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Brain-Based Guided Experience Approach to Teaching Entrepreneurship Students the Practice of Innovation

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Com o apoio

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Brain-Based Guided Experience Approach to Teaching Entrepreneurship Students the Practice of Innovation

ABSTRACT

This paper presents a new approach to coaching entrepreneurship students to practice innovation and to identify adequate high-impact business opportunities. The coaching approach is based on the methodology for guided experience learning that was developed by Caine, Caine, McClintic, and Klimek (2009) in *12 Brain/Mind Learning Principles in Action*, and on the innovation framework that was introduced by Verganti (2009) in *Design-Driven Innovation*. The cognitive perspective of creativity explained by Weisberg (2006) in his book *Creativity* is used to show how the practice of innovation can be learned. The model used for the creative process is based on Wallas' (1926) *The Art of Thought*, and on recent neurological findings on the deliberate and spontaneous pathways to creativity, that were described by Carson (2010) in *Your Creative Brain*. For the validation of radical innovations, the effectual process, described by Sarasvathy (2008) in *Effectuation*, is used.

Keywords: brain-based guided experience, teaching entrepreneurship, practice of innovation, innovation framework, cognitive perspective of creativity, creativity process

Brain-based guided experience approach to teaching entrepreneurship students the practice of innovation

Teaching of entrepreneurship in Brazilian business schools over the last three decades has not effectively promoted the high-impact businesses (as defined by Acs, Audretsch, Braunerhjelm, & Carlsson, 2005; Autio, 2005, 2007) that are needed to accelerate the sustainable development of the country. To address this, Degen (2009b) proposed a new approach to teaching entrepreneurship. This approach was to be used at Brazilian universities, which are not associated with the traditional business schools, with the objective of the creation of independent open entrepreneurship centers. These centers would allow students from all the faculties of the university (and alumni who were interested in becoming entrepreneurs) to congregate and undergo courses and coaching on essential skills such as: starting up a business, finding the right partners, and identifying the high-impact business opportunities that are best suited to the personal interests of the potential entrepreneurs.

To facilitate the implementation of the proposal Degen (2009a) wrote a textbook for the courses that were to be given at the entrepreneurship centers. The proposal made by Degen (2009b), however, failed to address a key point: how to coach the future entrepreneurs to find the adequate high-impact business opportunities needed to accelerate the sustainable development of Brazil.

Drucker (1986) 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. However, he also stated that a theory of innovation cannot be developed; instead, he argued, it is sufficient to say when, where, and how to look for innovation opportunities. As a consequence of this lack of a theoretical base for innovation, Drucker (and most other authors) simply ignored how entrepreneurs practice innovation and how this practice can be learned and concentrated instead on how to systematically look for innovation opportunities.

The practice of innovation

Recently, however, some attempts were made to describe the practice of innovation and how it can be learned. Verganti (2009) explained that the capacity of an individual, such as Steve Jobs (of Apple), to innovate and create radical high impact innovations (including the Apple II, the iPod, iPhone, and iPad) lies in their *personal culture*. Verganti describes that Jobs' innovation:

> *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 (2009) has provided many examples of entrepreneurs who practice innovation based on their personal culture, but does not explain how these people have learned this practice. His only explanation for aspects of the personal culture of the Italian entrepreneurs that may have led them to practice innovation is that both primary and secondary education in Italy has focused on humanities, making culture an essential part of the personality of these entrepreneurs (Degen, 2010).

Requests for teachings on how to practice innovation have been raised—directly or indirectly—in all classes to graduated students and conferences on entrepreneurship that I have given over the last thirty years. This ongoing demand by students has forced me to develop some rudimentary explanations of how entrepreneurs learn the practice of innovation by processing experience to acquire a personal knowledgebase (Degen, 2010).

Entrepreneurs like Jobs use the acquired personal knowledgebase to intuit what people could want, and then these entrepreneurs become intrinsically motivated to realize this intuition. Sarasvathy (2008) called this *effectuation logic* that is similar to what Lindblom (1959) termed *the science of "muddling through"* (Degen, 2010).

Effectuation logic is necessary because the intuition of an innovation is based on personal knowledge, which cannot be transformed directly into a

meaningful business proposition without being first realized as a tangible product. This tangible product is essential, as other people need to experience the innovation in a realized form to be able to identify and evaluate the value proposition (Degen, 2010). The entrepreneurs therefore have 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 (in most cases exhaustive and stress-inducing) trial-and error period that the appeal of the value proposition of the innovation can be qualified and adequately projected, thereby making it possible to write a meaningful business plan to start a new venture based on the innovation (Degen, 2010).

