A Game-Based Method for Teaching Entrepreneurship

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Entrepreneurship is often thought of as the act of commercializing an innovation. In modern open economies, entrepreneurship is one of the key aspects for economic growth. The teaching and learning entrepreneurship is therefore of importance. Schools, colleges and universities can play an important role by including entrepreneurship and innovation in their curricula. The Berkeley Method of Entrepreneurship is a holistic and student-centered teaching and learning approach that is hypothesized to enable engineers to be more entrepreneurial. It encompasses three main elements: networks, mindset and frameworks. Networks and frameworks are covered in most entrepreneurial curricula, whereas only a few curricula explicitly include the mindset perspective. The Berkeley Method of Entrepreneurship is based on the hypothesis that the mindset of an entrepreneur can be characterized by a distinct set of behavioral patterns, and that an inductive game-based teaching approach is a successful vehicle for introducing and re-enforcing these. The game-based teaching approach allows the students to explore their current mindset and compare it with that of entrepreneurs. The paper presents two of the hypotheses behind the Berkeley Method of Entrepreneurship: the set of behavioral patterns and the game based teaching approach. This paper outlines the concepts behind this novel teaching approach as well as future research.

I. INTRODUCTION

Entrepreneurship matters. In modern open economies it is more important for economic growth than it has ever been. The reason behind this is that globalization and the revolution in information technology imply a need for structural change, requiring a substantial reallocation of resources. This induces an intense demand for entrepreneurship[1]. In understanding entrepreneurship, schools, colleges and universities play an important role and should therefore implement programs and courses that improve the education and training in the area of technology management and entrepreneurship[2]. Governments and universities worldwide are pushing for education programs that produce more “entrepreneurial engineers” who are “bilingual” in the sense that they possess dual managerial and technical competencies[3].

As pointed out by Phan, Siegel and Wright[4], more research concerning good ways to train students in entrepreneurship is needed, and Verzat et al.[5] states that research investigating suitable pedagogical methods to attain requisite skills among engineering students is lacking. Some of the most crucial elements of entrepreneurship at the level of individuals are attitudes, skills and actions[6]; i.e. elements that

are partly not taught in traditional classes at schools, colleges and universities. Creating entrepreneurial mindsets in students also calls for the use of innovative models and content in teaching and may involve changing the content of courses as well as the process of learning itself[7]. Research investigating suitable pedagogical methods to attain requisite skills among engineering students is lacking. Equally, accounts of the use and potential of games as a pedagogical tool are largely absent from mainstream journals[8].

The Berkeley Method of Entrepreneurship is a holistic and student-centered teaching and learning approach that is hypothesized to enable engineers to be more entrepreneurial. It encompasses three main elements: networks, mindset and frameworks. Networks and frameworks are elements found in many entrepreneurial courses and provide the students with knowledge and facts associated to entrepreneurship whereas mindset is an element often missing in traditional courses. Generally, the mindset is a way of thinking that influences the way someone views and acts upon a situation; the mindset is reflected in the person's behavioral patterns[9].

The Berkeley Method of Entrepreneurship is based on a two-fold hypothesis:
1. The mindset of an entrepreneur can be described as a set of behavioral patterns, and
2. An inductive game based teaching approach is a successful vehicle to introduce and reinforce behavioral patterns in students.

In the game-based teaching approach, students explore their current mindsets and compare it with that of entrepreneurs. The Berkeley Method of Entrepreneurship further stresses the relationship between the student and the subject—that is, how the student perceives information, experiences and knowledge provided in the course.

This paper begins with a definition and description of entrepreneurship and why it is of importance for society (Section 2). It describes current trends in teaching and learning as well as the special aspects of teaching and learning entrepreneurship (Section 3). Furthermore, the paper contains a description of the Berkeley Method of Entrepreneurship (Section 4) and the hypotheses on which it is based. The paper presents a set of behavioral patterns that characterize an entrepreneur (Section 5) and discusses how these can be invoked by introducing games in the teaching and learning setting (Section 6). The paper presents some ideas for further research related to entrepreneurship and management education in general, and to the Berkeley Method of Entrepreneurship in particular (Section 7). At last, the conclusions are drawn (Section 8).

