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# Teaching entrepreneurship students to become knowledge-agents for innovation

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for innovation**

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## **Teaching entrepreneurship students to become knowledge-agents for innovation**

### **ABSTRACT**

Drucker (1985) has postulated that entrepreneurship is the 'practice of innovation'. As such, he has outlined that it is knowledge-based, and that like any other practice (such as medicine or engineering) it can be learned. He wrote that we cannot develop a theory of innovation. But and that it is sufficient to say when, where, and how to look for innovation opportunities. As a consequence of the lack of a theoretical base for innovation, Drucker (and most other authors) simply ignore how entrepreneurs 'practice innovation' and how this practice can be learned; and have concentrated instead on how to systematically look for innovation opportunities. The constant demand by entrepreneurship students for information about how to learn the 'practice of innovation' forced me (Degen 1989, 2009) to develop some rudimentary approaches to learning the practice. This paper builds on these approaches, and tries to shed some additional light on the way entrepreneurs learn the 'practice of innovation' in such a way that they become 'knowledge agents for innovation'. This paper also explores how this practice can be taught to entrepreneurship students.

**Keywords:** entrepreneurs as innovators, practice of innovation, knowledge-agents for innovation, creative process, teaching entrepreneurship

## Introduction

Peter Drucker (1985) in his book *Innovation and Entrepreneurship* has outlined an approach to entrepreneurship as the practice driven of innovation:

Entrepreneurship is neither a science nor an art. It is a practice. It is a knowledge base... but as in all practices, medicine, for instance, or engineering, knowledge in entrepreneurship is a means to an end. Indeed what constitutes knowledge in a practice is largely defined by the end, that is, by the practice... innovation is the specific tool of entrepreneurship, the means by which they exploit change as an opportunity for a different business or a different service. It is capable of being presented as a discipline, capable of being learned, capable of being practiced (p. viii).

This has led him to conclude that "Entrepreneurs innovate. Innovation is the specific instrument of entrepreneurship" (p. 30).

In this writing, Drucker has echoed the thinking of the dean of the modern scholars on entrepreneurship, Joseph Schumpeter, who in 1934 introduced the notion of the entrepreneur as innovator. Schumpeter (Harbison & Myers, 1959) wrote that "everyone is an entrepreneur only when he actually 'carries out new combinations', and loses that character as soon as he has built up this business" (p. 18). He has suggested that the entrepreneur is motivated by creativity, "the joy of creating, of getting things done" (p. 18). Schumpeter has identified the entrepreneur as the indispensable motivating force that spurs economic growth, and has formulated their role as *agents of creative destruction* (1942).

If we accept Schumpeter's proposition that entrepreneurs are innovators, or agents of creative destruction, and Drucker's interpretation of entrepreneurship as a knowledge-based practice that can be learned, we can infer that entrepreneurs are *intrinsically motivated* (Jensen, 2008, p. 118) to enhance their specific knowledge, by creating mental perceptual maps of the personal and intellectual meanings for certain experiences that interact in their spatial memory, and thereby creating more knowledge. This specific knowledge allows them to break boundaries, and to go beyond the standard frames of reference (Caine & Caine, 1991). This intrinsic motivation to accumulate knowledge in a specific field of interest makes entrepreneurs knowledge-agents for innovation in their field. Consequently, students who desire to become entrepreneurs have to learn the how to accumulate the necessary knowledge in a specific field so to become knowledge-agents for innovation in this field.

Curiously, Drucker (1985), having stated that innovation is a practice that can be learned, wrote that:

We cannot yet develop a theory of innovation. But we already know enough to say when, where, and how one looks systematically for innovative opportunities, and how one judges the chances for their success or the risks of their failures. We know enough to develop, through still only in outline form, the practice of innovation (p. 34).

As a consequence of the lack of a theoretical base for innovation, Drucker and other authors (such as von Hippel (1995) and Utterback (1996) from the MIT, and Christensen (1997) from Harvard: to name a few classic authors) have simply ignored how entrepreneurs practice innovation, and how this practice can be learned. They have instead based their work on ways to systematically look for innovative opportunities. Most existing textbooks on entrepreneurship (c.f. Timmons & Spinelli (2004), Hisrich, Peters & Shepherd (2006), Baron & Shane (2008), and Bygrave & Zacharakis (2008)) have followed the same approach: concentrating on how one evaluates the chances for the success or the risk of failure of innovative opportunities, and how to build a successful business based on one such innovative opportunity. None of these adequately addresses the practice of innovation that entrepreneurs are supposed to perform.

A notable exception is Verganti (2009), who has attempted to describe the practice of innovation and how it is learned. He has argued that the capacity of an individual such as Steve Jobs (of Apple) to innovate, and create radical innovations (like the iPod, iPhone and iPad) lies in their *personal culture*. Verganti describes Jobs' practice as follows:

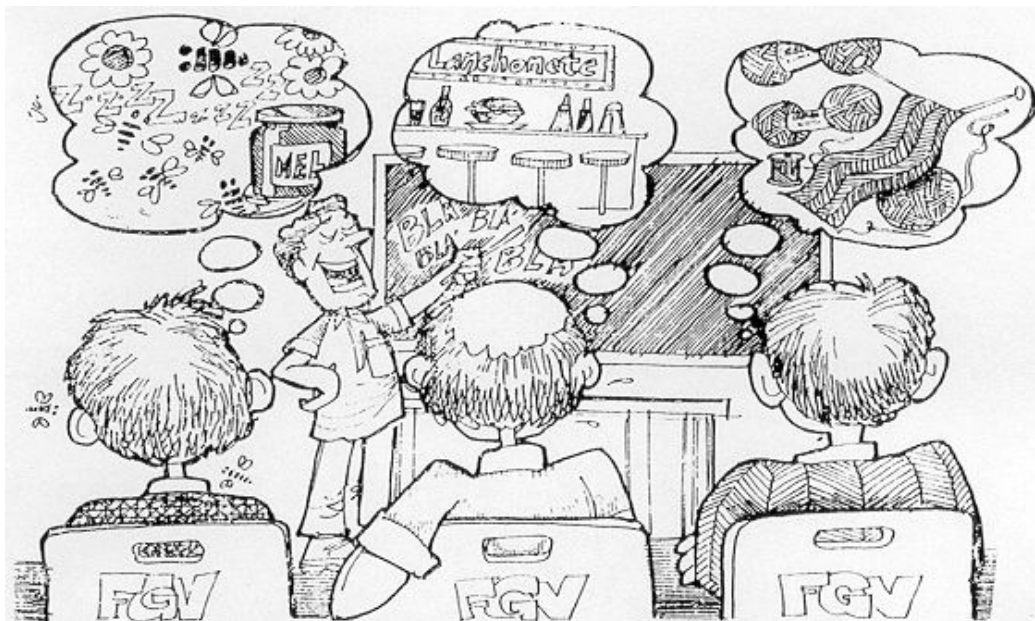
It reflects his own vision about why people do things, about how values, norms, beliefs, and aspirations could evolve, and also about how they should evolve. It is a culture build from years of immersion in social exploration, experiments, and relationships in both private and corporate settings (p. viii-ix).