Acquiring a personal knowledgebase

The first steps for entrepreneurship students who want to practice innovation are to choose a field of interest and then to begin building a personal knowledgebase of the chosen field. Dewey (1998, first published in 1938) noted that the acquisition of knowledge occurs mainly by processing the present experiences in the chosen field that will assist creatively in future experiences. Drucker (1986) suggested that the acquisition of a personal knowledgebase to facilitate the practice innovation follows the same process as the acquisition of a personal knowledgebase for other disciplines, such as medicine or engineering.

To effectively build a personal knowledgebase in a specific field of interest, entrepreneurship students need a sense of purpose. McClelland (1967, first published in 1961) defined this as a *high-need-to-achieve* (N-Arch): an intrinsic commitment to a personal aspiration that creates in the individual a degree of excitement that energizes the processing and patterning of experiences. Gopnik, Meltzoff, and Kuhl (1999) defined this processing and patterning of experiences as going beyond simple facts:

> Look beyond the surfaces of the world and try to infer its deepest patterns. We look for the underlying hidden causes of events. We try to figure out the nature of things (p. 85).

The commitment and excitement that energizes the entrepreneurial students in their processing and patterning of experiences occurs when they reach what Csikszentmihalyi (1997a, 1997b, 2008) termed *flow*. However, students of entrepreneurship often lack both the skill and necessary awareness to search for the right experience and the deeper implications in these experiences. For this reason, teachers and coaches in the entrepreneurship course proposed by Degen (2009b) need to deliberately orient the experiences of their students. They need also to teach students how to reflect on their experience, for the purpose of adequately grasping the implications (Degen, 2010).

Guided experience

The following is a model that facilitates the coaching of students to practice innovation. The model is based on the guided experience learning methodology that was developed by Caine, Caine, McClintic, and Klimek (2009) in *12 brain/mind learning principles in action: Developing executive functions of the brain*.

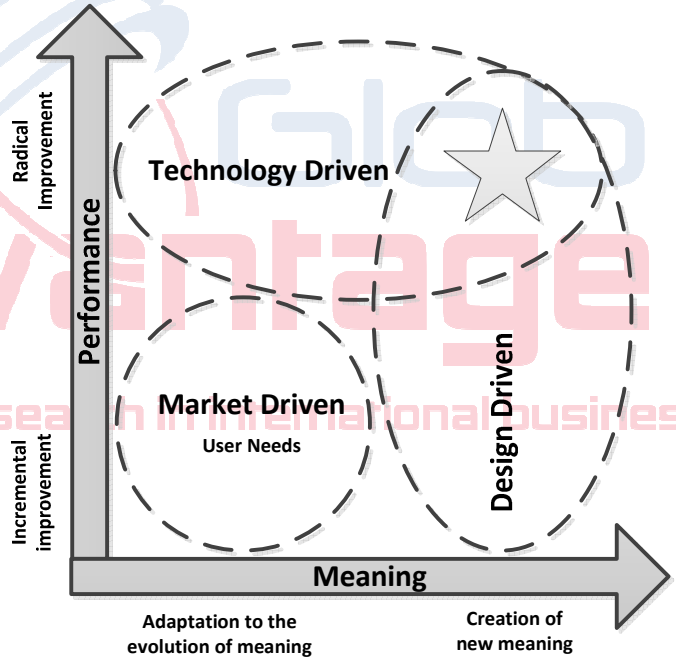
The guided experience begins when students, with the encouragement from their coach, select a field of interest (product or service) and to form a connection to the field. The coach is achieves this by asking the students to write out specific questions, which spell out what the students want to research.

To orient these questions, the students are asked by the coach to familiarize themselves with the knowledgebase of the selected field (by experiencing it), and then to use the innovation framework developed by Verganti (2009; shown in Figure 1) to direct their questions. The framework has two dimensions: the first is *product performance*, and the second is the *meaning of the product to customers* (where *meaning* defines the profound psychological and cultural reasons that customers have for using and becoming attached to the products). These two dimensions illustrate the three possible paths (or combinations of these paths) that a student may choose to practice innovation.