II. ENTREPRENEURSHIP

Entrepreneur, originally a French word, is commonly defined as an individual who organizes or operates a business or businesses. The first usage of the word "entrepreneurs" dates back to the Irish-French economist Richard Cantillon who, in 1734, defined them as "non-fixed income earners who pay known costs of production but earn uncertain incomes"[10]. The newer definition comes from Ronald May, who states that "An Entrepreneur is someone who commercializes his or her innovation," and Howard Stevenson[11] who states that "Entrepreneurship is the process by which individuals pursue opportunities without regard to the resources they currently control." Entrepreneurship is the art of being an entrepreneur.

Entrepreneurship is an essential ingredient for creative destruction, a phenomenon described by the Austrian economist Joseph Schumpeter[12]. According to Schumpeter, creative destruction is "the essential fact about capitalism" where new combinations of resources (e.g. human talent, physical resources and financial resources) give rise to new industries and wealth[13]. According to Schumpeter, creative de-

struction is the primary mechanism for economic development for societies and businesses. In his view, entrepreneurs are the dynamic figures who combine, or recombine, vital resources to serve emerging customer needs, thereby "creatively" destroying the pre-existing economic order[14].
Entrepreneurship in a society can exist at three distinct levels: individual, firm and macro. The three levels operate under different conditions and have their own crucial elements. Their respective success has different implications[15]. The success of entrepreneurship at the macro level implies economic growth. However, a success at the macro level cannot be achieved without successful entrepreneurship at the firm and individual levels since the macroclimate is grown out of these[16].

Entrepreneurs often find themselves in novel and unexplored territories. This calls for a certain type of mindset as studied by several researchers. Political economist Robert Reich considers leadership, management ability and team-building to be essential qualities of an entrepreneur[17]. Other researchers state that common skills and attitudes of entrepreneurs are the ability to bear risk[18,19] and cope with true uncertainty, and possession of an extrovert behavior—that is, an outgoing, talkative, energetic behavior[20].

III. TEACHING AND LEARNING ENTREPRENEURSHIP

As an answer to the need of increasing entrepreneurship in society, citizens should be trained to start companies. One opportunity to create new companies is in areas of innovation and new inventions. In most countries, universities generate lots of new innovations. Thus, the universities that not only innovate (through research) but also train entrepreneurs will be at the forefront of growing their countries' economies[21]. Today many universities have extended their traditional missions (education, research and outreach) to also include innovation and entrepreneurship. The newer goal is often expressed as education, research and outreach-and-innovations. Entrepreneurship and innovation are being included in curricula at adaptive universities. In addition, discussions about teaching and learning in general have received increased attention at universities lately.

Generally speaking, teaching is interpreted as the act of helping someone to learn. In recent years, discussions about teaching have shifted from "how to present and transfer knowledge from a teacher to someone else" to "how information and knowledge provided is perceived by the receiver"[22]. They have shifted from a teacher-student-transfer focus in which the subject is only the transported goods, to the student-subject-relation focus in which the teacher is only the medium used. The task for the teachers is to help the students learn. This shift is illustrated in the didactic triangle in Figure 1[23].

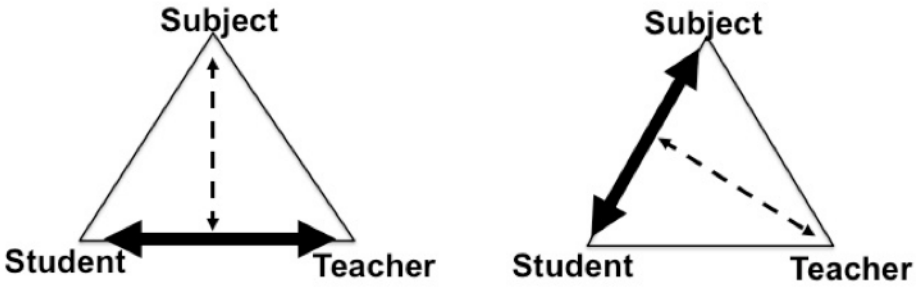

Figure 1: An interpretation of the Didactic Triangle showing a shift from the teacher-student-transfer focus (left) to the student-subject-relation focus (right).