Verganti has provided many examples of entrepreneurs that practice innovation based on their personal culture, but does not explain how these people have learned this practice. His only explanation for the personal culture of the Italian entrepreneurs that may have led them practice innovation is that the primary and secondary education in Italy that has been sharply focused on humanities, making culture an essential part of the personality of these entrepreneurs.

The request for methods for learning the practice of innovation has been raised directly or indirectly in all classes and conferences on

entrepreneurship to graduate students that I have given over the last 30 years (Degen 1989, 2009). This constant demand by the students has forced me to develop some rudimentary explanations of how entrepreneurs learn the practice of innovation (Figure 1). This paper builds on these answers, tries to shed some additional light on how entrepreneurs learn the 'practice of innovation', and how this practice can be taught to entrepreneurship students.

**Figure 1.** Teaching entrepreneurship students to 'practice innovation'



Adapted from Degen, R. J. (1989). *O Empreendedor: Fundamentos da Iniciativa Empresarial* [The Entrepreneur: Fundamentals of Free Enterprise]. São Paulo: McGraw Hill.

### **Who is an Entrepreneur?**

Schumpeter (1978, p. 72) has clearly characterized entrepreneurs as innovators or agents of creative destruction that lose this agency as soon as they build up their businesses ventures and become investors and managers of their businesses. Drucker (1985, p. viii) has expanded Schumpeter's characterization, and defined entrepreneurs as those who practice innovation, where this practice is knowledge-based. Drucker has identified that to acquire the practice of entrepreneurship, students have to be intrinsically motivated to enhance their knowledge in a specific field and thereby become knowledge-agents for innovation in their field of interest.

Acquiring knowledge is not an easy task, and entrepreneurship students need to feel adequately challenged by the expected outcome to sustain the generally difficult and sometimes lengthy learning process in their specific field of interest. They need to be intrinsically motivated by the expected outcome to live the necessary experiences that build up their knowledgebase so that they can practice innovation. If the process of becoming an entrepreneur according to Schumpeter and Drucker's concept was easy, everybody could practice innovation.

Drucker has written that everybody can learn the practice of innovation (1985), and although this is arguably true, not everybody has the necessary intrinsic motivation to become an entrepreneur. David McClelland (1999) has explained that depending on the *need for achievement* (N-Ach) of an individual, he or she may either have (or lack) the necessary intrinsic motivation to undertake the hard task of acquiring the necessary knowledgebase to practice innovation. Thus, N-Ach refers to the individual's desire for significant accomplishments. Those people high in N-Ach are characterized by a strong tendency to seek challenges and a high degree of independence. Their reward is the recognition of their achievement. On the other hand, those individuals with low N-Ach tend to prefer easy tasks that are not very challenging, in order to minimize the risk of failure. They normally prefer the relative security and predictability of a career in a corporation than the challenge of starting a new business venture.

Another characteristic that entrepreneurship students have to acquire is *effectual reasoning*. This term is defined by Sarasvathy (2001):

The word 'effectual' is the inverse of 'causal'... Causal rationality begins with a pre-determined goal and a given set of means, and seeks to identify the optimal – fastest, cheapest, most efficient, etc. – alternative to achieve the given goal... Effectual reasoning, however, does not begin with a specific goal. Instead, it begins with a given set of means and allows goals to emerge contingently over time from the varied imagination and diverse aspirations of the founder (entrepreneur) and the people they interact with... While both causal and effectual reasoning call for domain-specific skills and training, effectual reasoning demands something more – imagination, spontaneity, risk-taking, and salesmanship (p. 2).

Entrepreneurs as innovators or agents of creative destruction are in essence the *unreasonable man* or *nonconformist* described by Bernard Shaw (1934): "The reasonable man adapts himself to the world: the unreasonable one persists in trying to adapt the world to himself. Therefore



all progress depends on the unreasonable man". The entrepreneur is, in this sense, a nonconformist who constantly promotes change.

There are, as outlined in Figure 2, five characteristics of entrepreneurs: agent of creative destruction, practices innovation, needs achievement, effectual reasoning, and nonconformist. These characteristics can easily be assimilated by entrepreneurship students: all that is needed is the right challenge to induce the intrinsic motivation (or N-Ach), and from this, to gain experience, accumulate the necessary knowledgebase to practice innovation, and then to become successful entrepreneurs.

**Figure 2.** Some characteristics of entrepreneurs

- **Agent of Creative Destruction**  
Joseph A. Schumpeter (1934)
- **Practices Innovation**  
Peter F. Drucker (1985)
- **Need for Achievement (N -Ach)**  
David C. McClelland (1962)
- **Effectual reasoning**  
Saras D. Sarasvathy (2001)
- **Nonconformist**  
G. Bernard Shaw (1903)