The first path*, market-driven innovation* (see Figure 1) is the most common, and is promoted by most researchers: including von Hippel (1995)

and Utterback (1996) from MIT, and Christensen (Christensen, 2003; Christensen and Raynor, 2003; Christensen, Anthony, & Roth, 2004) from Harvard. This path consists of researching customers' needs for a product and making incremental performance improvements and adaptations to the evolution of the customers' meaning. The second path, *technology-driven innovation* (see Figure 1), consists of making radical improvements to the performance of a product alongside the introduction of new technology. The third path, *design driven innovation* (see Figure 1) consists of creating a new meaning for a product by redesigning both the product and the complete experience that the customers have with it. In some cases technology- and design-driven innovations combine to create a breakthrough new product (designated in Figure 1 by a star).

Figure 1. Paths to innovation



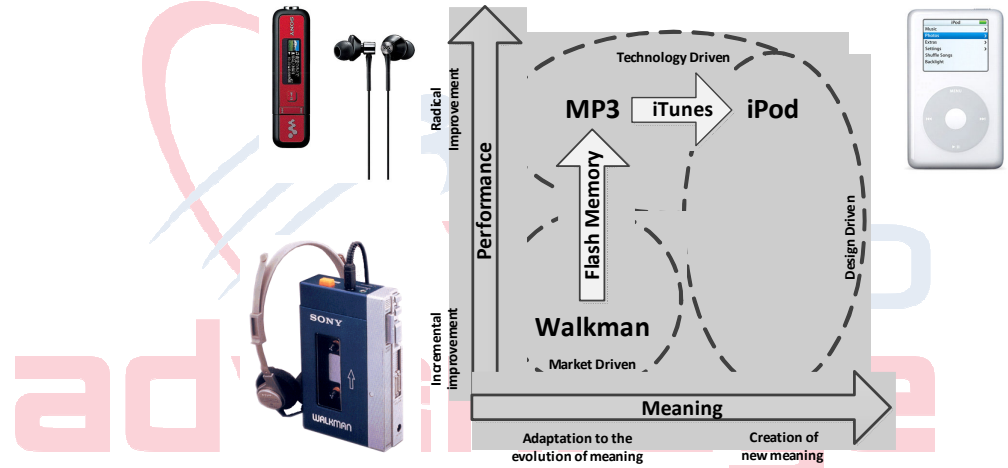
Source: Adapted from "Design-driven innovation: Changing the rules of competition by radically innovating what things mean," by Verganti, R., 2009, Harvard Business Press, Boston (p. 55).

The technology-driven and the design-driven innovations can be defined as *pushing* innovations; rather than researching customer needs for a product (as in market-driven innovation) pushing innovations propose to

potential customers a breakthrough vision of the product. When such a proposal is successful and people love it, such as Jobs' innovations of iPod, iPhone, and iPad, the entrepreneur gains significant long-term competitive advantage. Note that the products in this example are all design-driven innovations, and they created new meanings for the MP3 player, smartphones, and tablet computers (respectively).

To better illustrate the concepts of the framework developed by Verganti (2009), two radical innovations are discussed below (see Figures 2 and 3).

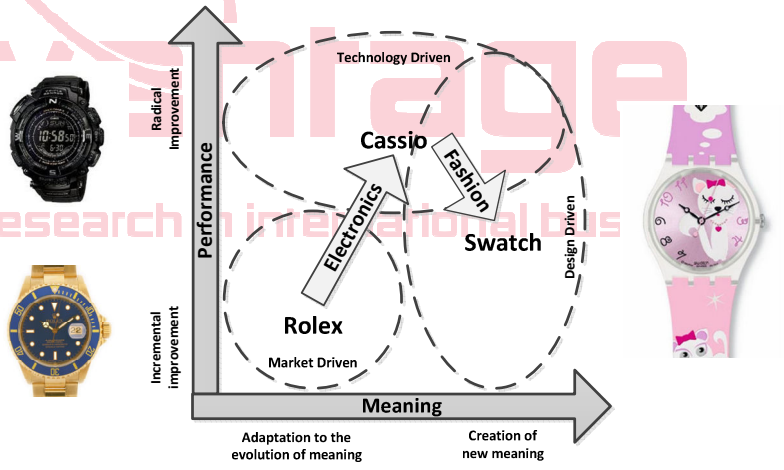
Figure 2. Example of technology-driven innovation (MP3) and design-driven innovation (iPod) in the portable music payers industry



The first radical innovation was the introduction of the iPod by Jobs (Figure 2). The iPod was a purely design-driven innovation that radically improved the existing MP3 players. Jobs designed a completely new user experience: simplifying the design of the portable music player, simplifying its use, adding the facility to organize its music library externally (with iTunes), and providing easy access to music for it via the online Apple stores. The portable music player industry was originally created by Sony with the introduction of the Walkman. The innovations that followed the original Walkman were all driven by technology: the substitution of the original cassettes by compact disks was followed by flash memory and the use of MP3s.