The teacher-student-transfer focus (left in Figure 1) is also referred to as deductive teaching, whereas the student-subject-relation focus (right in Figure 1) is referred to as inductive learning[24]. In a deductive classroom, the teacher conducts lessons by introducing and explaining concepts to students. Then, students are expected to complete tasks to practice the concepts. The students should demonstrate

that they have understood the concepts by repeating what the teacher just said or did. In an inductive classroom, the teacher presents or exposes the students to examples that show how the concept is used. The intent is for students to "notice" how the concept works through reflection. The students should demonstrate that they have understood by re-inventing the concepts based on their own experience.

Deductive teaching methods are suitable to use in subjects where facts and raw knowledge is of most importance, whereas an inductive teaching approach is suitable to use when skills and attitudes are in focus. For entrepreneurs, skills and attitudes are equally or even more important than facts and raw knowledge, and an inductive learning approach is therefore most suitable. Since skills and attitudes are "owned" by the students, the relation between the student and the entrepreneurship-subject becomes essential, the school and teachers are only a means for the student to reflect upon his or her skills and attitudes (compare Figure 1, right side).

An example of an inductive learning approach is game-based learning, something that has received increased attention lately[25,26]. It has been driven by clear successes in military and industrial training, as well as by emerging research into the cognitive benefits of game plays. Developers and researchers are working in various areas of game-based learning, including games that are goal-oriented; social game environments; non-digital games that are easy to construct and play; games developed expressly for education; and commercial games that lend themselves to refining team and group skills. More complex approaches like role-playing, collaborative problem solving, and other forms of simulated experiences have broad applicability across a wide range of disciplines and are beginning to be explored in more classrooms[27].

IV. BERKELEY METHOD OF ENTREPRENEURSHIP

At the University of California at Berkeley, a new method for teaching and learning entrepreneurship is under development[28,29]. The pedagogy is focused around learning rather than teaching (compare Figure 1) and the students are pushed to proactively develop their own understanding rather than to wait for someone to teach them what they need to know. The students are trained to frame problems and find ways to solve them and then reflect on what they have learned from the process. The pedagogy of Berkeley Method of Entrepreneurship is based on the following five principles:

- Students learn by doing[30].
- Instructors host the environment for students to interact directly with the problem. Students make their own decisions and learn inductively[31].
- Behavior training for students is enforced through games and exercises[32].
- Learning outcomes prosper when focusing on goals and processes instead of grades.
- Learning leverages on mimicking real-world entrepreneurial situations[33].

The method has already been used in practice at different occasions: boot camps and courses for undergraduate and graduate students, Global Venture Lab Conferences for academia and industry, and research activities. The three-part model describing the Berkeley Method of Entrepreneurship is depicted in Figure 2.

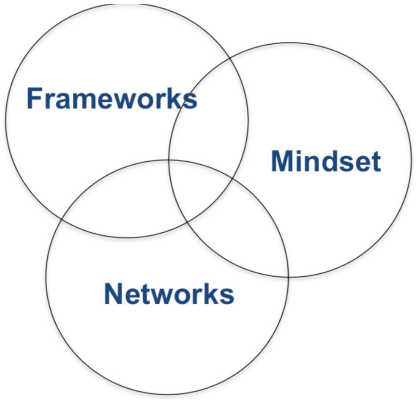

Figure 2: The three layers in Berkeley Method of Entrepreneurship

The three parts are defined as:

- Framework: Teaching effectiveness of strategy, tactics and execution—for example, opportunity recognition, pivots, minimum viable product, raising funds, tools, frameworks, etc.
- Mindset: Exposure to issues related to culture, social psychology and mindset. It covers the psychology of being an entrepreneur—for example, trusting, risk assessment, communication, overcoming social barriers, rejection therapy and fail training.
- Network: Network is a general term that covers both people-based connections for creating ventures as well as a safe environment to develop a venture. It assures infrastructure and a supportive, safe and effective environment such as diverse networks, ability to connect, facilities, services, clarity of rules of engagement and mentors.