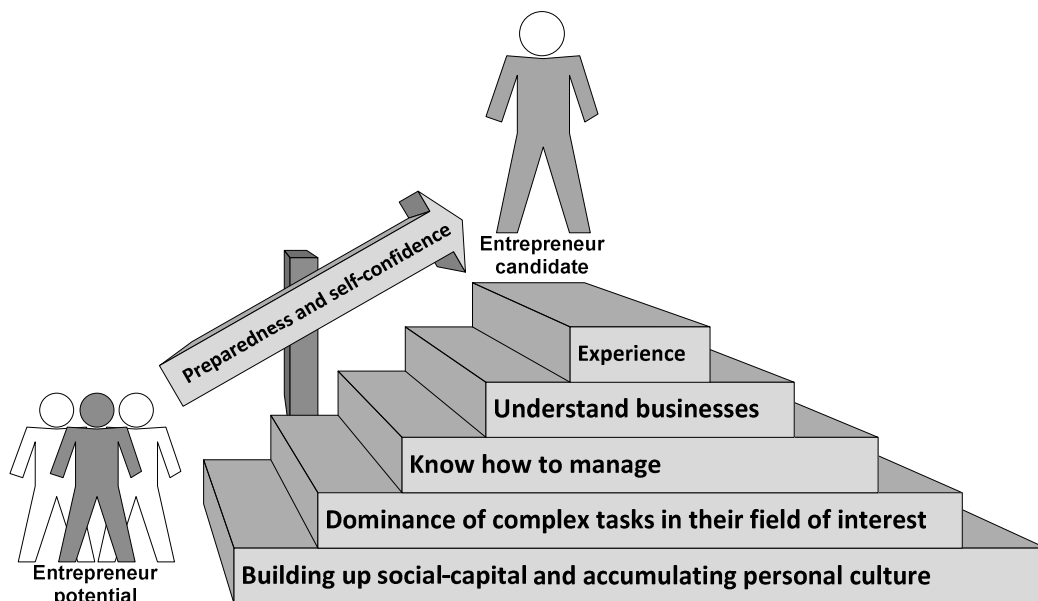
In this paper, the definitions of *entrepreneurship* and *innovation* follow the approaches advocated by both Schumpeter and Drucker wherein Entrepreneurs are innovators that start new business ventures, and by doing so create a new value proposition. Entrepreneurs either create new markets or reshape existing ones. After they have commenced their new business ventures, they may continue practicing innovation or become managers of their business. Most entrepreneurs continue practicing innovation, and if this is not possible in their business they sell-out and start a new business venture. Historically, the approach of Steve Jobs history reflects this; he left *Apple* because he wanted to continue practicing innovation, which went against the perception of his company's board under John Sculley, who focused on efficiency instead of creativity. Jobs returned when *Apple* needed him to practice innovation again.

### Acquiring Knowledge

John Dewey, in *Experience and Education* (1998, first published in 1938), has suggested that knowledge (or learning) is acquired by processing experience. However, his research is accompanied with the warning that not all experiences are equally effective in promoting knowledge, and that the central problem in acquiring knowledge is to select present experiences that will remain fruitful and assist creatively in future experiences. This means that entrepreneurship students have to carefully choose their specific field of interest and start building up their experience in this field, to acquire the appropriate personal knowledgebase. This is the same process as acquiring the personal knowledgebase to practice other disciplines, such as medicine or engineering (Drucker, 1985, p. viii).

Every future entrepreneur or entrepreneurship student, from day one of their lives, begins to acquire knowledge. They start by building up their social-capital (shared norms or values that promote social cooperation) and accumulating a personal culture. They learn at school how to dominate complex tasks in their field of interest, how to manage others, how to understand business, how to manage others, how to understand business, and how to gain experience (Figure 3).

**Figure 3.** Entrepreneurship candidates acquiring knowledge



Adapted from Degen, R. J. (1989). *O Empreendedor: Fundamentos da Iniciativa Empresarial* [The Entrepreneur: Fundamentals of Free Enterprise]. São Paulo: McGraw Hill (p. 20).

Some students, during their university courses, are intrinsically motivated to acquire knowledge in a specific field of interest to such an extent that this allows them to practice innovation before even graduating. An example is the case of *Google*, which began in March 1996 as a research project by Larry Page and Sergey Brin, both Ph. D. students in Mathematics at Stanford. In search for a dissertation theme, Page considered (among other things) exploring the mathematical properties of the World Wide Web: understanding its link structure as a huge graph. Encouraged by his supervisor, Page focused on the problem of determining which web pages link to a given page, considering the number and nature of such back-links to be valuable information about the page. In his research project, nicknamed *BackRub*, he was joined by Brin. Convinced that the pages with the most links to them from other highly relevant Web pages must be the most relevant pages associated with the search, Page and Brin tested their thesis as part of their studies, and laid the foundation for their search engine that was later renamed *Google* (Google Milestones) .

It is no coincidence that most of the new high impact business innovations were started by young entrepreneurs during their years at universities or shortly afterwards. Examples include *Google* (initiated 1996 at Stanford), *Microsoft* (started in 1976 by Bill Gates and Paul Allen, when Gates still was a student at Harvard), *Dell* (founded in 1984 by Michael Dell while he was a student at the University of Texas at Austin), *Yahoo* (created in 1994 by Stanford graduate students Jerry Yang and David Filo), and *Facebook* (founded in 2006 by Mark Zuckerberg with his college roommates and fellow computer science students at Harvard). The fact that so many young entrepreneurs have started innovative businesses while they were students at university is a direct consequence of them acquiring the necessary knowledge to practice innovation during these years, and the support that many universities provide to research in form of orientation, grants, and scholarships.

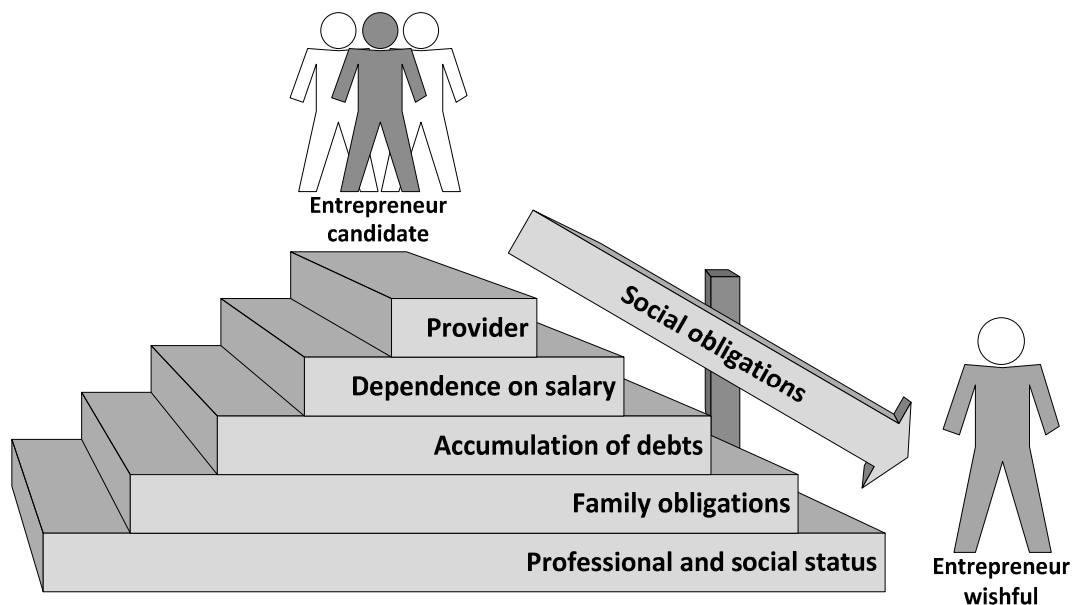
There are additional factors that make it easier for university students in particular to initiate businesses based on the practice of innovation. While students are at university, they often have the full support of their parents and family who want to see them succeed, and who, in some instances, can even supply some seed money for the startup of a business venture.