Another radical innovation was the introduction of relatively inexpensive and simple fashion-driven electronic watches by the Swiss company Swatch in the already established watch industry (see Figure 3). This was also a purely design-driven radical innovation that introduced fashion trends into the watch industry. Swatch shed all the unnecessary new features that had been introduced into electronic watches with the technology-driven innovations of Japanese companies like Casio and Seiko. These latter innovations had significantly enhanced the performance of watches and had introduced many new features that were not possible for the traditional mechanical watches; this had positioned them as sophisticated instruments and compromised the tradition of Swiss mechanical watches as precision instruments. This technology-driven innovation forced the Swiss watch industry to reposition their mechanical watches as expensive luxury status symbols and to develop the Swatch electronic watches as fashion items.

Figure 3. Example of technology-driven innovation (Casio) and design-driven innovation (Swatch) in the watch industry



In Degen's (2009b) course, students are encouraged (by their coach) to develop questions using Verganti's (2009) framework (Figure 1). This encourages their familiarization and buy-in of the field of interest that they select. The questions also help students to decide how they want to explore the field in search of a meaningful innovation. The coach assists the

students by providing multiple sources of information to build up the students' knowledgebase on their field of interest.

Students are then encouraged by the coach to access information from a wide variety of sources, and particularly from existing businesses in the field of interest and related fields, in order to answer their questions. By trying to answer the questions, students improve, refine, and process what they are learning.

Active processing of experiences and the use of the brain's executive functions

The coach assists students with consolidating the learning from their experiences by asking open-ended questions, providing guiding comments, and offering direct instruction (when needed) in order to consolidate essential knowledge and skills. The purpose is to induce students to actively process the experiences. Caine and Caine (1990, 1991) defined *active processing* as the art of digesting, thinking about, reflecting on, and making sense of experience, and of consolidating learning. This ranges from systematic practice and creative rehearsal to deep probing and questioning that test the limits of the students' abilities to call on the brains executive functions and respond within a real-life context (Caine et al., 2009).

The purpose of the coach is to encourage students and guide them to make use of their brains' *executive functions*. This term describes the human ability to plan and organize thinking, use reason, engage in risk assessment, make sense of ideas and behavior, multitask, moderate emotion, work with longer time horizons, think critically, access working memory, and reflect on personal strengths and weaknesses (LeDoux, 2002; Caine et al., 2009). These functions are largely housed in the front of the brain, in what is termed the *prefrontal cortex*.

The skills that make use of the brain's active functions are essential for students to create successful innovations. Unfortunately, the experiences that teach students to use the brain's executive functions making decisions, applying knowledge to personally relevant questions and projects, reflecting on personal thinking and accomplishments, and use critical thinking and

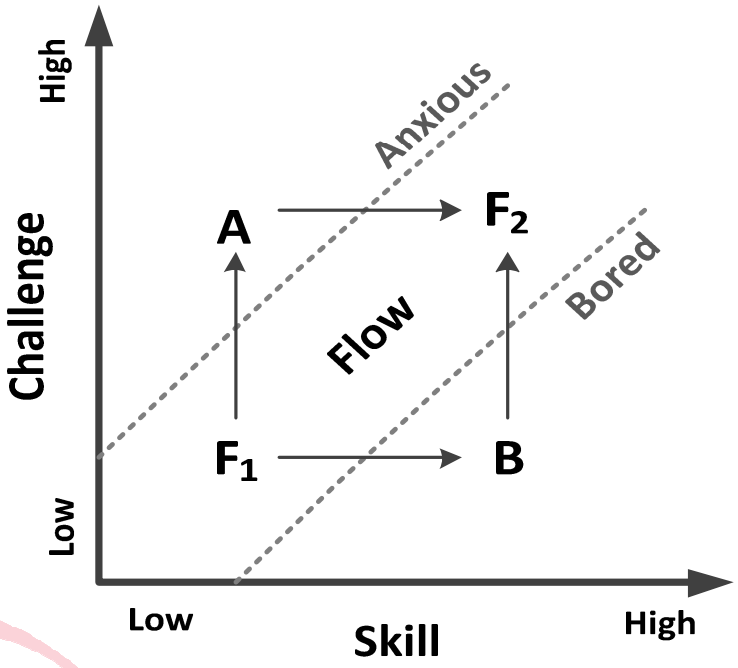
feedback from others, may well be lost in the present age of instant information. The internet and other media supply an almost infinite number of facts to the students, who are rarely challenged to think critically, analyze content, evaluate what is happening, or make their own intelligent decisions. Thus, television, video games, internet, social media, and search engines provide students with entertainment, excitement, and information without the need for the reflection that helps develop their brains executive functions (Caine et al., 2009). Students often lack the patience or motivation to challenge or reflect on the answers they have found in the internet (Small & Vorgan, 2008; Carr, 2010).