Framework and networks are provided in most traditional and entrepreneurship courses, whereas mindset is often not explicitly included in courses today. In traditional courses, the students are given access to good infrastructure and a supporting environment (networks). The aim is to facilitate the students to study, search for information and share documents. The infrastructure and networks also contain clarity of rules; the students should know what is expected from them in the learning situation. In traditional courses, students are taught about the tactics associated with the subject (framework). In entrepreneurship courses, tactics and frameworks could encompass the following: knowledge about opportunity recognition, how to raise funds or how to use certain tools and frameworks.
What is often missing in traditional or entrepreneurship courses is an explicit work with mindset (mindset). The Berkeley Method of Entrepreneurship aims at training students to become entrepreneurs and therefore exposes the students to the entrepreneurial mindset. This is done with an inductive game-based teaching approach.

The Berkeley Method of Entrepreneurship is based on a two-fold hypothesis:

- The mindset of an entrepreneur can be described as a set of behavioral patterns, and
- An inductive game based teaching approach is a successful vehicle to introduce and reinforce students' behavioral patterns.

A list of ten behavioral patterns has been formulated and current research aims at confirming or rejecting each of the behavioral patterns. The inductive game-based teaching approach has started to be used at UC Berkeley in courses provided by the Sutardja Center for Entrepreneurship & Technology. Current research aims at tuning existing games and/or finding additional games to reinforce the behavioral patterns. Research concerning the measurement of the success of using a game-based teaching approach in entrepreneurial curricula is also in its initial stages. The following two chapters describe the ten behavioral patterns characterizing entrepreneurs and the game-based teaching approach.

V. THE GAME-BASED TEACHING APPROACH

The mindset of successful entrepreneurs has been studied and a proposal describing their most dominant characteristics is given through ten behavioral patterns. The proposal is based on extensive interaction with entrepreneurs in the Silicon Valley area and on literature review—e.g. Rainforest by Hwang and Horowitt[34]. A distinct set of behavioral patterns is identified and listed in Table 1. It is important to note that this is an ongoing research, which implies that the ten behavioral patterns should be interpreted as best current status. It cannot be excluded that more patterns will be added, or current patterns will be modified/removed. The ten behavioral patterns describe the typical mindset of successful entrepreneurs. If everyone in a community acts like this, there will be a vibrant entrepreneurial culture.

No.	Behaviour
1	Pay It Forward "Agree that you will get help from others, and pay it forward."
2	Story Telling "Realize something new by induction, and then learn to communicate the story with a new language."
3	Friend or Foe "If you can't tell: learn to trust others without expecting anything in return."
4	Seek Fairness "Make deals that seek fairness (in positive sum transactions), not advantage (in zero sum transactions)."
5	Plan to Fail "It is necessary to be wrong sometimes. Plan to experiment. Plan to fail. (Fail Fast) Analyze, adapt and repeat. The smarter you think you are, the harder this is going to be."
6	Diversify "Diversify your networks. Connect to people you would not normally, then go and listen. Open Up. And connect them to others."
7	Role Model "Be a role model for other entrepreneurs and innovators."
8	Believe "Believe that you can change the world."
9	Good Enough "Perfection is no good but good enough is perfect."
10	Collaboration Individual vs team and competitors vs partners

Table 1: Ten behavioral patterns characterizing an entrepreneur.

Pay It Forward

Pay-it-forward is a term used to describe the concept of "asking the beneficiary of a good deed to repay it to others instead of the original benefactor"[35]. The first known use of the term dates back to 1916 when it was used in the phrase "You don't pay love back; you pay it forward"[36]. In areas strong in entrepreneurship, such as Silicon Valley in California, a pay-it-forward culture has been identified[37]. Entrepreneurs in these areas build support networks outside of existing companies. These networks can be around any area of interest. The networks are mutually beneficial; that is, as a participant you both learn from others and contribute to help others. Over time, experienced executives "pay back" the help they received by mentoring others. A pay-it-forward culture makes an entrepreneurship ecosystem smarter[38].