Likewise, at this stage, although some students have great responsibilities, many are unencumbered by social or financial obligations (except perhaps the repayment of student loans).

### Becoming Risk-Averse

Generally, it is only after students leave the university that the social obligations start to increase (Figure 4). The majority of students, after graduation, will leave the universities and find employment. They will then rent an apartment, and lease or buy a car, and in this way become increasingly dependent on their salaries. The next step for most young professionals is to purchase a house, and to accumulate debts; marriage and children often follow, and create strong family obligations. A successful career can raise their professional and social status to the extent that they become reluctant to give this up for the uncertainty of a new business venture. Thus, all these factors contribute to weighting down the potential entrepreneur, who is increasingly risk-averse, and less prone to start a business venture.

**Figure 4.** Entrepreneurship candidates assuming social obligations and consequently becoming risk-averse

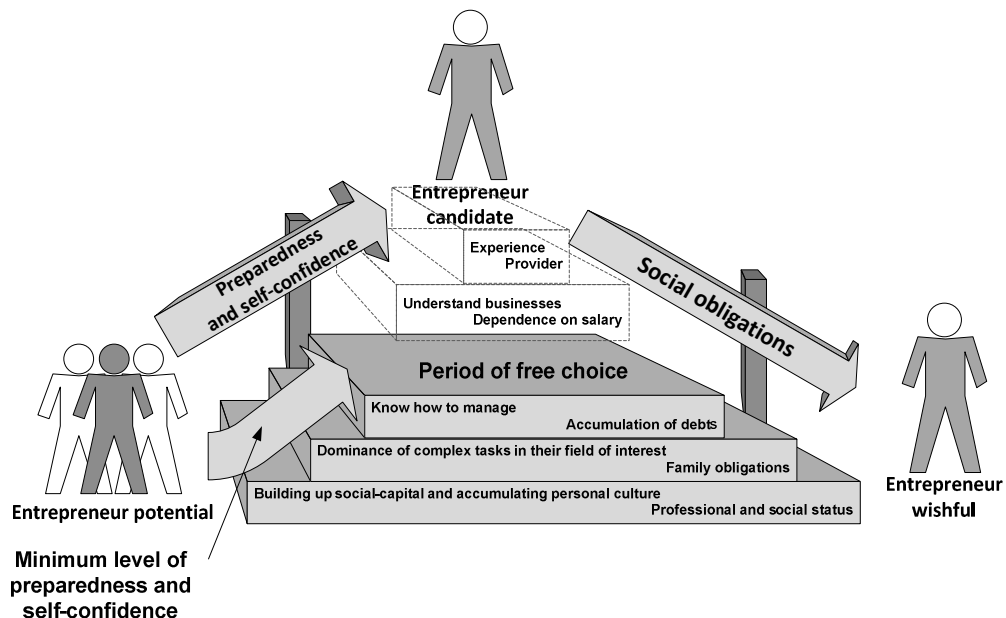


Adapted from Degen, R. J. (1989). *O Empreendedor: Fundamentos da Iniciativa Empresarial* [The Entrepreneur: Fundamentals of Free Enterprise]. São Paulo: McGraw Hill.

## Period of Free-Choice

The years that students are at a university (or shortly afterwards) probably constitute the best period in their lives to begin a new business venture. Students are immersed in a rich and complex learning experience, which allows them to perceive new patterns and relationships that make things intrinsically more meaningful. This generally includes commitment, a degree of excitement that energizes processing of information, and patterning that allows them to explore new thoughts and connections with an expanded capacity to tolerate ambiguity, uncertainty, and delay of gratification: all this contributes to building up their preparedness and self-confidence.

**Figure 5.** Period of free-choice for entrepreneurship candidates



Adapted from Degen, R. J. (1989). *O Empreendedor: Fundamentos da Iniciativa Empresarial* [The Entrepreneur: Fundamentals of Free Enterprise]. São Paulo: McGraw Hill.

The optimum period for entrepreneurs to start a new business venture, their *period of free choice* (Figure 5), tends to decline with the increase of social and financial obligations. The preparedness and the accumulation of the knowledge base to 'practice innovation' in most cases continues, but the self-confidence to start a new business venture begins to decline. This decline is mostly motivated by an increase in risk aversion due increasing social obligations.

In today's highly competitive corporate environment it is common that executives that could be potential entrepreneurs suffer some distress related to their jobs. It is a well documented fact that distress inhibits cognitive functions (Jensen, 2008, p. 43-45). For these potential entrepreneurs gone are the carefree days of 'relaxed alertness' at the university that is the optimal state-of-mind for meaningful learning (Caine & Caine, 1991, p. 131); they have to concentrate on surviving and possible winning in corporate rat race. There is very little time for making plans outside of their job.

### **Practicing Innovation**

Students who are correctly motivated will use effectual processes to reach their goal. They will use their accumulated knowledge to pursue innovation that will emerge and take form over time from their imagination, aspirations, and interaction with fellow students, professors, and others.

The problem is that almost all the students who enroll in entrepreneurship classes at university have the dream of starting a successful business venture, but only a very few know how to find an innovation, or are intrinsically motivated to do what it takes to acquire the necessary knowledgebase to practice innovation. The students expect that they will be taught how to practice innovation to start their dream business venture. They expect a 'magic formula' that will transform them into entrepreneurs, and find themselves feeling frustrated when they don't find a truly innovative idea for a successful business venture.

Unfortunately, most entrepreneurship classes are not helpful to them for teaching how to find innovations; the courses follow in their syllabus (and in the required textbooks) Drucker's (1985) approach of describing where to find innovations, but not how to learn to practice innovation. In this way, students are only taught where to look for innovation, and not how to create innovation.

The most common recommendation given to students for finding a business opportunity is to try to find an unfulfilled need, and then develop a product or service to fill it. This approach may work well for optimizing an existing feature, but it fails to produce innovations that change the meaning of products, or to propose new reasons as to why people buy items. Arguably, there is no insight for innovation that can be achieved by asking

people about something that they don't know, and no market research will give a meaningful idea about something that does not yet exist.