A key challenge for coaches is to create a working relationship with the students using the guided-experience learning methodology. Coaches need to motivate the students continually, with new open questions. These questions should aim to induce students to actively process their experiences by using their executive function skills.

Reaching flow

If the coach adequately motivates students by having them formulate ambitious and challenging personal goals for the possible outcomes of the guided experience, the students will naturally acquire an intrinsic commitment to a personal aspiration (defined as *high-need-to-achieve*; McClelland, 1967). This produces a degree of excitement that energizes their processing and patterning of experiences. When this occurs, students experience an optimal guided experience, and reach what Csikszentmihalyi (1997, 1997b, and 2008) termed *flow* (see Figure 4). Students in achieving flow are learning to practice innovation. Flow occurs when people are living an *optimal experience* (Caine et al., 2009) and become so involved in its activities that little else matters to them. In this context, the experience itself is so enjoyable that people will continue its activities, even at great personal cost, for the sheer sake of doing these activities.

Figure 4. Living an optimal experience and reaching flow



Source: Adapted from Csikszentmihalyi, 2008 (p. 74)

Students living an optimal guided experience are continuously in flow; each time the students develop the required skills to meet the challenge they are become bored (that is, they move from F1 to B in Figure 3), so the coach has to increase the challenge proportionally by raising new open questions to allow the students to return to flow (that is, move from B to F2 in Figure 3).

If the challenge is too great for the students' capabilities to develop the required skills, they become anxious, frustrated, and stressed (move from F1 to A in Figure 3). When they reach this stage, students will tend to abandon the experience if the coach does not help them to develop the required skills to return to flow (that is, to move from A to F2 in Figure 3).

Creative thinking

The purpose of coaching students to live an optimal guided experience is help them develop a solid knowledge base on their field of interest and induce them to creative thinking (the thought process that brings about something that is novel), in order to bring new ideas to the field. This creative thinking is the practice of innovation.

Simon (1986) stated that "creative thinking is simply ordinary thinking that has produced an extraordinary outcome." This view of creativity is called the *cognitive perspective of creativity* (Weisberg, 2006), and is constructed from the basic cognitive activities of ordinary thinking like memory (remembering), planning (anticipation and correction of potential errors), logic reasoning (both induction and deduction), comprehension (of verbal and nonverbal information), and judging (whether outcome of an anticipated action will be accepted).

Mednick (1962) identified that ordinary thinking is firmly rooted in individual past experiences, and that some of the most creative ideas come from making associations between remote or seemingly disconnected ideas and concepts learned in past experiences. Thus, both ordinary thinking and creative thinking will refer to accumulated past experiences (Weisberg, 2006). For this reason René Descartes' famous phrase "cogito ergo sum" (I think therefore I am) was inverted by Damasio (2006) in *Descartes' Error* to "I am, therefore I think;" or in modern terms "I have a brain (memory), therefore I think."

A number of researchers (LeDoux 2002; Squire & Kandel 2009; Damasio 2006, 2010) have suggested that thinking is not the defining factor in human identity (as Descartes had proposed): they explain that human personality requires the ability to remember past experiences and an awareness of the subjects that are being thought about. This personal knowledgebase, stored in memory, directs all activities, including ordinary and creative thinking.

