*

Several researchers and management theorists have proposed that, similar to living beings, organizations evolve through a life cycle or a series of developmental stages, from conception and introduction, through growth, to maturity, and later to decadence and death (Greiner 1972).

This same concept was initially applied by Churchill and Lewis (1983), when they came up with the idea that new ventures behave in the same manner, following a natural phase progression from idea generation and startup, through growth and maturity, to decay and exit. One key implication for managers is to understand the different changes that take place during each phase, the different skills that are needed, and how to retain and manage knowledge while dealing with problematic and challenging situations (learning curve). By effectively resolving current problems, through an experience-based decision platform, management becomes more proficient in making both tactical and strategic choices (Lester et al. 2003).

The entrepreneurial life cycle comprises the following stages: Pre-Launch, Startup, Growth and Maturity. Each one of these stages presents different challenges and requires certain managerial skills, capabilities, and resources to be able cope with them (Parker 2007). Usually the initial pre-launch stage is very chaotic, and the entrepreneur must confront uncertain and complex scenarios, where nothing is clear, and new venture ideas are fuzzy approximations of potential new businesses.

Pre-launch requires the would-be entrepreneur to identify an attractive opportunity and carry on the initial customer discovery and validation process, in order to determine if there is really a market need. To do so, he or she must manage minimal market research techniques, possess some social interaction finesse, and be very sensitive to environmental signals and trends. Some say that during this phase the entrepreneur acts in a 'search mode' looking for potential new opportunities.

Creative and innovative skills are desirable, but also an inspirational and team-building spirit is needed to get everybody involved toward a common vision and goal.

During the startup phase the entrepreneur has already defined the business model and probably is working on the latest product prototype or an initial inventory to start selling. At this point, numerous systems and business processes are to be established. The rest of the management and operations teams need to be hired, and the marketing strategy has to be set up. This is when the product or service is launched, and while initial sales are starting to happen, a lot of things have to be revised and continuous adjustments made. The entrepreneur has to either start adjusting his or her mindset to a more operational mode or look for a counterpart that has the ability to start building a company and controlling processes and people.

While the business enters a growth stage and reaches a certain level of stability and maturity, competitive and strategic issues are now at the top of the list. As the new venture scales and grows in sales, it also requires more resources, and its management becomes more complex. Management controls and standards need to be implemented and observed. Competition needs to be continuously watched in order to maintain the business positioning, and new products, services, features, and improvements are to be developed. The entrepreneur now requires more managerial and leadership skills in order to keep the ship afloat and to deal with shareholders, competitors, and stakeholders. Negotiation capabilities and strategic thinking are a must. Finally, an executive and aggressive mindset is needed, because at this stage top management must decide whether to sell the business, harvest the market, do reengineering, disinvest, or reposition the product or company.

### *15.3.2 The Entrepreneurship Process*

Accordingly, the entrepreneurial process framework shows a set of activities that start with opportunity recognition, business concept development and refinement, resources assessment and acquisition, and implementation, growth management, and harvesting (Morris et al. 1994).

Opportunity recognition refers to the series of actions that an entrepreneur must take to discover customer needs and assess the market potential, which are as well key activities during the ideation or pre-launch phase of the entrepreneurial life cycle. The second step of the entrepreneurship process involves business model development and customer validation, when the idea is then tested and adjusted in order to make it commercially feasible. This can be related to the startup phase of the life cycle, where the business model is finally defined and systems and processes are structured to make sure that there is a replicable and scalable viable product, and that it can be immediately produced and sold.

Assessment of resources, resources acquisition, and growth management activities support scaling the business and assuring its continuity towards the long-term vision. It is during the growth and maturity stages of the entrepreneurial life cycle that entrepreneurs need to be able to define the business's future milestones and the

resources that are required to accomplish them. Production and distribution capacities are expanded, and the necessary cash is accessed to promote sales and gain market share (marketing expenses). If a resources miscalculation occurs, it is likely that the business will run out of sufficient working capital cash flow to be able to meet the market demand.

### *15.3.3 Entrepreneurial Competencies*

As we have seen so far, both the life cycle and entrepreneurship process frameworks are highly related and consistent with each other. On the one hand, the life cycle perspective talks about the evolutionary stages that a new business goes through during its development; and on the other hand, the entrepreneurial process theory centers its discussion on the activities that precisely take place during each stage of the life cycle.

No matter what, each phase and every step requires entrepreneurs to possess certain abilities to meet and address occurring changes. Previous organizational development research has demonstrated that management competencies are strongly related to business performance, productivity, and survival rate (Shook et al. 2003; Hayton and Kelley 2006). If management possesses the necessary skills and knowledge to solve whatever situations that might occur, there is a better chance for the enterprise to stay alive. Thus, it is necessary for the founding entrepreneurs to identify at each stage the core competencies that managers will require and make sure that they have them (Pickett 1998).

Some researchers suggest that business skills and competencies are built upon a manager's experience and acquired knowledge, which is mainly achieved through education. Expertise then can be applied to actions that effectively resolve difficult situations and problems. Management teams that combine business skills learned at business schools with real-world and hands-on experience often have a better chance to effectively and efficiently reach organizational goals (Honeyseth and Metheney 2012).

Competencies are skills, abilities, knowledge, behaviors, and other characteristics that are applied by personnel to effectively perform a job. Such competencies are employee-related levers to determine what has to be done in order to achieve relevant results for the organization in a way that is consistent with and builds its culture (Intagliata et al. 2000).

From a resource-based perspective, enterprise growth is mostly determined by the way in which an experienced management team handles both internal and external resources and implements a business plan (Penrose 1959), but growth can be limited by the scope of managerial resource access, the ability to integrate other personnel, and to follow the long-term vision and point of view of the founding entrepreneurs (Majundar 2008).

Entrepreneurship education at every level must facilitate students to develop the necessary competencies, skills, and abilities to think and act entrepreneurially.

Students need to be able to identify and pursue new business opportunities while dealing with uncertainty, ambiguity, and frustration (Morris et al. 2012). Entrepreneurship competencies can be taught and developed over time, and higher-education programs are a key part of cultivating future entrepreneurs. Through entrepreneurship programs and experiential learning, students can mold their values, beliefs, and behaviors into competencies that will eventually help them gain the necessary confidence in their entrepreneurial capabilities (self-efficacy) as they embrace creation of new ventures (Morris et al. 2013).

## 15.4 CETYS MBA Entrepreneurship Concentration Program

Founded in 1961, The Center for Higher and Technical Education (CETYS University) is a not-for-profit private educational institution of excellence located in the State of Baja California, México. CETYS University has three campuses located in Mexicali, Tijuana, and Ensenada, and is currently offering undergraduate and graduate degree programs in the areas of Management and Business, Engineering, and Humanities; it also offers general, bilingual, and international High School.

The university's educational philosophy, which clearly distinguishes the institution from others, relies on its Educational Model Distinctive Core Elements:

- Internationalization
- Sustainability
- Social Responsibility
- Community Engagement
- Information Literacy
- Entrepreneurship

CETYS is currently rated as one of the top universities in the country, with national recognitions by FIMPES (Mexican Federation of Private Institutions of Higher Education) and internationally accredited by the Western Association of Schools and Colleges (WASC) and the Accreditation Council for Business Schools and Programs (ACBSP), among others. It has the highest number of graduate students in Baja California and promotes an entrepreneurial spirit in all of its students through academic programs and extra-curricular events. As an example, four of the five most important enterprises in the State of Baja California were founded and are operated by CETYS alumni.

For the last 8 years, the CETYS MBA has been among the 20 best-rated graduate programs in the country, offering different concentrations for students to choose from. The CETYS MBA with a Concentration in Entrepreneurship Program (MBACE) is the first of its kind in Mexico's northwest region, and the third one nationally.

CETYS MBACE follows an evolutionary model, which was structured around the Entrepreneurship Life Cycle and the Entrepreneurial Process frameworks. The program integrates a comprehensive set of courses that addresses all the basic and necessary entrepreneurial competencies to help students develop their confidence

and an entrepreneurial mindset, whether they work inside an organization or are looking forward to start a new venture.

### *15.4.1 MBA Program at CETYS*

The MBA program at CETYS Universidad has been updated and revised in 2015. The program embraces a modern point of view for a world class program. The previous program was originally developed in 2004; since then, many developments in the academy have happened. Among those, CETYS defined a new mission as well as a new perspective on entrepreneurship. This perspective implies a reconfiguration of the MBA program. As such, the program includes a total of 16 courses divided into five modules. Each module includes courses from business basics to strategy. Figure 15.1 includes the modules and their courses. The idea is that the integration of the five modules results in a comprehensive business program.

Each module of the MBA program includes courses related to business and managerial aspects. CETYS MBA is divided into six distinctive sets of courses. Table 15.1 includes the courses for all the modules.