The most effective approach to practicing innovation is to use personal knowledgebase to intuit what people 'could' want, and then become intrinsically motivated to realize this intuition by using the process that Sarasvathy (2008) has called *effectuation logic*: "because effectuates often begin with only a very loose notion of their goals, they can make up their plans in an incremental fashion, utilizing uncertainty and contingent information as resources for their goals rather than relying on goals as determining factors of resource acquisition and choice" (p. 90). Linblom (1959) has called this approach *muddling through*.

The point of effectual logic is that the intuition of an innovation that is based on one's personal knowledgebase cannot be transformed into a meaningful business plan, because it first has to be transformed into something that people can relate to. Other people have to see the innovation realized to be able to identify and evaluate the value proposition. The entrepreneur therefore has to first materialize their innovation, and then, using opinions about its value, incrementally improve it so that it appeals to the largest possible number of people. It is only after this trial-and-error period that the appeal of the value proposition of the innovation can be quantified and adequately projected, thereby making it possible to write a meaningful business plan to start a new venture based on the innovation.

### **Acquiring Knowledge**

To acquire knowledge, entrepreneurship students need a sense of purpose. This serves to orient and focus their experiences in the search for innovations, and they will build up their knowledgebase by processing these experiences. Their intrinsic commitment (N-Arch) to a personal aspiration creates in them a degree of excitement that energizes their processing and patterning of the experiences. But to maximize their connections, gain deeper insights, and perceive the additional possibilities that are hidden in experiences, they have to deliberately and consciously work for these experiences.

This knowledge- building or leaning process was called by Caine & Caine (1991, p. 147-148) *brain-based active processing*, which they describe as follows:

The consolidation and internalization of information, by the learner, in a way that is both personally meaningful and conceptual coherent. It is the path to understanding, rather than simply to memory...Active processing necessarily engages emotions, concepts, and values when meaningfulness is genuinely an issue... It does not occur at one specific time, nor is it that can be done in only one way. It is a matter of constantly "working" and "kneading" the ongoing experience that students have. It also requires that students stand back and examine what has transpired and what it means (p. 147-148).

Generally, students lack both the skill and necessary awareness to search for the right experience and the deeper implications in these experiences. For this reason, entrepreneurship teachers need to deliberately orient the experiences of their students so that the latter can fully benefit from these. They need also to teach students how to reflect on their experiences, for the purpose of adequately grasping the implications.

The first step for the entrepreneurship student is to decide in which field they want to build up their knowledge base to practice innovation with the purpose of starting a high growth business venture. To decide, students have to be aware that they are in constant contact with a multitude of innovative business ventures. They have to start observing these businesses and try to understand why some are successful, some are mediocre, and some fail. It is necessary to identify what the entrepreneurs did right or wrong in starting these businesses, and what could have been done better. Students are encouraged to speculate on what they personally would do if they decided to start such a business.

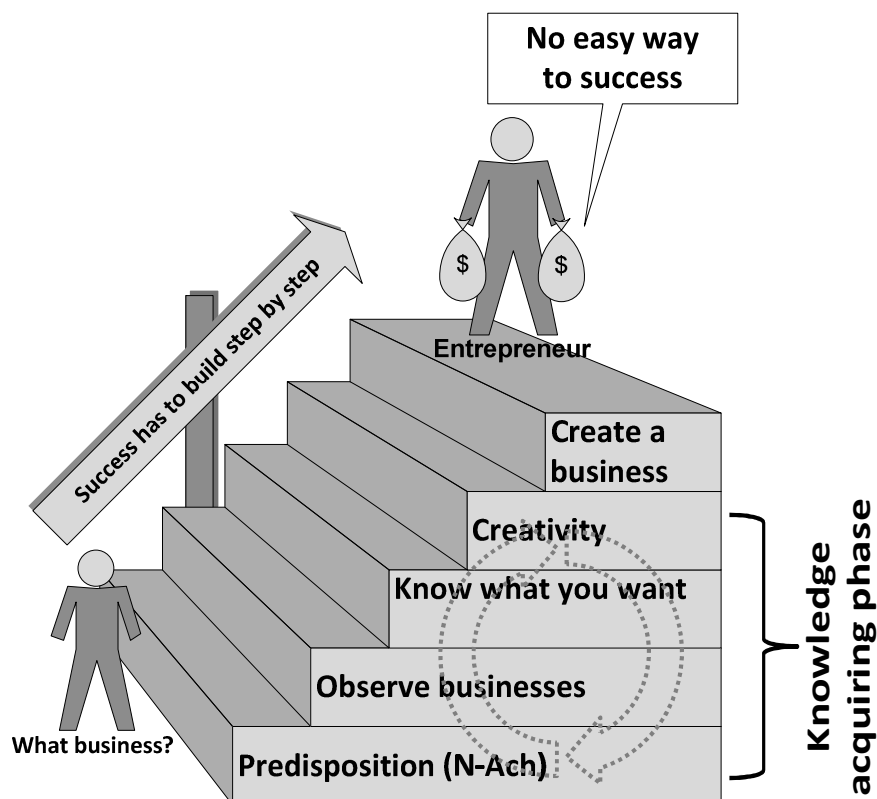
By reflecting on the experiences that they collect, students gain the necessary knowledge to decide which business they want to start. An important aspect in observing businesses is to evaluate the lifestyle required from entrepreneurs for them to be successful, and to determine if this lifestyle meets the student's aspirations. This obviously requires that the students who are in the process of observing businesses know what they want. It is impossible for an entrepreneur to be successful if the lifestyle that is required of them does not intrinsically motivate them. An incompatibility between the lifestyle that a business requires from the entrepreneur and the lifestyle that the entrepreneur aspires to is one of the



primary reasons that many businesses are sold, or close down, in the early years after they have been started.

The decision of the field or type of business that the entrepreneurial students wishes to engage with is only the beginning. They will then have to immerse themselves in the field of this business, to acquire more and more experiences and build-up the necessary knowledgebase to be able to practice innovation. This build-up process (Figure 6) starts with the students predisposition (N-Arch), the observation of businesses, which allows them to select their field of interest for a business venture based on their expectations (knowing what they want), then moves into a deeper observation of the businesses in the selected field (to gain experiences). Reflection on these experiences allows the student to transform them into a knowledge, and then to practice innovation using this knowledgebase. The last step is to take advantage of the desire and ability of the brain to make multiple connections between the experiences to create innovations. This last stage is where creativity emerges.