The more knowledge that students acquire on their field of interest using the guided experience approach, the greater their ability for creative thinking, allowing them to identify more opportunities for innovation in the field than others with less knowledge in the specific field (Weisberg, 2006). If the students additionally acquire a broad knowledgebase in many other fields, by accumulating more and unrelated experiences, they will further enhance their ability to engage in creative thinking and to identify opportunities for innovation in their field of interest (Verganti, 2009).

Many innovations are created by the transference of creative ideas from one industry to another. Swatch (Figure 2) is an example of the

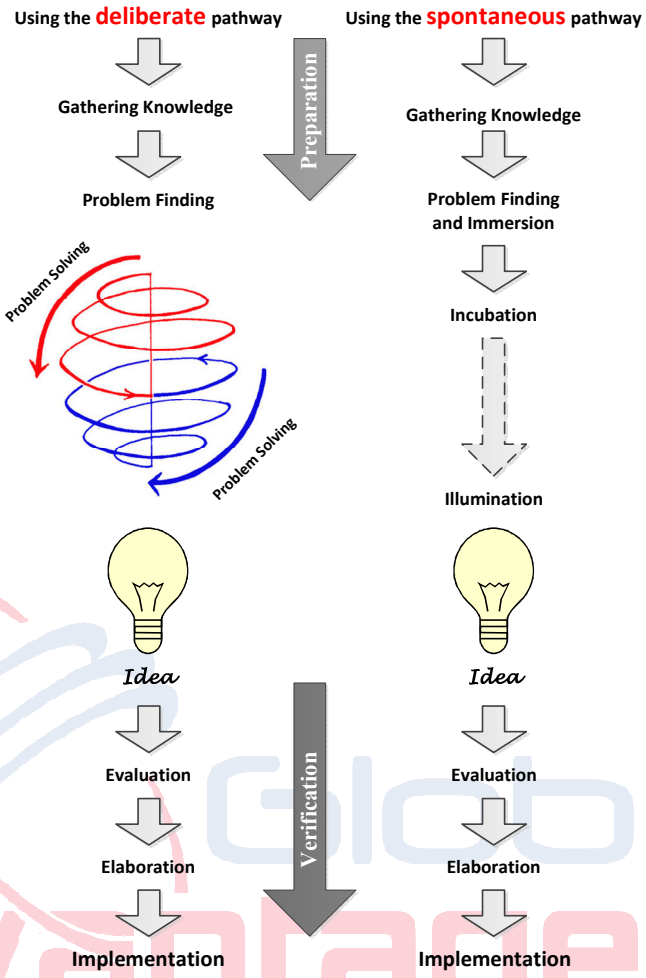
combination of two ideas that were completely strange in the context of the traditional Swiss watch industry: Swatch introduced the idea of plastic bodies and automated mass production (to reduce costs), with a fashion appeal to consumers who wanted to own a range of stylish watches (in order to match specific clothes and moods) without spending too much money.

Creative thought process

Wallas (1926), in *The Art of Thought*, presented one of the first models for the creative thought process, based on his knowledge of the accounts written by artists and scientists. He described the creative process in four stages. The first is *preparation*, which consists in gathering of background information and then exploring and focusing on the problem to be solved. The second is *incubation*, which involves internalizing the problem and then taking a break from actively thinking about it. The third is *illumination*, which is a moment of insight in which creative solutions to the problem pops into conscious awareness. The fourth is *verification*, which involves judging the appropriateness of the solution or idea, elaborating on it, and actually applying it to the original problem.

Figure 5. Stages of the deliberate and spontaneous pathways for the creative thought process

Stages of the creative thought process



Source: Adapted from Carson, 2010, p. 62

Carson (2010), in *Your Creative Brain* complemented the creative process that had been described by Wallas (1926), and developed it further, using recent brain research to describe two pathways to creativity: the *deliberate* and the *spontaneous* pathways (see Figure 4). The deliberate pathway involves moving deliberatively and consciously toward a creative solution, step-by-step, sensing when the solution is closer; the spontaneous pathway allows a creative solutions to be generated at an information processing level in the brain—below conscious awareness—and the solutions (when they appear to meet a certain level of appropriateness) will push forward into consciousness as an "aha!" moment. Unlike the deliberate pathway, the spontaneous pathway does not involve a sense of becoming closer to a solution until the insight bursts forth (Carson, 2010).