#### 15.4.1.1 Non-credit Introductory Courses

New students entering the program are require to complete four non-credit prerequisite courses as a basic introduction to accounting and business management fundamentals, along with probability and statistics basics, and writing and

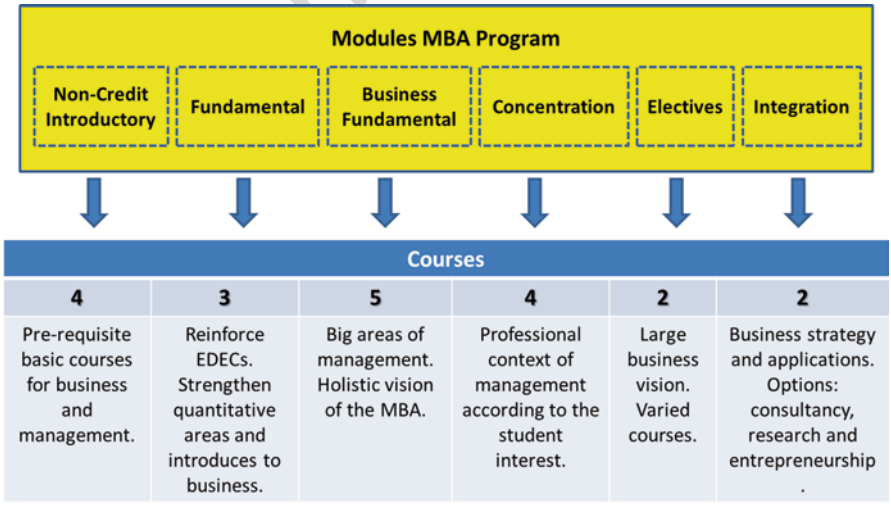


**Fig. 15.1** Description of MBA program modules

t1.1 **Table 15.1** Courses for each
t1.2 module

| Module | Courses |
|---|---|
| Fundamental | 1. Civility and Business Mission |
| | 2. Entrepreneurship and Business Models |
| | 3. Analytic Thinking for Decision Making |
| Core | 4. Strategic Marketing |
| | 5. Supply Chain Management |
| | 6. Human Capital Management |
| | 7. Global Economy and Public Policies |
| | 8. Financial Management for Business |
| Concentration | 9. Concentration Course I |
| | 10. Concentration Course II |
| | 11. Concentration Course III |
| | 12. Concentration Course IV |
| Elective | 13. Elective Course I |
| | 14. Elective Course II |
| Integration | 15. Integral Project |
| | 16. Business Strategy and Competitiveness |

communication skills for business. The courses serve as an initial framework for all students, whether they have a business management or accounting degree or a non-business related background. The CETYS MBA program was originally designed for different professional careers and occupational backgrounds, like engineers, medical doctors, lawyers, marketers, sales managers, or quality production.

#### 15.4.1.2 Fundamental Courses

A second set of courses, what we call the "formative framework", was conceived to help students be conscious on how their thinking guides their attitudes and behaviors. If they are open to new ideas and paradigms, and understand how the correct mindset can guide their actions in the most ethical way possible, their future decisions will probably be in the best interests of all stakeholders, whether they work for an actual business or launch a new company.

One of the fundamental courses is the entrepreneurship introductory course under the name of "Entrepreneurship and Business Models", which addresses all the entrepreneurial processes, from idea generation and opportunity recognition, to business model generation, bootstrapping, guerrilla marketing, entrepreneurial finance, business planning, growth management, harvesting, and exit strategies. It helps students gain an overview of the whole process and motivates them to start thinking about new products and business development. As an introductory course,

this provides the basic entrepreneurial knowledge for aspiring entrepreneurs, using the Business Canvas Model—an analytical and developmental framework for startups.

#### 15.4.1.3 Business Fundamental Courses

The following groups of courses address the business's core functions and provides students with a clear understanding of the main disciplines needed to manage any kind of company or organization, whether a small family-owned business or a large multi-national corporation. All of the courses are pre-requisites for whatever concentration students may select.

#### 15.4.1.4 Concentration Courses

Departing from the introductory entrepreneurship course, the MBACE concentration courses are domain specific, and provide a deeper perspective of the fundamental practices, skills, and competencies that well-rounded entrepreneurship students must know and develop, and that eventually will help them have a better chance of success in their future endeavors.

#### 15.4.1.5 Elective Courses

The student chooses two courses from a very large selection. With these courses the student can focus on particular business and management aspects of interest or look to enlarge previous perspectives. The MBA program offers a wide variety including courses focused in management, leadership, accountancy, human resources, international business, finances, marketing, culture, and entrepreneurship.

#### 15.4.1.6 Integration Courses

This set of courses includes two distinctive courses of the MBA program at CETYS. One course is on strategy and the other is a project. The strategy course adopts Harvard's course on Microeconomics of Competitiveness (MOC). Developed by Professor Michael Porter (Porter 2008) the MOC course focuses on the sources of national or regional productivity, which are rooted in the strategies and operating practices of locally based firms, the vitality of clusters, and the quality of the business environment in which competition takes place. The other course is a project in which the student integrates all what has been learned in the program. The project course offers three tracks: consultancy, research (academic or business applied), and entrepreneurial. Before entering the course, the student should define their track of interest.

### 15.4.2 CETYS MBACE Curricula Structure

MBACE students go through an evolutionary learning process that starts with a series of basic business foundations and gradually, as they move along with their masters courses, they are trained in different skills and competencies.

The MBACE has an integrative approach to the entrepreneurial experience and provides students with consulting support in terms of incubation facilities, market research, and business planning within the university campus. The program is intended to nurture an entrepreneurial mind and spirit among all MBA students at all three CETYS campuses (Mexicali, Tijuana, and Ensenada), from undergraduate to graduate and alumni.

As we already pointed out, the courses were designed within the Entrepreneurial Process and Entrepreneurship Life Cycle frameworks. With a hands-on and experiential approach, each course addresses and explains the different aspects, variables, risks, challenges, decisions, and actions that venture development requires in every stage of the process.

The MBA Program on Entrepreneurship takes advantage of the general structure of the MBA program, building very positive attitudes and actions. During the program, the student is constantly pushed to move forward, considering always a natural entrepreneurial cycle. To do this, the general program's courses all focus on entrepreneurship, while inserting explicit courses whenever necessary. Specifically, the six courses from the Modules of Concentration and Electives are defined in advance emerging the innovative program on entrepreneurship. In addition, this program offers other two courses: Entrepreneurship and Business Models and the Integral Project with the option on entrepreneurship. In all, the MBACE includes eight related courses and eight MBA courses.

As the student is accepted in the MBACE, the sequence of the courses follows a specific pattern. At CETYS the MBA student takes up to two courses every 9 weeks. The 9 weeks represents a quarter, with the opportunity to take four quarters in a year for a total of eight courses. The program requires at least 2 years of coursework. However, it is very common that students take several quarters of only one course, requiring more than 2 years for graduation. There are very different reasons for taking less than the two expected courses per quarter. In any case, the program regulates which courses are offered and can be taken, considering the requirements.

The MBACE includes six unique courses. As mentioned above, those courses are in exchange of the courses from both Concentration and Elective Modules. The specific courses are in Table 15.2. However, for this specific program, the courses are taken in a pre-defined arrangement. Each quarter, the student takes one course on entrepreneurship and one course of the other modules. In this way, the student has the opportunity to move forward always gaining additional knowledge to build a new business idea.

The courses on entrepreneurship always consider the potential new opportunity. That is, while taking the courses, the students develop ideas for their new venture. Every entrepreneurial course is designed to move forward with the new venture of

t2.1 **Table15.2** Coursesfor entrepreneurship

| t2.2 Module | MBA courses | Quarter | MBACE courses |
|---|---|---|---|
| t2.3 t2.4 Fundamental | 1. Civility and Business Mission | **1** | 2. Entrepreneurship and Business Models |
| t2.5 t2.6 | 3. Analytic Thinking for Decision Making | **2** | 9. Opportunity, Innovation and Design Thinking |
| t2.7 t2.8 Core | 4. Strategic Marketing | **3** | 10. Business Models and Business Plan Development |
| t2.9 t2.10 | 8. Financial Management for Business | **4** | 11. Growing Firm Management and Harvesting |
| t2.11 t2.12 | 6. Human Capital Management | **5** | 12. Entrepreneurial Marketing and Sales |
| t2.13 t2.14 | 5. Supply Chain Management | **6** | 13. Entrepreneurial Finance |
| t2.15 t2.16 | 7. Global Economy and Public Policies | **7** | 14. Legal and Fiscal Aspect of Entrepreneurship |
| t2.17 t2.18 Integration | 16. Business Strategy and Competitiveness | **8** | 15. Integrative Project |



every participating student. In this way, it is expected that at the end of the program, the Integral Project will result in the new operational venture.

## 15.5 Entrepreneurship for MBAs

The literature on business education mentions that learning-by-doing seems to be a good teaching method to establish long term learning. Specifically, the action regulation theory perspective on entrepreneurship (Frese 2012) provides a theoretical base for developing professional programs. Moreover, according to empirical evidence included by Gielnik et al. (2015) indicates that the use of this theory is an effective approach to facilitate entrepreneurial action. In addition, Morris et al. (2013) support the idea that a modern university, and in consequence a modern business school, should include entrepreneurial programs in their professional programs. As a modern and advance school, CETYS Business School puts those concepts in action thru its MBACE.

Entrepreneurship occurs when entrepreneurs act on the business opportunities they discover (Shane et al. 2012). Similarly, in an MBA program, entrepreneurial intention might be a result of the student's desire to develop an entrepreneurial career (Papzan et al. 2013). The previous seems to be the result of scholars pushing students into positive entrepreneurial attitudes and actions. Having a positive attitude toward entrepreneurship is as important as taking the appropriate entrepreneurial actions. Here, attitudes can be understood as positive feelings, beliefs, values,

and perceptions. On the other hand, action represents the acts of doing something—such as gathering resources and setting up viable structures with entrepreneurial results, like starting a new business (Gartner 1985).

Action is important because starting a new venture requires having opportunities; the MBACE at CETYS provides such opportunities. To succeed in launching a new idea business, entrepreneurs participating in the MBA program tend to initiate more start-up activities (Carter et al. 1996; Lichtenstein et al. 2006). The previous implies that entrepreneurial students have more successful ventures, as they are immersed in a program which provides many possible entrepreneurial actions and activities. That is the case of the MBACE at CETYS Universidad.

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# Chapter 16
# Resources and Tools of the Firm: Competencies and Entrepreneurship

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**Abstract** This chapter examines the three dimensions encompassed by the concept of competencies: competencies as the idiosyncratic mixture of resources or capabilities of the firm (RBV); specific competencies of each profession (HRM); and generic competencies whose value has been highlighted by sociologists and education specialists. Within this set of competencies, entrepreneurship is a key competency that allows people to organize, coordinate, and guide others. At the same time, entrepreneurship is also one of the characteristics that defines a profession. The main aim of this chapter is to highlight the importance of generic competencies and the benefits of fostering the acquisition of generic competencies in higher education programmes.