**Figure 6.** Entrepreneurs as knowledge-agents for innovation

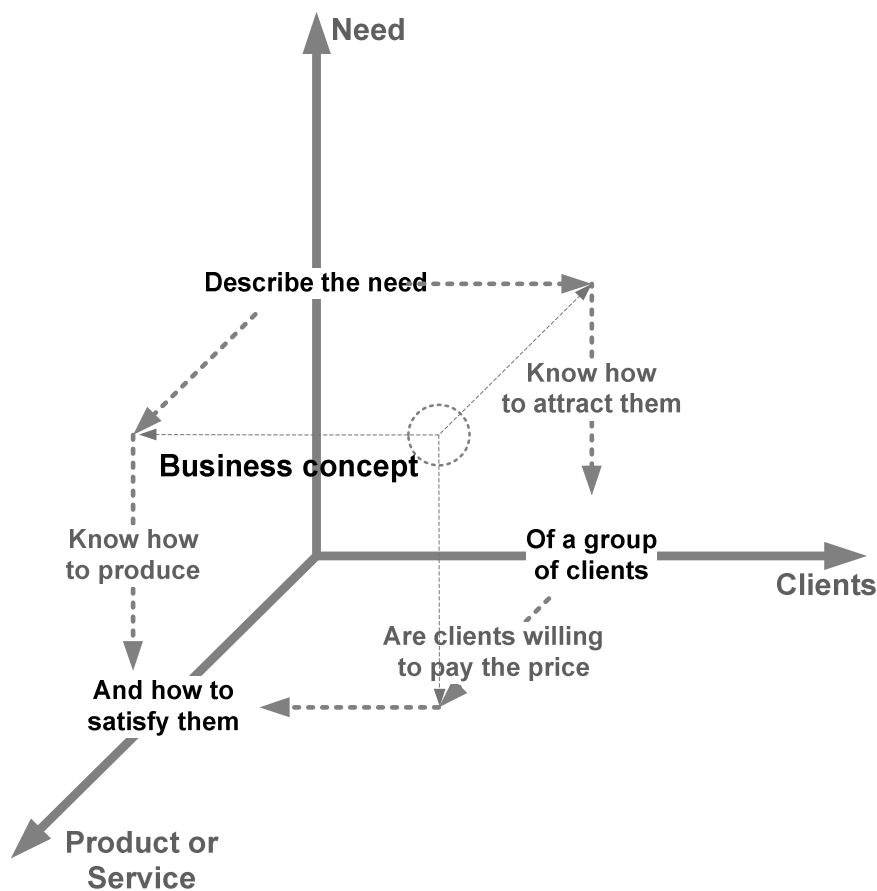


Adapted from Degen, R. J. (1989). *O Empreendedor: Fundamentos da Iniciativa Empresarial* [The Entrepreneur: Fundamentals of Free Enterprise]. São Paulo: McGraw Hill.

## Business Dynamics

One of the keys to effectively building-up student's knowledgebase is to deliberately make them represent (or design) the observed business experiences from different points-of-view. The elaboration of these representations and views is more effective in creating understanding if the student engages with all aspects of the businesses under observation. For this reason, teachers have to provide the necessary frameworks for students to represent business dynamics, starting from a simple understanding of the business concept (Figure 7), to the structural variables of Porter's (1979) five forces (Figure 8).

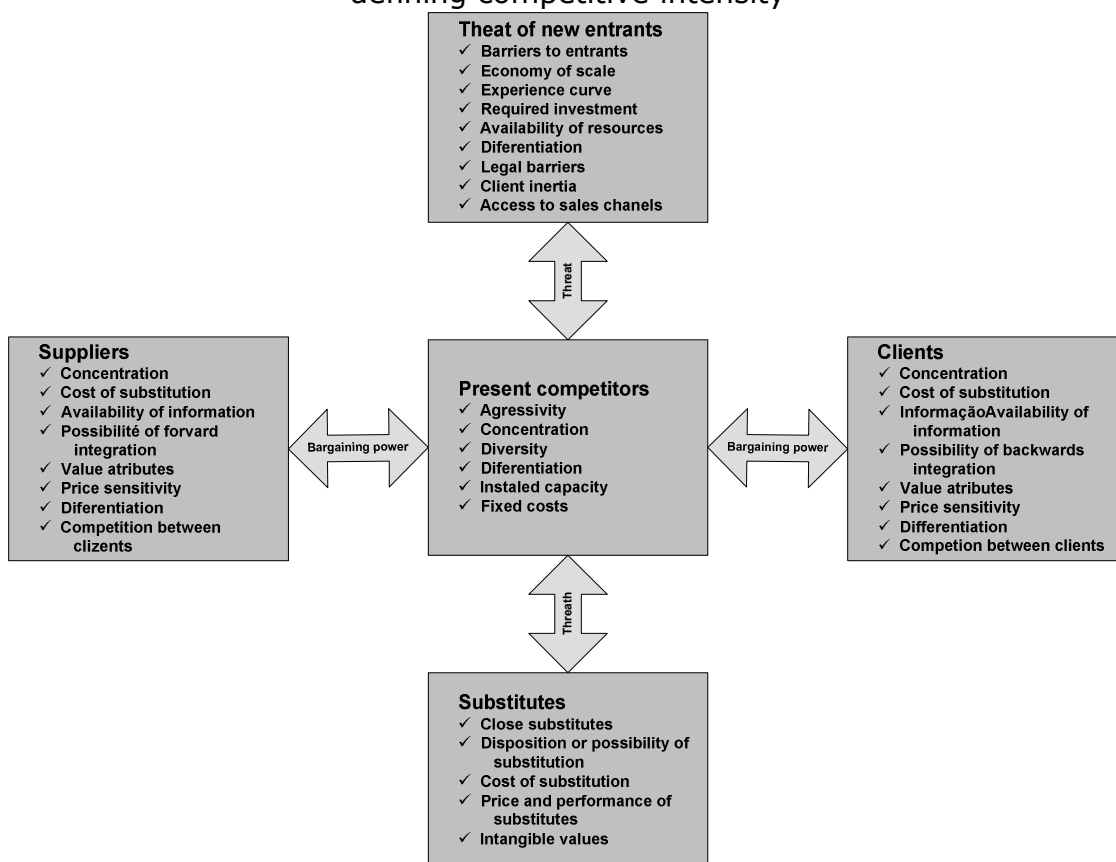
**Figure 7.** Understanding the business concept



Adapted from Degen, R. J. (1989). *O Empreendedor: Fundamentos da Iniciativa Empresarial* [The Entrepreneur: Fundamentals of Free Enterprise]. São Paulo: McGraw Hill (p. 60).