The first stage of Wallas' (1926) creative thought process, preparation, is the key to both of the pathways described by Carson (2010). For this reason, the coach must continually remind students that, in order to generate creative ideas, they need to absorb as much knowledge as possible on the their field of interest and in as many related or unrelated fields that they can. They must be made aware of Louis Pasteur's famous quote "le hazard favorise lésprit prepare" (chance favors the prepared mind). The coach has to encourage students to build on their acquired knowledge using the optimal guided experiences in their field of interest to generate ideas and select from these ideas the most promising one for validation. This means going from the preparation phase using one of the pathways illustrated in Figure 4, in order to create an idea, and then to enter the validation phase.

Effectual process

The ideas created by the students for a product or service in their chosen field of interest follow one of the three possible paths to innovation defined by Verganti (2009; see Figure 1): market-driven, technologically-driven, or design-driven. As the coach has to push students to develop high-impact business opportunities — the purpose of the entrepreneurship — he or she will encourage the students to explore radical technological advances or the new meanings of design-driven innovations, or a breakthrough combination of these two.

These approaches cannot be verified using causal logic, and students therefore need to be coached in using effectual logic. The reason for this is that casual logic requires the students to be able to predict the future (in order to be able to control it and come up with a credible business plan): this is impossible, however, because they are breaking new ground with radical innovations and there are no references for these in the market. Effectual logic allows students to learn how to control the future when they cannot predict it.

Sarasvathy (2008), in *Effectuation*, described the three elements of the effectual problem-space that students with ideas for radical innovations

face: (1) it is impossible to calculate future consequences of the innovation; (2) preferences are neither given nor well-ordered for the innovation; and (3) the elements of the environment to pay attention to and to ignore, in order to influence the innovation, are unclear.

The only possibility under these conditions is to evoke creativity and use transforming tactics to validate the idea by using a trial-and-error method known as *effectual process*. This process for validating radical new products or service uses five core principles for entrepreneurs (Sarasvathy 2008):

- *Bird-in-hand principle*. Begin with what is available, rather than waiting for the perfect opportunity. Action is based on what is readily available: identity, knowledge, and personal networks.
- *Affordable loss principle*. Evaluate opportunities based on whether the downside is acceptable; rather than on the attractiveness of the predicted upside.
- *Crazy-quilt principle*. Form partnerships with people and organizations who are willing to make a commitment to jointly create the future (in terms of product, firm, or market), rather than basing partnerships on competitive analyses or strategic planning.
- *Lemonade principle*. Leverage contingencies by embracing surprises that arise from uncertain situations, remaining flexible rather than tethered to existing goals.
- *Pilot in the plane principle*. Each of the previous principles implies the logic of non-predictive control. The effectuation process suggests focusing on the controllable aspects of an unpredictable future, using the logic of: "To the extent that we can control the future, we do not need to predict it".

The implication for the students of these principles, in terms of validating their ideas of radical innovations, is straightforward: they need to find means to develop prototypes of their radical innovations as soon as possible at affordable costs, rather than waiting for perfection (which may eventually become irrelevant). These ideas can then be tested in the market with potential customers, suppliers, and distributors. If positive, feedback

can be used to improve the idea; or if the feedback is negative the idea can be abandoned, taking the previously calculated affordable loss into account.

Discussion

The guided-experience approach to teaching entrepreneurship students the practice of innovation has been tested by me—in a limited and rudimentary form—in entrepreneurship classes in MBA s at the Fundação Getúlio Vargas (FGV) of São Paulo. The limitations to this testing were the lack of time to properly coach the students, and limits to the time available to students due to the heavy learning schedule of the MBA s. Despite of these limitations, I was able to coach some students who successfully innovated in their field of interest.

These few gratifying results encouraged me to propose to the universities a part-time entrepreneurship course, based on current knowledge of brain-/mind-based learning (Degen, 2011). The course requires an eighteen-month duration (as this is the time period required for the students to live an optimal guided experience) with adequate coaching to guide the student's experiences during the duration of the course (Degen, 2009b).

This paper has raised the issue of the lack of effectiveness of the present approaches used by business schools and universities to teach entrepreneurship. To address this lack, this paper clarified the proposed brain-based guided experience approach to teaching entrepreneurship students the practice of innovation, which forms the backbone of a complete entrepreneurship course. The proposed course is targeted for a wide attendance: it is not limited to business school students, but will be extended to all students of the university and eventually to the alumni.

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