## 16.1 Introduction

The purpose of this chapter is to highlight the importance of competencies—both specific and generic—as entrepreneurship tools. To achieve this aim, we present arguments that show the need for competencies to become a prominent feature in higher education teaching programmes.

We first present two perspectives from which to address the issue of company resources and capabilities. First, we discuss the resource-based view (RBV), which presents company resources and capabilities as a source of competitive advantage. According to this approach, the idiosyncratic mix of resources (tangible and intangible) explains how companies can achieve sustainable competitive advantage (Barney 1991, 1996; Grant 1995). Prahalad and Hamel (1990) used the term competencies in their classic article entitled The core competence of the corporation.

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Here, the term competencies refers to an idiosyncratic mix of tangible and intangible resources that enable a company to develop products and compete with peers. In this sense, resources, skills, and competences are three closely interrelated terms. Competencies may also be interpreted as services that provide resources (Penrose 1959). As this chapter shows, adopting this definition makes it possible to link resources, capabilities, and competencies to entrepreneurship. Entrepreneurs take decisions that aim to seize market opportunities. Alternatively, entrepreneurs create opportunities by modifying the competitive landscape (Barney and Wright 1998), deploying knowledge, and harnessing company competencies.

This chapter also examines a second approach to studying competencies. This approach is taken from an alternative stream of literature. It refers to the individual competencies that an employee requires to perform his or her operational, managerial, or professional function (Baron and Kreps 1999; Schuler and MacMillan 1984) and to meet the demands of his or her job's internal or external environment. Scholars have examined 21 generic competencies, evaluating their relevance for any kind of work (González and Wagenaar 2003; Seth and Seth 2013).

In this second approach to studying competencies, entrepreneurial capability is classified as an additional competency related to certain jobs rather than being classified as a universal competency as it is in the previous approach. Clearly, one issue is to assess how important entrepreneurial capability is for a certain job, yet another quite different issue is the role of the entrepreneur as a figure who combines all of a company's resources and skills to achieve sustainable competitive advantage.

In this chapter, we first present the classical resource-based view (RBV) framework and then analyse generic competencies for four distinct main job groups: Self-employed, managers, teachers and professionals, technicians and mid-level professionals, and others with lower qualifications. There is a large theoretical gap between the RBV and the analysis of generic competencies in different jobs. Across this gap, the theoretical framework changes vastly, as does the type of phenomena under study.

## 16.2 Resources, Competencies, and Entrepreneurship

Scholars have used the RBV to study how companies organize their human and technical factors of production to achieve sustainable competitive advantage. In other words, the RBV seeks to explain how companies adopt and use technology, where technology here broadly refers to the know-how that allows a company to develop products and services and ultimately compete.

Different authors in the field of RBV or knowledge management describe this phenomenon using a range of concepts with a single meaning. For Prahalad and Hamel (1990), this basic know-how corresponds to the company's *core competencies*, whereas for Winter (Winter 2003; Zollo and Winter 2002), a company's know-how is part of the company's organizational routines, including operational routines and

top-level or managerial routines. Spender (2008), a knowledge creation and knowledge management scholar, stressed practice—how the company develops operational or managerial practices—as the way in which the organization applies its know-how to develop its products and services. The concepts, language, and definition of a company's know-how all change, but this know-how remains a proprietary blend of elements outside the scope of any complete conceptual description in terms of practices and the mix of intangible elements—behaviour and forms of intelligence and commitment—that cannot be fully known.

But what is the relationship between this mix of resources and capabilities and *entrepreneurship*? In terms of a company's know-how, the entrepreneur is the figure with the greatest responsibility in leading the company towards fulfilling its objectives. The link between resources, capabilities, and entrepreneurship is discussed by Penrose (1959: 48), who indicated that any possible increase in the company's scale (i.e., any new entrepreneurial undertaking) is limited by available resources (i.e., talent and managerial capability). Thus, as mentioned previously, entrepreneurship is the most fundamental resource and capability: the entrepreneur reorganizes and mixes all other resources to yield new capabilities for the company. Resources and capabilities are complex tools used by the entrepreneur to achieve competitive advantage.

## 16.3 Competencies in the RBV Vs. Competencies Linked to Professional Activities

There is no contradiction between competencies in the RBV and competencies linked to professional activities, but there is a noticeable difference between the two approaches. When a company designs and establishes practices for a job according to human resources policies (Baron and Kreps 1999), the aim is to obtain an efficient, reasonable, and well-rounded system of human resources practices (Arthur and Boyles 2007). But this does not preclude the appearance of the aforementioned intangible elements and informal relations, leading to an idiosyncratic mix that characterizes the know-how behind different activities.

The level of the idiosyncratic mix, however, differs greatly between the RBV and the human resources approaches (and practice). In both cases, an idiosyncratic mix occurs because of the inevitable existence of intangible and unknown elements. Yet, whereas the RBV is fundamentally rooted in the most general aspects of that mix and their strategic consequences (i.e., sustainable competitive advantage), human resources policies and practices seek to minimize the ambiguity of the idiosyncratic mix and accurately define different jobs.

Therefore, the idiosyncratic mix is always present, and it is the basis for the entrepreneur to achieve competitive advantage (or differentiation) at any level. Nevertheless, the distance between the two types of idiosyncratic mix under study corresponds to different business areas: the RBV seeks the idiosyncratic mix at all levels, including the most general levels within the company, whereas human

resources policies and practices are concerned with the mixture only at levels corresponding to each operational or managerial position (Barney and Wright 1998). The purpose is to make the mix, or combination, of factors as explicit as possible, thereby facilitating its efficient design.

Finally, the approach of considering competencies as being linked to professional activities differentiates between *specific* or *instrumental* competencies linked to the job description (which characterize the idiosyncratic mixture) and *generic* or *transversal* competencies. We discuss transversal competencies in the next section, and we study them in more detail in the empirical study.

## 16.4 Generic or Transversal Competencies

As previously mentioned, the competencies examined herein, which are related to four different job groups, are not competencies linked to the definition of each job in a particular sector (specific or instrumental competencies) but rather transversal competencies that are theoretically useful for any job. These competencies, which have primarily been studied in research fields other than economics (sociology and education), are important because they have a social and cultural character and because they establish the framework within which the idiosyncratic mix of specific competencies lies.

In a society in transformation, where demand for certain competencies is constantly changing, generic or transversal skills are important (González and Wagenaar 2003). Generic competencies are presented in the literature as soft skills: transversal competencies that transcend the techniques required by a specific job or trade. They are linked to human emotions, behaviour, motivations, values, and culture. In recent years, these skills have been crucial for any medium- or high-level job, and many have advocated their widespread inclusion in the education syllabus. The reason is that they provide better conditions for employees' social interactions and for the overall management of the company, making it easier to achieve competitive advantage (Seth and Seth 2013). By improving communication and internal relations within the company, these generic competencies enable entrepreneurial undertakings underpinned by leadership and instrumental competencies to create or access opportunities. Hence, generic competencies are also an important element of entrepreneurship.

Soft skills are attitudes and behaviours that arise in interactions between individuals and that affect the outcome of these interactions. They differ from specific competencies or hard skills in that the latter consist of technical knowledge and skills required to perform a specific task (Muir 2004). The sociology and education literature suggests that scholars have scarcely explored the development of soft skills in higher education (Rainsbury et al. 2002), despite their major importance in professional work and organizations. Studies have shown that hard skills account for just 15 % of success in a given task, whereas soft skills account for 85 % (Jain and Syed Anjuman 2013). According to studies by Stanford Research Institute and

the Carnegie Mellon Foundation (Fortune 500), 75 % of CEOs' success at work owes to soft skills or personal competencies, and only 25 % owes to technical skills (Sinha 2008).

It is important to design training such that it may improve workers' performance. Educators must ensure that students are able to effectively transfer their skills to their jobs (Miller et al. 2012), even though these generic skills, which enable people to apply their technical or specific competencies, refer primarily to personal skills, communication, and emotional intelligence. It is therefore important to correctly establish the generic skills required for people to be effective in their jobs (Rubin and Dierdorff 2009). Several studies call for stakeholder involvement in designing the programmes aimed at building these skills (Rubin and Dierdorff 2009; Rynes et al. 2003). Studies also advocate systematic assessments of the needs these competencies must meet (Miller et al. 2012). The aim of such actions is to teach the right generic or transversal skills so that workers can do their jobs effectively.

There are different approaches to identifying key generic skills. Robles (2012) and Chambers and McDonald (2013) discussed how to cultivate soft skills, arguing that each person has different skills. They focused on the soft skills that people acquire at different levels of the organization. Chambers and McDonald (2013) identified seven core soft skills: integrity, building relationships, integration, communication, group work, diversity, and continuous learning. Robles (2012) identified several soft skills cited by executives as most important: integrity, communication, courtesy, responsibility, social skills, positive attitude, flexibility, teamwork, and ethics at work.

Kar (2011) introduced the concept of life skills based on an understanding of Delors (1996) four pillars of learning (learning to know, learning to do, learning to be, and learning to live together) and defined life skills as social, personal, and management skills necessary for someone to work independently. Kar (2011) proposed 12 core life skills: problem solving, critical thinking, effective communication, decision-making, relationship building, self-awareness building, empathy (instead of sympathy), coping with stress and emotions, meditation and exercise, positive attitude, work–life separation, and understanding body language.

Dulewicz and Higgs (2003) presented emotional intelligence (Goleman 1996) as a better indicator of people's success than IQ, and they proposed the first questionnaire to measure emotional intelligence in Europe (Dulewicz and Higgs 1999). They designed one for managers and one for other people in the organization. According to these authors, the seven key elements of emotional intelligence are awareness, emotional resilience, motivation, interpersonal sensitivity, influence, intuition, and diligence.