Besides the business concept and competitive intensity frameworks, another method that is very useful for representing business dynamics is *entity-relationship models* (Chen, 1976; adapted by Degen, 2009, p. 166-170). The use of these models enhances the understanding by the students of the relationships between the different entities or players that have an influence on the success of businesses, and the value attributes that determine these influences.

**Figure 8.** Structural variables influencing Porter's (1979) five forces defining competitive intensity



Adapted from Porter 1979 in Degen, R. J. (1989). *O Empreendedor: Fundamentos da Iniciativa Empresarial* [The Entrepreneur: Fundamentals of Free Enterprise]. São Paulo: McGraw Hill.

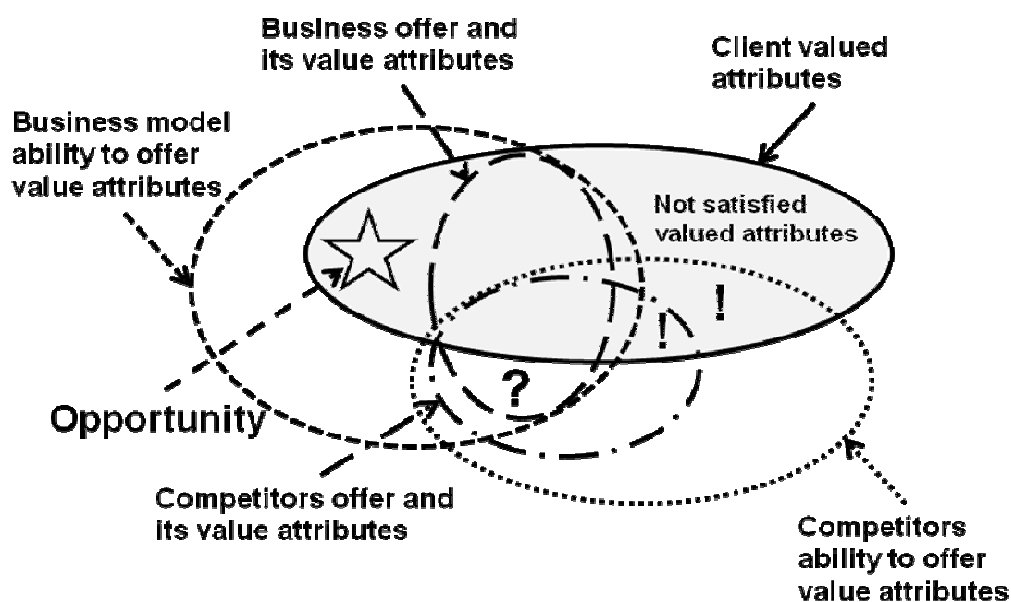
At the same time, professors need to help them make the connections between their business experiences and their basic business knowledge, to better understand these experiences from such varied perspectives as Business strategy, finance, marketing, human behavior, and organizational structures. The purpose is to motivate students to learn these subjects as

part of an integrated understanding of businesses experiences and not as isolated topics (as they are normally taught in business schools).

Students should be made aware that most business innovations render a previous product or service obsolete, by presenting a better or cheaper solution to client needs, and that in this way the entrepreneurs behind these innovative ventures are Schumpeter's (1942) agents of creative destruction. Also, students can be made aware that only a very few innovations are completely new to the extent that they create or fill completely new needs. However some certainly are: the walkman, introduced by *Sony* in 1978 was one of these innovations. The customer's need that *Sony* so successfully exploited during the 80s and 90s did not exist prior to the introduction of the walkman.

On the other hand, Steve Job's iPod (introduced in 2001) was an innovation that did not introduce a new need but instantaneously made all existing mp3 players obsolete, because it fulfilled customer needs much better than all others, leaving the pioneer *Sony* (who introduced the basic need) trailing behind *Apple* in the market. Jobs repeated the same success the iPhone (introduced in 2007), and now trying once more to achieve this for e-readers with the iPad (introduced in 2010).

**Figure 9.** Value attributes of product or service offers



Adapted from Degen, R. J. (2009). *O empreendedor: Empreender como opção de carreira* [The entrepreneur: Entrepreneurship as a career option]. São Paulo: Person Education (p. 71).

In this way, Jobs has analyzed the value proposition of existing mp3 players, and developed innovations that better fulfilled these needs, drawing on his personal knowledgebase. An interesting exercise to develop the cognitive capacity of students is for them to map the value propositions of a product and a competing product, as well as a company's capacity to offer value propositions, the competitor's capacity to offer value propositions, and any gaps (Figure 9). The analysis of the gap between clients desired value proposition and those offered are an opportunity, if the company can fulfill these or a threat if it cannot.

The theoretical explanation of the proposed learning method, applied to entrepreneurship students, and based on neuroscience and cognitive science, is beyond the scope of this paper. Those who want to expand their knowledge or are not familiar with this approach to teaching may find the theoretical foundations in brain-mind learning literature (Caine & Caine (1991); Jensen (2008); and Caine, Caine, McClintic, & Klimek (2009)).

Jensen (2008, p. 5-6) has reflected on the shift of thinking of educators in what he has called the new paradigm of *brain-based teaching*. In this paradigm, educators are encouraged to ask, in response to the adage that *you can lead a horse to water, but you can't make it drink*, the question of *how can we make the horse thirsty so that it will want to drink from the trough?* In the old paradigm, an educator's responsibility ends at 'leading the horse to water', making it the student's responsibility to drink. Today it is the role of teachers to motivate their students (to drink).