The pay-it-forward concept is the motivation behind seasoned managers or entrepreneurs getting involved in coaching and/or mentoring[39]. Mentoring has been identified as an exchange relationship whereby both the mentor and the protégé gain several benefits from each other. For example, compared with non-mentored individuals, mentored employees demonstrate higher levels of objective and subjective positive outcomes such as career development, job satisfaction, socialization, organizational commitment and career advancements[40].

Story Telling

This behavioral pattern refers to Christensen's influential work on the innovator's dilemma[41] and Moore's work on crossing the chasm[42]. Especially in high-tech markets, an entrepreneur's product idea or business model can be radically new or disruptive. It can be a "new to the world" type of innovation. Often, even the terminology used to describe the concept might be missing. Exploring a new, possibly disruptive market requires major changes in patterns of behavior related to entrepreneurial communication. The entrepreneurs need to learn how to "cross the communication chasm" so that potential investors, and later on customers, understand the added value in the new offering. The entrepreneurs need to learn to communicate their story with a new language; they need to be storytellers and do story telling.

To be able to adopt new innovations, consumers need to be aware of an innovation and understand the additional value provided by the innovation[43]. Narrative, or story telling, is a central tool in addressing many of today's key leadership challenges such as the following: articulating the risks and opportunities identified by strategic management tools like strategic plans, scenario analysis, and dilemma resolution[44]. Story telling can be one way to overcome the communication chasm. It can be used effectively for several purposes of communication: sparking action, transmitting values, exploring alternative future scenarios or sharing knowledge.

Friend Or Foe

Trust, generalized trust and particularized trust are important concepts strongly related to a person's judgment of friend or foe. Trust means to believe in someone's word; it is often towards a known person. Research has validated the importance of social cohesion based on trust, support and altruism in driving behavioral outcomes. It has been shown that trust is mainly created through real-life collaborating, working together and/or sharing information[45]. In social networks, trust can be multiplied.

Generalized trust is trust towards strangers that arises when "a community shares a set of moral values in such a way as to create regular expectations of regular and honest behavior"[46]. Generalized trust differs fundamentally from particularized trust through extension to people on whom the trusting part has no direct information[47].

Seek Fairness

Covey[48] coined the idea of abundance mentality or abundance mindset, a concept in which a person

believes there are enough resources and successes to share with others. It can be contrasted with the scarcity mindset (i.e., destructive and unnecessary competition), which is founded on the idea that, if someone else wins or is successful in a situation, that means you lose—not considering the possibility of all parties winning (in some way or another) in a given situation. Individuals with an abundance mentality reject the notion of zero sum transactions and instead believe in positive sum transactions. They are able to celebrate the success of others rather than feel threatened by them. Genuine strive for mutually beneficial solutions or agreements, as supported by a positive sum transactions attitude, is the key in (entrepreneurial) relationships. A "win" for all is ultimately a better long-term solution than if only one person in the situation had gotten his way.

Plan To Fail

Important concepts related to this rule are effectual logic, failure acceptance and pivoting. Research on successful entrepreneurs revealed that they use non-predictive or effectual logic. This means that you begin with who you are, what you know and whom you know, and begin doing the doable with as few resources invested as possible[49]. Research also concludes that an entrepreneur should "repeat, continue after failure and pivot until the chain of stakeholders and commitments converge to a viable new venture"[50]. In particular, they begin by interacting with a wide variety of potential stakeholders and negotiating actual commitments. Let the actual commitments reshape the specific goals of the venture. An entrepreneur has to accept that the reshaping is an important part in aiming to improve; it is not to be thought of as a defeat.