Many of the previously discussed competencies are pertinent to entrepreneurs, who should combine different company competencies and use them to discover or create opportunities. Among these relevant competencies are personal integrity, communicationskills, group work and continuous learning skills (Chambers and McDonald 2013), social skills, positive attitude, flexibility, and ethics (Robles 2012), conflict resolution, critical thinking, decision-making skills (Kar 2011), interpersonal sensitivity, influence, intuition, and diligence (Dulewicz and Higgs 1999).

This provides the entrepreneur with the ability to organize and manage competencies, as well as the ability to use competencies through collaboration with different organizational members.

## 16.5 Empirical Analysis of Competencies in Four Job Groups

Table 16.1 gives details on the sample of respondents, including qualification level and type of work. Most surveyed graduates were technicians and associate professionals (29 %), followed by professionals (24 %) and managers (22 %).

The sample comprised 706 respondents from five countries: Spain (39 %), Argentina (30 %), Colombia (20 %), Mexico (10 %), and USA 1 %. Participants responded to questions that gathered data on how important 21 generic competencies were in their jobs. These competencies appear in Table 16.2, which also presents descriptive statistics (means and standard deviations) for the sample.

Table 16.3 shows the results of a one-way analysis of variance in the values assigned to each competency with respect to the variable job held. This analysis yielded the F-ratio and p-value for each competency. We checked whether the values for the competencies were the same across job groups. The data in the table show the significant differences in means (Table 16.4).

As shown in Table 16.3, respondents confirmed the importance of social transversal competencies or of those related to information, communication, and responsibility, regardless of differences in scores between different job groups. The data allowed us to relate each competency with each job group. Thus, the capacities for



**Table 16.1** Number and percentage of respondents by sector

| Place of work | | |
|---|---|---|
| Managers | 153 | 22 % |
| Professionals | 168 | 24 % |
| Technicians and associate professionals | 202 | 29 % |
| Clerical support workers | 23 | 3 % |
| Service and sales workers | 2 | 0 % |
| Skilled agricultural, forestry, and fishery workers | 79 | 11 % |
| Craft and related trades workers | 0 | 0 % |
| Plant and machine operators and assemblers | 0 | 0 % |
| Elementary occupations | 0 | 0 % |
| Armed forces occupations | 2 | 0 % |
| Other | 77 | 2 % |
| Total | 706 | 100 % |

t2.1 **Table 16.2** Key skills in the workplace

| t2.2 t2.3 Competencies | | | Mean | Sd | Non-resp. |
|---|---|---|---|---|---|
| t2.4 Instrumental | Cognitive | Critical thinking | 0.16 | 2.11 | 705 |
| t2.5 | | Systematic thinking | –0.21 | 2.04 | 693 |
| t2.6 | Methodological | Management capability | 0.57 | 1.87 | 705 |
| t2.7 | | Continuous learning capability | 0.19 | 2.04 | 698 |
| t2.8 | Technological | ICT literacy | –0.12 | 2.11 | 704 |
| t2.9 t2.10 | | Capability to find necessary information and discern its relevance | 0.26 | 2.02 | 704 |
| t2.11 t2.12 | Linguistic | Ability to communicate effectively | 0.76 | 1.72 | 703 |
| t2.13 t2.14 | | Communication in a foreign language | –1.32 | 2.74 | 704 |
| t2.15 t2.16 Interpersonal | individual | Self-management/ self-organization | 0.36 | 1.85 | 703 |
| t2.17 t2.18 | | Multicultural competency/cultural intelligence | –1.27 | 2.41 | 698 |
| t2.19 | | Adaptability and flexibility | 0.12 | 1.93 | 702 |
| t2.20 t2.21 | | Ethical responsibility/integrity/ honesty | 0.71 | 2.08 | 698 |
| t2.22 | Social | Partnership and cooperation | 0.32 | 1.87 | 698 |
| t2.23 | | Team work | 0.46 | 1.90 | 698 |
| t2.24 | | Negotiation skills | –0.08 | 2.30 | 701 |
| t2.25 t2.26 Systemic | Organization | Accountability and decision-making | 0.38 | 1.94 | 702 |
| t2.27 | | Ability to work under pressure | 0.21 | 2.13 | 703 |
| t2.28 | Entrepreneurship | Creativity/creative thinking | –0.18 | 2.29 | 702 |
| t2.29 | | Entrepreneurial capability | –0.81 | 2.39 | 706 |
| t2.30 | Leadership | Initiative/goal-seeking | –0.02 | 2.04 | 704 |
| t2.31 | | Leadership/management skill | –0.33 | 2.44 | 700 |



*systematic thinking* and *critical thinking* (Table 16.3) were more useful in managers and self-employed people, and these skills were particularly useful (even essential) for professionals. *Entrepreneurial capability* was of little use as a competency in all groups whose competencies were viewed as a technical need, except for self-employed people (and, by extension, entrepreneurs), for whom entrepreneurship was a *useful*capability. As we stressed earlier, however, entrepreneurship's utility depends on the ability to promote and leverage different company competencies. Hence, when higher education aims to boost students' CVs with training in entrepreneurship, this training must be accompanied by teaching on the concepts and practices that encourage and recognize competencies as essential tools for entrepreneurship.

**Table 16.3** Competencies by job groups

| Jobs | Self-employed | Managers | Teachers and professionals | Technicians and mid-level professionals | Rest | Total | | |
|---|---|---|---|---|---|---|---|---|
| Number answers | 118 | 110 | 134 | 168 | 180 | 710 | F ratio | P value |
| Ability to communicate effectively | **1.0** | **1.0** | **1.1** | 0.3 | **0.6** | **0.7** | 6.649 | 0.000 |
| Ethical responsibility/integrity/honesty | **1.1** | **1.1** | **1.1** | 0.2 | 0.4 | **0.7** | 7.254 | 0.000 |
| Management capability | **1.0** | **0.9** | 0.3 | 0.5 | 0.3 | ***0.6*** | 4.888 | 0.001 |
| Team work | 0.2 | **0.8** | 0.5 | 0.4 | 0.4 | 0.4 | 1.887 | 0.111 |
| Taking responsibility and decision-making | **0.6** | **1.2** | 0.4 | 0.1 | −0.1 | 0.4 | 8.922 | 0.000 |
| Self-management/self-organization | **0.7** | 0.5 | 0.4 | 0.3 | 0.0 | 0.3 | 3.660 | 0.006 |
| Collaboration and cooperation | 0.3 | 0.3 | 0.5 | 0.1 | 0.3 | 0.3 | 0.654 | 0.624 |
| Ability to find necessary information and discern its relevance | 0.3 | −0.1 | **1.1** | −0.1 | 0.0 | 0.2 | 8.495 | 0.000 |
| Ability to work under pressure | 0.4 | **0.6** | −0.1 | 0.2 | 0.0 | 0.2 | 1.963 | 0.098 |
| Continuous learning | 0.3 | −0.1 | **1.0** | −0.1 | −0.1 | 0.2 | 7.405 | 0.000 |
| Critical thinking | 0.4 | 0.5 | **1.1** | −0.4 | −0.4 | 0.1 | 14.009 | 0.000 |
| Adaptability and flexibility | 0.3 | 0.2 | 0.1 | 0.0 | 0.1 | 0.1 | 0.439 | 0.781 |
| Initiative/goal-seeking | **0.6** | 0.5 | 0.0 | −0.5 | −0.4 | 0.0 | 7.963 | 0.000 |
| Bargaining | 0.4 | **0.9** | −0.4 | −0.3 | −0.7 | −0.1 | 10.713 | 0.000 |
| Ict literacy | 0.1 | −0.7 | 0.3 | 0.0 | −0.4 | −0.1 | 4.732 | 0.001 |
| Creativity/creative thinking | 0.4 | 0.2 | 0.4 | −0.7 | −0.8 | −0.2 | 9.570 | 0.000 |
| Systematic thinking | −0.1 | −0.1 | 0.5 | −0.6 | −0.7 | −0.2 | 8.116 | 0.000 |
| Leadership/management skill | 0.2 | **1.1** | −0.7 | −1.0 | −0.7 | −0.3 | 16.659 | 0.000 |
| Entrepreneurial capability | 0.2 | −0.6 | −0.9 | −1.3 | −1.2 | −0.8 | 8.190 | 0.000 |
| Multicultural competence/cultural intelligence | −1.0 | −0.9 | −0.9 | −1.6 | −1.7 | −1.3 | 4.334 | 0.002 |
| Communication in a foreign language | −1.3 | −0.7 | −0.6 | −1.6 | −2.0 | −1.3 | 7.079 | 0.000 |
| **Average** | **0.3** | **0.3** | **0.2** | **−0.3** | **−0.3** | **0.0** | | |

t4.1 **Table 16.4** Significant
t4.2 differences between means

| Assessment | Values |
|---|---|
| Essential | more than 0.5 |
| Highly useful | 0.0 to 0.5 |
| Useful | –0.5 to 0.0 |
| Unhelpful | –1.0 to –0.5, |
| Useless | less than –1.0 |

## 16.6 Conclusions

In this chapter, we stress the importance of specific competencies, and we then highlight the importance of generic competencies in the second part of the chapter and the empirical study. Generic competencies help with the overall use and application of competencies.

We have shown that competencies can be viewed in three ways. First, competencies are a fundamental part of the idiosyncratic mix that characterizes a company's competitive advantage. Second, they are an indispensable instrument for defining jobs. Third, they constitute transversal skills that can be analysed separately to determine which competencies should be included in education syllabuses to help employees perform their jobs and allow companies to compete. According to this third view, *entrepreneurial capability* constitutes an additional competency in professionals'training. Survey responses (except those of self-employed people) showed that people from several professions did not consider entrepreneurial capability important for their jobs. Nevertheless, these responses may reflect employees' focus on technical issues within each profession. These responses therefore represent values and culture instead of constituting opinions that should determine the future of entrepreneurship teaching in higher education.