### **Creating Knowledge**

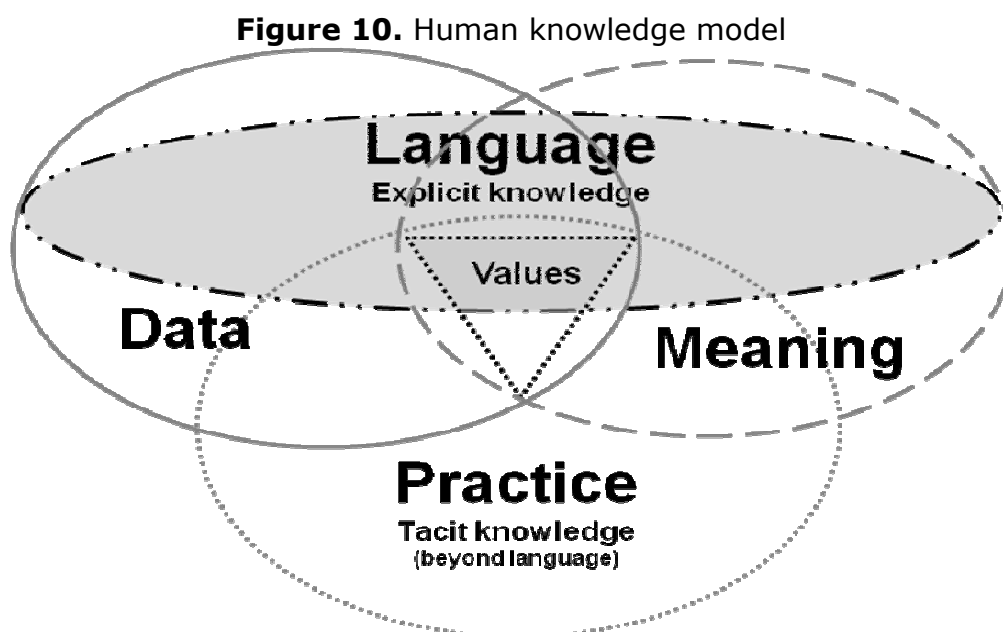
The human brain is in constant activity, and is performing many functions simultaneously:

Thoughts, emotions, imaginations, and predisposition operate simultaneously and interact with other modes of information processing and the expansion of general social and cultural knowledge... The search for meaning (making sense of experience) and the consequential need to act on our environment are automatic. The search for meaning is survival oriented and basic to the human brain. The brain needs and automatically registers the familiar while simultaneously searching for and responding to novel stimuli. This dual process is taking place every waking moment (and, some content, while sleeping) (Caine & Caine, 1991, p. 80-81).

The human brain is both a pattern-maker and a pattern-detector. The ability to make meaningful sense out of countless chunks of information is

critical to understanding. Since the brain is automatically searching for meaning, patterning occurs all the time, and each pattern that is discovered is then added to the person's perceptual maps. Perception is the act of the brain in constructing these maps. The process involves brain structures that are responsible for categorizing, discriminating, and regrouping. The identification of an object, for example, occurs by gathering information (almost instantaneously) on its size, color, shape, surface, texture, weight, smell, and movement. These Chunks of information allow a person to assemble (or understand) the whole (Jensen, p. 182). This understanding, based on the person's maps, is the person's knowledgebase, and is stored in conscious or non-conscious memory.

The perceptual maps gathered by the orchestrated experience of the entrepreneurship students builds up their knowledge base to practice innovation. The exposure to more patterns, translates into more relevance, context, and connections. It's the ability to see ideas in relation to others, as well as how individual facts become meaningful in a larger field of information that is important (Jensen, 2008, p; 183). To better understand the pathway to knowledge building by processing perceptual maps it is possible to use Spender's (2010) model for human knowledge, which is outlined below.



Adapted from Spender, 2010

Knowledge, according to the model (Figure 10), is composed of perceptual maps in the person's memory that in turn are formed by data (chunks of information), meaning, and acquired practice. The perceptual maps of data and the meaning of data can be both explicit (expressed and transmitted by language) and tacit (beyond language). The acquired practices, on the other hand, are always tacit, because they are procedural physical skills that use bodily, manipulative, or hands-on abilities (such as bicycle riding), or reflexive automated non-conscious abilities (such as reaction to a threat, or shaking hands). The perceptual maps in turn build up a person's explicit and implicit knowledge.

Values are built-up in a person's knowledge exactly the same way as ordinary knowledge. The difference is that values normally have a deeply felt meaning for the person.

### **Creative Process**

Hebert A. Simon (1985), a Nobel Laureate and Professor of Computer Science and Psychology at Carnegie-Melon University, has suggested that "today we have a substantial body of empirical evidence about the process that people use to think and to solve problems, and evidence as well, that these same processes can account for the thinking and problem solving that is adjudged creative" (p. 4). He has defined creativity, arguing that "acts are judged to be creative when they produce something that is novel that is thought to be interesting or to have social value. Interesting or valuable novelty is the touchstone of creativity" (p. 5). He has also suggested that knowledge (or expertise) is the prerequisite to creativity. To make the point, he has noted that "we should not be surprised if we find that many (most?) highly creative people behave like workaholics" (p. 13).

Simon has suggested that the creative process is the recognition of patterns (or the association of the multiple perceptual maps), and is therefore not simply logical, linear, and additive, but intuitive and inductive:

The creative processes are problem-solving processes – that we do not have to postulate any special kind of "genius" to explain the creative act... further, that effective problem solving rests on knowledge, including the kind of knowledge that permits the expert to grasp situations intuitively and rapidly. But intuition is no mysterious talent. It is the direct byproduct of training and experience that has been stored as knowledge (p. 19).

There is a subtle distinction between Simon's creativity and Drucker's innovation: creativity is typically used to describe the act of generating new

ideas, while innovation generally describes the process of both generating and applying a creative idea to produce something of value. Evidently, the use of creativity to generate a new idea is the necessary first step within the innovation process. Entrepreneurship students who wish to practice innovation effectively need to begin with creative ideas.

## **CONCLUSION**

Teaching entrepreneurship students to practice innovation or to become knowledge-agents for innovation firstly involves demystifying innovation and creativity as practices that can be learned like any other practice. It is also important to explain to students why they are in the most favorable period in their lives to start a high-growth business.

The next step is to engage their intrinsic motivation to start a business venture by orienting them in choosing a field of interest. Their experiences can then be orchestrated in the chosen field. At the same time encourage, students can be encouraged to build up their necessary knowledgebase, by eliciting their sense of curiosity to better understand the business experiences they are encountering.

To enrich a student's understanding of their business experiences, they can be taught them to represent (or design) their experiences from different angles using appropriate business dynamic frameworks: from the simple business concept, to the structural variables of Porter's (1979) five forces. These frameworks (and others) can be used to motivate students to learn the basic business knowledge they require (finance, marketing, human behavior, organization, etc. This teaching method draws on the brain-mind teaching approach.

This paper tries to shed some light on how entrepreneurship students can be taught to become knowledge-agents for innovation, and is based both on existing research and on my teaching experience (Degen 1989, 2009). This paper will be followed by additional research into the ways that entrepreneurs practice of innovation and how this practice can be taught.

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