Diversify

According to Dubini and Aldrich[51], the diversity of entrepreneurs' networks is crucial to the scope of opportunities available to them. Information about new business locations, potential markets for goods and services, sources of capital, potential investors and innovations is likely to be spread widely among individuals. This implies that someone with a small set of overlapping relationships is at a disadvantage when competing for information with someone with a large set of divergent ties. However, it is not easy to diversify; there are social barriers to stifle human connections. Although the geographical distances are shrinking due to technology, the social distances caused by culture, language and distrust are still there[52].

Role Model

It has been demonstrated that a first step in approaching a new role or a new behavior is to be able to associate oneself with a role model possessing this behavior. Culture can be learned by imitating people similar to us or imitating people that are admired as socially dominant[53,54]. Role models are therefore powerful tools for learning new behaviors. One of the most powerful ways to change someone's behavior is to have them spend time and listen to someone whom they want to emulate[55].

In a good mentoring relationship, the mentor can be a role model through both words and actions—assuming the mentor is an entrepreneur with experience and the mentee is a newer entrepreneur. Entrepreneurs are constantly breaking rules and making mistakes in an effort to drive their businesses forward. As a new entrepreneur, this is challenging; having a mentor in this process can be invaluable. Entrepreneurs are a role model for how other entrepreneurs should see and deal with ethics in entrepreneurship.

Believe

An important concept related to belief is self-efficacy. The construct of self-efficacy was introduced by Bandura[56] and represents one core aspect of his social-cognitive theory[57]. Perceived self-efficacy is concerned with people's beliefs in their ability to influence events that affect their lives. This core belief is the foundation of human motivation, performance accomplishments and emotional well-being. A me-

ta-analysis concerning the relationship between self-efficacy and work-related performance indicates that there is a significant weighted average correlation[58]; i.e. persons with a high belief in their ability to influence events demonstrate higher work-performance than those with a low belief.

It has also been found that a strong sense of personal efficacy is related to better health, higher achievement and more social integration. If people believe that they can take action to solve a problem instrumentally they become more inclined to do so and feel more committed to this decision[59].

Perfection Vs Good Enough

It is important for entrepreneurs to understand that perfection can be harmful, not because of the perfect result but because perfection usually requires time, and timing can be more important than a perfect result. An idea can always be changed or altered to make improvements. In the book The Art of the Start, author Kawasaki[60] explains that entrepreneurs should "fix, ship, fix, ship," rather than "fix, fix, fix, ship." The idea will constantly be improved. Bird Dunn states, "Perfection is the enemy of completion." Reid Hoffman, founder of LinkedIn, says, "One of the metaphors that I use for startups is you throw yourself off a cliff and assemble an airplane on the way down." This implies that you cannot wait for the plane to be perfect; it has to be assembled quick and with an aim to be good enough for flying.

Collaboration

Collaboration can be performed in different flavors; there can be collaborations between individuals who build the teams in businesses. Financial and human resources often seem to be the most critical for a successful launch of the venture and these resources tend to be closely interrelated. When new ventures apply for early stage venture capital funds, potential investors always evaluate the project by searching for a well-balanced team with sufficient business experience[61].

There can also be collaborations between competing companies, called co-opetition, which is defined as a strategy embodying simultaneous cooperation and competition between firms[62]. Collaboration in business today is more of a survival trait than a buzzword. Because competing firms possess relevant resources and face similar pressures, collaboration with competitors enables firms to acquire and create new technological knowledge and use the knowledge in pursuit of innovations[63]. Increased popularity of co-opetition is evident by the fact that over 50% of collaborative relations (strategic alliances) are between firms within the same industry—that is, among competitors[64]. Recently, scholars have suggested that especially small businesses in an industry need to collaborate with competitors so that they can create economies of scale, mitigate risk and leverage resources together[65].