As mentioned in the introduction, the question of entrepreneurial capability's relevance in a particular job or profession is quite different from the vision of the entrepreneur as a figure capable of combining all resources and skills within the company (and possessed by its employees) to achieve sustainable competitive advantage. If the entrepreneur is depicted as such a figure, then resources and capabilities, core competencies, and generic and specific competencies constitute the toolbox available to entrepreneurs when they embark on an entrepreneurial undertaking. This chapter presents an overview of the different types of competencies that enable entrepreneurship, where entrepreneurship within business management (*entrepreneurial capability* in Table 16.3) refers to the capability or competency to coordinate and harness the potential of other resources.

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# Chapter 17
# Entrepreneurship in Higher Education as a Horizontal Competence

**Cristina Mesquita, Rui Pedro Lopes, and Kristina Bredis**

**Abstract** The definition of entrepreneurship usually leads us through business and profit-maximizing techniques and attitudes, usually characterizing individuals and company makers. Recently, the use of the term social entrepreneurship has also been gaining popularity, to describe the entrepreneurial activities with the goal of creating social value (Abu-Saifan, Technol Innov Manag Rev: 22–27, 2012; Shane and Venkataraman, Acad Manag Rev 25: 217–226, 2000). Entrepreneurial activity, in its broad definition, is associated to several factors, both external, such as the economy, employability, market opportunities, and internal, such as the personality characteristics of individuals (Zhao, Seibert, and Lumpkin 2010). In fact, specific traits, such as leadership, optimism, perseverance, passion, resilience, creativity, empathy and others, are more easily found in entrepreneurial individuals. Although not usually considered as explicit competences in the curriculum of higher education degrees, these personality traits can be strengthened, and skills can be learned either directly or by specifying horizontal competences in higher education programmes. The training intentionality of higher education institutions is described in the curricular unit forms, which constitute the study plan of current educational programmes. These are rigorously focused on vertical competences, associated to the scientific area of the programme, but they also include horizontal skills, that contribute to empower the student with a broader set of knowledge and abilities. The teaching and learning methodologies, the content of the curricular units and the learning outcomes all describe the training process, which can be analysed to get an overall idea of the intentionality of entrepreneurship training in current educational degrees.



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## 17.1 Introduction

The notion that entrepreneurship is a crucial factor in the development and well-being of societies, has been encouraging universities to introduce related competences in the curriculum of almost all areas and courses (Bellotti et al. 2012; Lans et al. 2014). The interaction with private and public sector partners has been incremented, and offices have been created to help forming new enterprises and foster innovation and economic development. Students have access to specific training, through extra-curricular activities and subjects (Rae et al. 2010). However, entrepreneurship in non-business studies is not yet sufficiently integrated into the curriculum of higher education institutions (European 2008).

Most of these skills are not considered in the curriculum of subjects as explicit competences to build during the graduation. However, these personality traits can also be strengthened, and these skills can be learned either directly or by specifying horizontal competences in higher education courses.

This article examines the existence of intentionality in a higher education institution to promote social entrepreneurship skills. The analysis focused on a Polytechnic Institution offering programmers in several different areas of knowledge. It is an exploratory study that analyzes curricular units in order to understand if the referred learning and teaching strategies and the learning outcomes enable the development of social entrepreneurship skills. Due to number of different curricular units and the amount of text to process, text-mining techniques were used.

The paper is structured in three parts. In the first one we clarify the terminology and present some studies about entrepreneurship and social entrepreneurship. The second part introduces the research methodology, the techniques used and its procedures. In the third part an exploratory analysis is presented. This analysis gives us some evidence on how the higher education institution is developing teaching and learning strategies that enhance social entrepreneurship in their students. To conclude we discuss the implication of this study for research and practices.

## 17.2 Entrepreneurship: Conceptual Approaches

The definition of entrepreneurship is complex. Many authors, in several studies, introduce this concept differently, leading us to a diversified and polysemic concept that should be clarified.

According to Dees (1998), the term entrepreneur originated in French economics in the seventeenth and eighteenth century and it was associated to one who undertakes an activity or a significant project. Later, the term was used to identify the most daring individuals who stimulated economic progress and those who pursued new and better ways of doing things.

Klerk and Kruger (2002) carried out a study based on the conceptions of classical authors, including Cantillon, Say, Marshall and Schumpeter, highlighting their

contributions to clarify the concept of entrepreneurship. In Say's perspective, the entrepreneur has a managerial role. He acts as leader and manager because he plays an important role coordinating production and distribution. Wealth was part of the process and it did not mean that somebody had to suffer. Within this vision, the application of knowledge to create a product for human consumption was within the functions performed by an entrepreneur. According to Say, a country with intelligent merchants, manufacturers and agriculturists, potentially, has more capacity of attaining prosperity (Klerk and Kruger 2002).

In a different perspective, Schumpeter argued that innovation meant doing more with the same resources. This can be seen as an endogenous process. Schumpeter believed entrepreneurship did not only mean management of the firm but, more importantly, leadership of the firm. The entrepreneur, therefore, was responsible for the continuous improvement of the economic system. He is neither a professional, nor a lasting condition. Entrepreneurs do not form a social class, though successful entrepreneurship may lead to certain class positions, according to the way in which the proceeds of the business are used. Schumpeter regarded the entrepreneur as the decision maker in a particular cultural context: entrepreneurship is a temporary position for any person, unless he continues to be innovative (Klerk and Kruger 2002).

### *17.2.1 Entrepreneurship: Contemporary Approaches*

Contemporaneously entrepreneurship has been conceptualized especially in the management area and in the business world. Most of these approaches continue to focus on the classical definitions of Say and Schumpeter, introducing new elements that constantly expand it and makes it a more complex concept.

Concerning this concept, Frank Knight (1921) made some important contributions. He saw the entrepreneur as the contributor of savings to society by bearing all the uncertainty, and taking responsibility for his decisions. Entrepreneurship requires the ability to bear uncertainty as well as the availability of enough capital to support the investment, owed to the owner or to other investors.

Peter Drucker (2007) expands the definition proposed by Say, introducing the idea of opportunity. For the author, an entrepreneur is one who seeks the change, exploring it as an opportunity. Also, Timmons and Spinelli (2004) state that entrepreneurship is opportunity driven, shaped by the market. A good idea is not necessarily a good business opportunity and the underlying market demands determines the potential of the idea. An idea becomes viable only when it remains anchored on products or services that create or add value to customers, and remains attractive, durable, and timely. Timmons and Spinelli (2004) suggest three critical factors of a successful venture, namely, opportunities, teams, and resources. The successful entrepreneur is one that can balance these critical factors.

To Hisrich et al. (2005) the entrepreneur is someone who, by devoting time and effort, creates something new and valuable, both assuming the accompanying

financial, physical and social risks and the monetary rewards and personal satisfaction and independence.

In a study that intended to identify the differences between entrepreneurship management and administration, Howard Stevenson identified several dimensions, and suggested that "Entrepreneurship is the pursuit of opportunity beyond the resources you currently control" (Stevenson 2000). According to the author, this definition takes into account both the individual and the society in which the individual is embedded.

Derived from the definitions and key determinants the entrepreneurial process can be summarize as: innovating and creative, opportunity seeking, risk taking, resources gathering, business creating and growing, and value sharing. However, the definition of entrepreneurship cannot be disassociated from social concerns. Whereas, Stevenson (2000) said that the munificence of resources available for the pursuit of opportunity has never been greater. The capital is perhaps the least unique resource required to pursue opportunity. Intellectual capital, human capital, and public capital in the form of infrastructure and social norms provide even more important resources to the entrepreneur.

The author examined the history and culture in more than 40 countries over the last two decades, identifying some evidences such as:

1. Entrepreneurship flourishes in communities where resources are mobile;
2. Entrepreneurship is greater when successful members of a community reinvest excess capital in the projects of other community members;
3. Entrepreneurship flourishes in communities in which success of other community members is celebrated rather than derided and,
4. Entrepreneurship is greater in communities that see change as positive rather than negative.

This idea highlights the entrepreneurial action as an action that not only focuses on the idea of profit, but also in the development of people and communities.

Some world reports (OECD 2010, 2011; UNDP 2010) have reinforced the idea that people are the real wealth of a nation. This statement makes evident the necessary articulation between economic, human and social development and, also, environmental preservation.

The Human Development Report (UNDP 2010) highlights that "People are the real wealth of a nation", considering, in this sense, that the basic objective of development is to create an enabling environment for people to live long, healthy and creative lives. Although mistaken as a simple truth, it is often forgotten among the immediate concern of accumulating commodities and financial wealth. According to this report the human development is the expansion of people's freedoms to live long, healthy and creative lives; to advance other goals they have reason to value; and to engage actively in shaping development equitably and sustainably on a shared planet. People are both the beneficiaries and drivers of human development, as individuals and in groups. Thus stated, human development has three components: well-being: expanding people's real freedoms so that people can flourish; empowerment and agency: enabling people and groups to act to drive valuable

outcomes and justice: expanding equity, sustaining outcomes over time and respecting human rights and other goals of society.

There are always, although not unconstrained, policy choices. Some contribute to reduce poverty, for respecting human rights and for sustainability. Others favor elites, dismissing freedom of association and depletion of natural resources. Principles of justice need to be explicit to allow the identification of tradeoffs between them, such as with equity and sustainability, so that public debates and decisions are well supported.

Regarding this it is important to develop innovative combinations, with different configurations that achieve the goals of sustainable human development. The OECD Report (OECD 2010) refers that the most urgent challenge for national governments, local authorities, policy makers and economic stakeholders is therefore to help the less well-off adapt to new and changing situations and—more importantly and more generally—to promote sustainable economic and social development so that once the economy has recovered, the benefits can be widely diffused. Social entrepreneurship and social innovation are part of the solution, as they both explicitly aim to provide innovative solutions to unsolved social problems, putting social value creation at the heart of their mission in order to improve individuals' and communities' lives and increase their well-being.

Economic development as a lever for progress in today's society model has led to an appropriation of the concept of entrepreneurship, relating it with the business world, the establishment and development of businesses, and also with the characteristics of the successful businessman.

In the current conjecture focused on overcoming the economic and social crisis, the concepts of entrepreneurship and innovation play a very important role. However, it is increasingly clear that innovation and entrepreneurship require a different perspective of the business model than the one that has been assumed in recent decades. In fact, there are evidences that this model was partly responsible for situations of imbalance, creating economic asymmetries as well as social and environmental problems.

Although economic growth is necessary to overcome the crises that have settled in the world it cannot be achieved at any cost. Development should focus on qualifications, sustainability and inclusion. These will be valuable contributions to the development of democratic societies, to the generation of competitiveness, social cohesion, better jobs, social solidarity and environmental awareness.

Sustainable economic development depends essentially on the process of renewal of individuals and institutions, based on flexibility, innovation, humanization and the existence of entrepreneurs, able to seize opportunities, to act in unpredictable situations and to create economic and social development. This suggests the need to promote different models and solutions, supported by the principle of shared value, which refers to the creation of economic value models that also create an unquestionable value to society. Synergies generated by this complementarity will be positive if the approach takes into account the main challenges and societal needs in a judiciously and innovative way (Costa 2012).

These are the foundations of social entrepreneurship that assumes an increasingly important role in social cohesion promotion, local development, economic and cultural asymmetries reduction and lessen social inequalities. The creation of social value is the inspiration of this type of entrepreneurship, taking as its main objective the improvement of quality of life and the individual and collective well-being. The projects and development opportunities must place at the center of economic activity the ethical values, social justice, the individual and his real needs.

### *17.2.2 Differences between Business Entrepreneurs and Social Entrepreneurs*

Although entrepreneurship is a multifaceted concept there are some consensual aspects among authors that emphasize the peculiar features of the entrepreneur likes his perception of the reality and his attitude among the others. Nevertheless, some authors (Dees 1998; Tavares et al. 2008; Thalhuber 1998) establish some differentiation between business entrepreneurs and social entrepreneurs.

According to Thalhuber (1998) both social and business entrepreneurs have similarities, because both are creating demand, obtaining resources and converting ideas into products and services. They are action-oriented and focused on reality. The biggest difference, according to the author, is the sense of the social entrepreneur who has some special features: focus on long-term gains and a solid organization; profit is a mean, not an end; profit is invested in the organization itself, does not go to the members and generates autonomy for the organization. Serves to help more people, always trying to improve the quality of life for all, as opposed to distributing them among interested parties; develops the ability of their organizations to be responsible for their own destinies and not focus on the priorities of donors.

Dees (1998) refers that for social entrepreneurs, the social mission is explicit and central. This obviously affects how social entrepreneurs perceive and assess opportunities. Mission-related impact becomes the central criterion, not wealth creation. Wealth is just a means to an end for social entrepreneurs. With business entrepreneurs, wealth creation is a way of measuring value creation. This is because business entrepreneurs are subject to market discipline, which determines in large part whether they are creating value. If they do not shift resources to more economically productive uses, they tend to be driven out of business. The author underline that social entrepreneurs play the role of change agents in the social sector, by:

1. Adopting a mission to create and sustain social value (not just private value);
2. Recognizing and relentlessly pursuing new opportunities to serve that mission;
3. Engaging in a process of continuous innovation, adaptation, and learning;
4. Acting boldly without being limited by resources currently in hand, and;
5. Exhibiting a heightened sense of accountability to the constituencies served and for the outcomes created.

In this perspective, social entrepreneurship can occur within the public, private or non-profit sectors, and is in essence a hybrid model involving both for-profit and non-profit activities as well as cross-sectoral collaboration. This conceptualization suggests that social entrepreneurship can take a variety of forms, including innovative not-for-profit ventures, social purpose business ventures (e.g., for-profit community development banks), and hybrid organizations mixing for-profit and not-for-profit activities (e.g., homeless shelters that start small businesses to train and employ their residents) (Dees 1998).

For Thompson (2002) there are some differences between the locus of social and business entrepreneurship. The author argues that social entrepreneurship exists primarily in the non-profit sector. Many define social entrepreneurship as bringing business expertise and market-based skills to the non-profit sector in order to help this sector become more efficient in providing and delivering these services.

Table 17.1 provides a comparison of the features of a social and a business entrepreneur as well as some of their differences, resulting from several authors' contributions.

The study of Tavares et al. (2008) that aimed to identify the differences between the characteristics of social and business entrepreneurs, highlight some important points. About measuring performance and return, the authors verified that the social entrepreneur measures the benefit based on improving the community's quality of life, i.e. solving social problems, while the business entrepreneur measures his return in the economy, based on financial results which usually shows the success of the project, that is, the prevailing pursuit of profit and increased sales and return on investment. The study also identified that the two types of entrepreneurs work for the community and society. Social entrepreneurs work directly with the company seeking to improve the quality of life of the poorest people and business entrepreneurs believe that through their business create jobs, paying wages and taxes, and thus collaborate with society. In addition, it was observed that both enjoy working with people and like to lead, care about the people they work with and seek through training and guidance to help develop their employees and volunteers.



**Table 17.1** Differences between Business entrepreneurs and Social entrepreneurs

| Business entrepreneurs | Social entrepreneurs |
|---|---|
| Force is personal experience, knowledge and energy | Force is collective wisdom and experience organizations |
| Focus on financial terms gains | Focus on building long terms of organizational capacity |
| No limits on the type or freedom of ideas | Ideas based on the organization are in mission and competence center |
| Profit is an end goal | Profit is a profit pocketed meaning and / or distributed |
| Risk individuals and or financier in assets | Risks organizational assets, image and public belief |

*Source*: Tavares et al. (2008)

Having considered the relevance of entrepreneurship in our society, it is important to know what kinds of concerns are taken into account when training young people in higher education.

### *17.2.3 Social Entrepreneurship in Higher Education*

As we referred above, it is recognized that skills and human capital have become the backbone of economic prosperity and social well-being in the twenty-first century (OECD 2012). In this sense, higher education represents a critical factor for innovation and human capital development, playing a central role in the success and sustainability of the knowledge economy.

Besides educating students for an occupation, higher education institutions must also educate responsible citizens. This perspective is assumed in the European Union 2020 strategy, highlighting the need to embed creativity, innovation and entrepreneurship in education. That report underlines the importance of stimulating the entrepreneurial mindsets of young people and encourages the development of a positive societal climate for entrepreneurship (European Commission 2012).

Higher Education has, in this scope an important role to play improving the entrepreneurial key competence of students. According to UE 'Entrepreneurship and a sense of initiative' is one of eight key competences for lifelong learning which citizens require for their personal fulfilment, social inclusion, active citizenship and employability in a knowledge-based society'.

We believe that higher education institutions are valuing in its programs knowledge and entrepreneurial skills. However, the development of entrepreneurial skills should be viewed holistically and comprehensively. On one hand, entrepreneurship connects the knowledge, skills, dispositions and attitudes and has implicit a strong ideological component. On the other hand, these skills supported on ethical, social and human values are transversal to all forms of knowledge and human action.

There are several teaching-learning strategies that can help students to developed entrepreneurial skills such as: experiential learning activities, communication technics, case discussions, group exercises, roleplaying games, brainstorming, critical discussion about social, environmental or cultural problems. Although, Todorovic (2004) argues that entrepreneurship (thus its social element as well) is a field that needs the development of a dynamic component in addition to its theoretical basis. A dynamic component can be seen as an educational context that is affected by student activity and it is likely to grow in conjunction with the "real-world" environment. This component could be then presented in the classroom in a way that reflects the "real world".

The study of Wessel and Godshalk (2004) focuses on the importance of incorporating social entrepreneurship in higher education, mentioning that effective learning requires context through application and experience. The authors argue that service learning reconnects a university's resources with the needs of a community while providing students with a valuable leaning experience. Different studies cited

by the authors' highlights that this kind of learning provides skill development in conflict resolution, communication, role clarification, goal setting, positive relationships, collaborative participations, and projects management.

However the development of these methodologies, whether developed in classroom context or in organizational context, can only have a significant impact if it could generate the students commitment with social values, respect with others and with the environment, ethical behaviour, and also sense of accountability. The basic question is not how much socially entrepreneurial activity is developed in higher education but how it can be positively explored with among educational communities.

## 17.3 Methodology

Higher Education Institutions (HEI) have three primary missions: education, research and cooperation (Kyvik and Lepori 2010), which institutions pursue to contribute for population education at high level, scientific and technological advances and economic and social development. Concerning education, the Bologna Process was completely implemented in Portugal until 2009/2010 (Neave and Amaral 2012), defining 3 study cycles.

Research conducted in recent years has been revealing many interesting aspects of social entrepreneurs and their initiatives, as well as about the role of the Higher Education Institutions in the training process of social entrepreneurship skills. According to several authors cited in the theoretical background, higher education must provide adequate young people training approaches and techniques able of empowering them to act with social values, improving quality of live, social and economic development and the individual and collective well-being.

With this study, our objective was to assess if higher education training include teaching and learning methodologies that could contribute to strengthen social entrepreneurship characteristics in the students. It was performed in a Portuguese higher education public institution with first and second cycle programmes in a wide area of knowledge and technology. In total, the educational offer includes over 40 degrees and 30 masters in agriculture sciences, arts and sports, education and teachers' training, informatics and engineering, administration and management, health, communication and tourism. It is a medium to high size institution, with over 7000 students and 500 teachers, representing a diverse environment of subjects, scientific areas and pedagogical methodologies.

We started by collecting all the curricular units forms (CUFs) in a single database, to simplify the access, analysis and correlation of information within them. We then pre-processed the information, by removing repeated forms, building a dictionary of terms, eliminating irrelevant words and minimizing the number of different words, through reduction of inflectional form of the words.

After this initial step, we performed a histogram of different terms, in both the learning and teaching methodologies and in the learning outcomes fields, to assess

the most frequent terms. This would uncover potential patterns in terms of usage of specific terms. For each term we registered the number of times it appeared in all the CUFs. Due to the huge amount of different terms, many of them with little usage, we define the most important terms according to the 99th percentile. This records the list of terms occurring in 99 % of the CUFs.

Based on these terms, we proceeded to checking for the existence of patterns per scientific area of the curricular unit and per degree. For this, we built a heat map, crossing the term and the area/degree. The dark areas show terms with higher usage.

Finally, we identified and assessed the existence of terms, and combination of terms, associated with entrepreneurship and social entrepreneurship. This was performed based on bibliography and confirmed by an exploratory reading of a sample of CUFs. This allowed us to calculate the percentage of curricular units that show any form of learning/teaching methodologies, learning outcomes specific to building entrepreneurship and social entrepreneurship characteristics in students. Due to number of different CUFs and the huge amount of text to process, we used text mining techniques.

### *17.3.1 Text Mining*

The way we work and live has been shaped by the advances of technology. As devices become smaller, they tend to be with us anywhere, anytime. The storage, processing capacity, autonomy has been constantly increasing, which makes us less afraid of relying on their functionality and on keeping including them in our daily routine.

These omnipresent devices make it easy to save things previously discarded. Our decisions, holiday pictures, documents, supermarket choices, walking tours are all registered in the devices and uploaded for future reference to the huge information repository in clouds everywhere. The generation of data is growing much faster than our capacity to understand it.

Behind all this data there is potentially useful information, rarely uncovered or taken advantage of. In this context, information is usually hidden in patterns that can be uncovered by computational methods. These use artificial intelligence, machine learning algorithms, statistics and others to extract a structure from large data sets. Data mining tools and techniques are used to extract valuable gems buried under this huge amount of data.

Text is an expression of data. Text organizes letters in words and words in phrases, conveying information that can be stored, transmitted and read. Just like generic data, a huge amount of text can be difficult to interpret and to extract useful information from it. In this context, patterns can also arise from the analysis of text, through the use of similar tools and algorithms. These involve information retrieval, lexical analysis, pattern recognition, tagging, natural language processing and many others. Just like with generic data, text mining allows highlighting useful information in huge amounts of text.

On of the simplest technique, information retrieval, for example, allows finding documents of unstructured nature that satisfies some criteria among a large collection. Natural language processing, on the other hand, aims at allowing computers to derive meaning from natural language, usually in written format. This can involve identifying the category of words (part-of-speech tagging), recognizing entities (named entity recognition) or others.

In the simplest form, text mining depends on determining the vocabulary of terms. Text is split in tokens, eventually dropping symbols, accentuation or other characters. Moreover, some extremely common words may be of little value and can also be excluded from the analysis (stop words removal). After extracting the relevant tokens, they can be normalized, through the substitution of different words by a common term (for example, normalizing the words *John* and *JOHN* to *john* or *car* and *automobile* to *car*).

Finally, words can also be replaced by a base form, to reduce the diversity but maintaining their meaning. As an example, verb tenses can be replaced by the infinitive form (replacing *am*, *was*, *is* by *be*, for example) or removing the ends of words (replacing *different* and *differentiation* by differ, for example).

### *17.3.2 Curricular Units*

Higher education degrees are defined around a specific study plan, describing the curricular units (CUs) and all the associated details. The CUs are structured in scientific areas that contribute, in a given percentage, to the study plan. Usually, the most representative scientific area is also the main programme area. For example, an informatics degree can have seven areas, such as automation and robotics (4 %), computer engineering (35 %), computing sciences (25 %), information systems (10 %), mathematics (20 %), physics (3 %) and signal processing (3 %).

The structure and purpose of the CUs are described in a specific form, the curricular unit form, which contains the identification of the unit (name, degree, year of study, field of study, lecturers' name, and others) and the details of the learning process (learning outcomes, contents, teaching and learning methods, assessment methodology and bibliography). The CUF is of the responsibility of the lecturer and is scientifically reviewed by the department director and regulated by the programme director. The later focus, specially, in the teaching and learning methods, the content and the assessment methodology. Moreover, the CUFs are finally reviewed by the pedagogical council president and the faculty director.

This process ensures a quality control on the scientific and pedagogical aspects of students training, as well as enforcing the institution's policies.

The institution has a total of 44 degrees and 36 masters, with a total of 2645 curricular units. All the curricular units forms are available online in the ECTS guide web site[1] in PDF format. The web site is structured in a hierarchy, starting with the

[1] http://www.ipb.pt/go/d987

cycle of study (degree or master), followed by the list of programmes and, finally, the list of CUs in each programme. In the analysis we only considered higher education study cycles (bachelor and master). The forms were retrieved and the information was stored in a relational database, to provide more flexibility and speed in the analysis process. The fields where stored in a single table, with 11 columns (Table 17.2).

The CU information was pre-processed and indexed and duplicate rows removed, to reduce the bias. After removal, 2143 CUFs remained.

The ID, ANO_LECT, ANO, ESCOLA, UC, CICLO, AREA_CIENT and CURSO were kept unchanged, since the terms they hold should not change. They provide attributes specific to the structure of the programme. The fields RESULTADOS_APRENDIZAGEM, CONTEUDO_UC and METODOS_ENSINO where processed according to the following workflow:

1. The text was split into tokens
2. Words where removed according to the following stop list: *a*, *an*, *and*, *are*, *as*, *at*, *be*, *but*, *by*, *for*, *if*, *in*, *into*, *is*, *it*, *no*, *not*, *of*, *on*, *or*, *such*, *that*, *the*, *their*, *then*, *there*, *these*, *they*, *this*, *to*, *was*, *will*, *with*
3. Words were changed, to reduce the inflectional forms, using the Porter Stemming Algorithm (Porter 1997)
4. Finally, the contents of these four fields were indexed to improve speed and flexibility in the analysis

After the pre-processing we started analyzing the text. First, we calculated the frequency of terms in the METODOS_ENSINO field (teaching and learning methods) and in the RESULTADOS_APRENDIZAGEM (learning outcomes). We then built a heat map of term frequency to the area, to identify possible concentration of terms. Finally, we proceeded to correlate the expressions related to the entrepreneurship characteristics in the METODOS_ENSINO.

Entrepreneurship characterizes the perception of the reality and the attitude of individuals towards others. These pose a strong focus on the effect the individual

**Table 17.2** Structure of the database holding the curricular units forms

| Column name | Description |
|---|---|
| ID | The table primary key |
| ANO_LECT | The year of study |
| ANO | The school year |
| ESCOLA | The name of the school |
| AREA_CIENT | The scientific area of the curricular unit |
| UC | The name of the curricular unit |
| CICLO | The study cycle (BSc or MSc) |
| CURSO | The name of the programme |
| RESULTADOS_APRENDIZAGEM | The learning outcomes |
| CONTEUDO_UC | The curricular unit content |
| METODOS_ENSINO | The teaching and learning methodologies |

t3.1 **Table 17.3** Teaching and
t3.2 learning methodologies that
t3.3 stimulate entrepreneurship

| Entrepreneurship | Social entrepreneurship |
|---|---|
| Roleplaying | Society |
| Work group | Democracy |
| Supervision | Deontological |
| Project | Ecology |
| Practical training | Empathy |
| Oral | Ethics |
| Internship | Freedom |
| Critical discussion | Justice |
| Case | Respect |
| Brainstorming | Social problems |

causes on others and on the society. It is not easy to describe an entrepreneur based on a set of skills and on the learning outcomes and teaching methods that can foster these attitudes. However, there are some learning and teaching methods that can contribute to stimulate or promote these attitudes (Table 17.3).

Experiences that contribute to create innovative situations, design projects, plan and redefine strategies, interpret new situations clearly contribute to a positive attitude towards proactivity. Moreover, working collaboratively, gaining communication skills and learning in professional context (project, internship, supervision) can also provide proper learning experiences towards entrepreneurship.

This kind of learning experiences can appear in curricular units of any scientific area and of any programme, thus complementing the specific and technological knowledge with an entrepreneurial attitude.

These terms were combined to extract the number of CUFs in which they appear. Initially we assessed the CUFs referring any conjunction of entrepreneurship terms:

```
("Roleplaying" OR "Work group" OR "Supervision" OR "Project" OR "Practical training" OR "Oral" OR "Internship" OR "Critical discussion" OR "Case" OR "Brainstorming")
```

After, we extracted the number of CUFs containing the intersection of both columns:

```
("Roleplaying" OR "Work group" OR "Supervision" OR "Project" OR "Practical training" OR "Oral" OR "Internship" OR "Critical discussion" OR "Case" OR "Brainstorming")
AND ("Society" OR "Democracy" OR "Deontological" OR "Ecology" OR "Empathy" OR "Ethics" OR "Freedom" OR "Justice" OR "Respect" OR "Social problems")
```

### *17.3.3 Analysis*

The analysis procedure derives from the methodology we followed in this study. After eliminating repeated CUFs and reducing the terms' inflectional forms, we built a histogram of all the terms in the learning and teaching methodologies and in

the learning outcomes. We then looked for patterns of term usage according to CU area and programme. Finally, we combined terms related to entrepreneurship and social entrepreneurship to assess the number of CUFs which contains them.

#### 17.3.3.1 Terms Used in Curricular Units Characterization

Learning outcomes specify what learners will be able to do as a result of a learning activity (Phillips 2009). The statement should contain three elements, describing who is to perform, what action they are to take and the result that must come from their action. Learning outcomes should also refer to an observable and measurable performance, so action verbs are used to describe what students should be able to do at the end of the session, course or degree programme. However, some verbs describe actions that are unclear or difficult to interpret and should be avoided (for example: know, understand, learn).

The learning process in higher education is rooted in traditional methods, in which the teacher assumes the role of an expert, transmitting knowledge to students (McKimm and Jollie 2007). In addition, other methods are used, such as seminar, laboratory training and practical training, field study, course project, theses and others. There is no single method that can be applied in all situations. The teacher has to use different methods or even a combination of methods.

A total of 1818 different terms appear in the METODOS_ENSINO field of all the 2143 curricular units forms. Of this, 20 are on the 99th percentile (Fig. 17.1). This means that the terms in the horizontal axis appear in almost all the analyzed CUFs.

Phrases such as "classes of theory and practice", "laboratory practice", "laboratory work using educational and scientific laboratory equipment" are common,

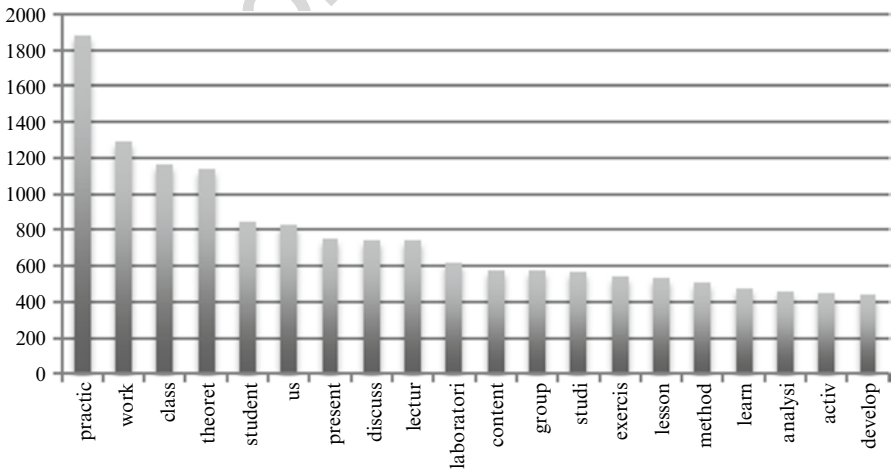


**Fig. 17.1** Most frequent term in the teaching and learning methodologies (99th percentile)

demonstrating the combination of theoretical and practical classes, traditional in higher education. It is also common to find phrases revealing student-centered methodologies, such as “discussion of cases”, “group work”, “text analysis”.

The same analysis was performed on RESULTADOS_APRENDIZAGEM (the learning outcomes field), revealing 44 terms in the 99th percentile (Fig. 17.2). Some examples include “know and understand the energy systems”, “identify the literary and artistic movement of the periods mentioned”, “apply knowledge, tools and techniques necessary for the development and management of a project”, “identify and implement inheritance between classes and establish class hierarchies”.

We proceeded to building a heat map of the learning outcomes terms to assess the distribution through the curricular unit areas (Fig. 17.3). The terms are the most frequent, all belonging to the 99th percentile, as shown above. They are in the vertical axis, in descending frequency order, which explains the higher concentration of color in the top of the figure. In general, there is no evidence of a concentration of terms on a specific area. However, the areas of the Biology, Mathematics and Nursing show extensive and transversal usage of many terms. Biology has always been a field of study demanding strong theoretical concepts complemented by field and laboratory work. Nursing is based on a rigorous practical training process, through formal internship. Finally, the curricular units of the mathematics area have extensive description of the learning outcomes.

The same exercise applied to the programme reveals a similar result. The terms are distributed through all the programmes, although Agroecology, Sports and Management show more usage (Fig. 17.4).

According to the above analysis, the organization of CUFs can benefit from a reflection on the effects of the learning outcomes and on the teaching and learning methods. Different subjects and different areas can benefit either from using diverse methods, as well as from using more measurable learning outcomes.



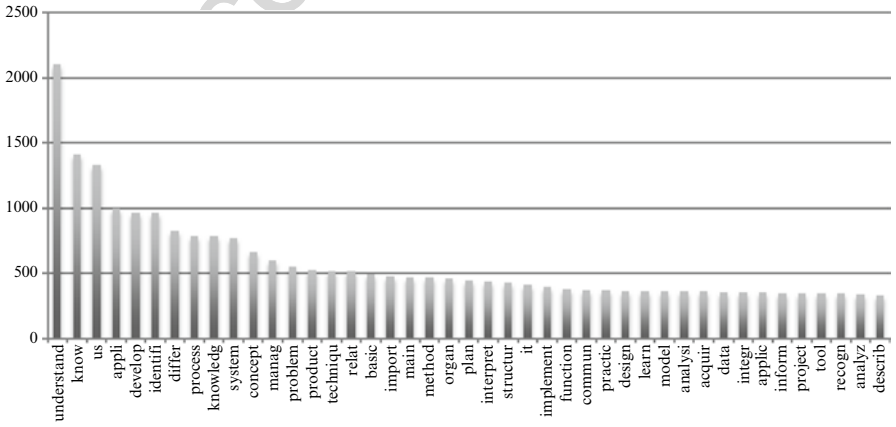


**Fig. 17.2** Most frequent terms in the learning outcomes (99th percentile)

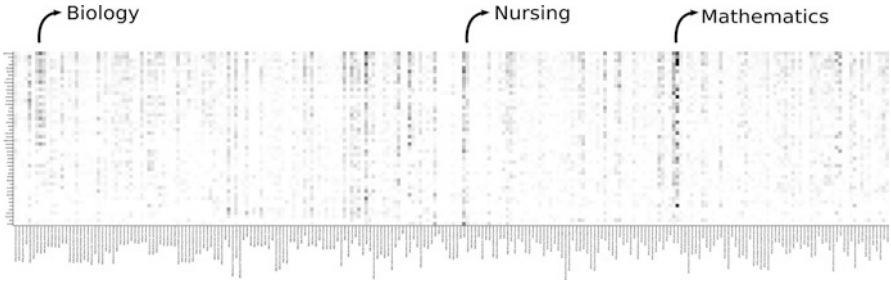


**Fig. 17.3** Heat map of the most frequent learning outcomes terms vs. the scientific area

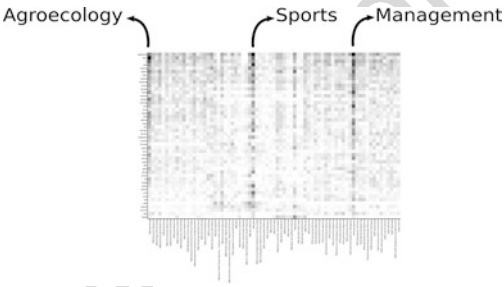


**Fig. 17.4** Heat map of the most frequent learning outcomes terms vs. the programme



### 17.3.3.2 Analysis of Entrepreneurship as Horizontal Competences

To be able to measure the existence of terms related to entrepreneurship and social entrepreneurship, we first defined the relevant terms. We then narrowed the list to the 10 most relevant terms. As explained above, we performed a conjunction of terms and registered the number of CUFs:

```
("Roleplaying" OR "Work group" OR "Supervision" OR "Project" OR "Practical training" OR "Oral" OR "Internship" OR "Critical discussion" OR "Case" OR "Brainstorming")
```

Of the 2143 CUFs, we retrieved 792 results, having, at least one of the entrepreneurship related terms. This means that 37 % of all the curricular units have learning experiences or learning outcomes that require building an attitude towards proactiveness.

We then further contextualized the focus of entrepreneurial learning experiences, to get an idea of the importance social entrepreneurship has:

```
("Roleplaying" OR "Work group" OR "Supervision" OR "Project" OR "Practical training" OR "Oral" OR "Internship" OR "Critical discussion" OR "Case" OR "Brainstorming")
AND ("Society" OR "Democracy" OR "Deontological" OR "Ecology" OR "Empathy" OR "Ethics" OR "Freedom" OR "Justice" OR "Respect" OR "Social problems")
```

After analyzing the content of the CUFs, we managed to identify the ones that also contain terms that contextualize social conscientiousness. In total, there are 149 documents that include any one of these terms. This represents 18 % of curricular units, a percentage that although showing that there is a focus in social entrepreneurship, it also can be much more developed.

## 17.4 Conclusions

Considering the importance of entrepreneurship and the complexity surrounding its definition, it can be argued that entrepreneurs can make valuable contributions to improve several aspects of the society. In fact, although business entrepreneurship has been gaining relevance as a potential solution to crises situations, the pursuit of social entrepreneurship orientation in an organization is, perhaps, the most vital step towards economic and social growth.

Higher education institutions, either by government recommendation or by economy and market demand, have been adapting the educational offer with entrepreneurship orientation. Usually business driven, the curricular units and extracurricular training have been providing support to the creation of small and medium size enterprises as well as stimulating innovation. However, little has been done concerning social entrepreneurship.

Higher education can be supportive in enhancing social entrepreneurship as long as the attitude within is also developed. Some programmes related to health (nursing, gerontology), education (social education) or environment (environmental education, forest engineering) already provide this focus. However, other programmes do not have include the principles of social entrepreneurship. Higher education institutions, lecturers, students, can benefit from specific actions towards increasing the knowledge of the learning process as well as stimulating the attitude towards social entrepreneurship.

There is an opportunity for higher educations institutions to incorporate social entrepreneurship into the classroom. In our perspective it is important to emphasize that social entrepreneurship is relevant for the training of all students, independently of their study areas. The inclusion of a specific topic in the existing programmes, such as organizational behavior, business environment, law, engineering could provide valuable insight dedicated to social entrepreneurship. Alternatively, a course dedicated to this subject could also be developed and integrated. Finally, social entrepreneurship may also be offered as extracurricular activities in the form of lecture series, non-credit courses, special studies symposia, and networking organizations.

This type of training should be designed in coordination, not just for one programme but also for programmes in different areas. This effort would require a constant and constructive dialogue between teachers of different areas, articulating knowledge, concerns and creating sustained innovation, economic and social value.

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[AU3] [AU4]

# Author Queries

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