VI. THE GAME-BASED TEACHING APPROACH

The Berkeley Method of Entrepreneurship includes behavioral training as well as reflections on mindset. For this, an inductive game-based teaching approach is used. Various games, referred to as the Berkeley Method of Entrepreneurship games, have been developed. A game can be defined as a structured playing, usually undertaken for enjoyment and sometimes used as an educational tool[66]. Or a game may be described as an "artificial situation" in which players engage in an artificial conflict against one another or all together against other forces. Games are regulated by rules, which may take the form of procedures, controls, obstacles or penalties[67]. Furthermore, four key components of games are goals, rules, challenges, and interactions. For the Berkeley Method of Entrepreneurship games this implies:

- Goals: A preset objective, aligned with the teaching objective
- Rules: Limitations on how to achieve the goals
- Challenge: Competition and use of skills to reinforce behavior
- Interaction: A setting for players to interact, communicate and enjoy the process

The idea is to let the games invoke a certain behavior or mindset in the student—for example, Story Telling (behavior-2) or Good Enough (behavior-9). After the game, the students should reflect about their own behavior and compare it with that of successful entrepreneurs. The result of the reflection can be either an ignition for the student (confirming that he/she wants to become an entrepreneur), an extinguisher (confirming that the student does not want to be an entrepreneur) or a wake-up call (ok, I need to learn more about this mindset).

Examples of games that can be used to invoke a specific behavior and games that invoke a set of behaviors are given below. Behavior-10 "Collaboration" involves group-dynamics. Win-win games emphasize the importance of cooperation, fun, sharing, caring and over-all group success in contrast to domination, egoistic behavior and personal gain. A game invoking this behavior was used in a marketing course in the Technology Business program at University of XX, Finland[68]. Students were given a problem to solve related to marketing communications of a local technology SME. The student teams competed against each other and, ultimately, the best solution would win. A faculty member initiated the collaboration between students and the firm; after the first introduction, students were on their own to build a relationship with the firm representatives. The students' first task was to negotiate the team building, or how to select members for a team. Ideally, teams should have been truly multidisciplinary, so that the members bring a wide variety of experiences and expertise to the team. The next step was to further identify the exact problem with the firm's marketing communication. Altogether, five teams, each with four to five students, continued to work for three weeks and presented their solutions in a final seminar to the panel of judges, consisting of faculty members and the founder/CEO and marketing manager of the firm. The first prize was actually given to two teams, which had also collaborated with co-opetition; that is, they had shared their memos from initial meetings with the CEO, which allowed them to identify the problem faster and proceed to analyze alternative courses of action, formulate strategy and implement strategy.

Behavior-1 "Pay-It-Forward" is the behavior of "asking the beneficiary of a good deed to repay it to others instead of the original benefactor." It has been used in an educational activity at Lund University, Sweden. In the Technology Management program[69], the students were asked to "assemble as much money as possible within 6 hours, and donate everything to charity." The students were free to come up with whatever (non-violent, fair, honest) idea of how this should be accomplished, but they only had six hours. The students were split into two competing teams of 20 students each where the team that assembled the most money won. When the activity was over, the students were asked to reflect about how they felt before, during and after the activity. This forced them to think about their attitude to the pay-it-forward behavior and their attitude of doing something that does not immediately give them any rewards or pay offs.

A multi-behavior "Scavenger game" has been used in educational activities initiated by UC Berkeley[70]. In this game, each team had five members, two of which were placed in a control room and three of which were part of the field-group. The field-group and group in the control room could only communicate via voice using a simple phone (no sms, texts, emails, videos etc). The group in the control room had no access to the Internet. A five-liner instruction was given to the group in the control room. These instructions had to be communicated to the field team, whose task was to find a location and take a picture of it. The field group that provided the correct picture first was the winning team. The task seems easy, except that the five lines of instructions were given in a different language (e.g. Chinese, Russian, illustrations, Korean or Finnish). In this game, an important behavior for the group in the control room was to be a Story Teller (able to communicate the shapes of the letters in the instructions), and for the field group to be able to demonstrate Collaboration skills, e.g. each student working on the translation of one instruction. Furthermore, the teams had to appreciate Diversity in the people they encounter in order to have someone to help them with translation. As soon as they thought they knew a location that

fulfills the instructions, they went there and took a picture of it. After completing the game, the students were asked to reflect about their own contributions, what behavior they felt comfortable with, and what behavior they needed to practice more. The students also reflected about the strategies used by the different teams and their respective advantages and disadvantages.

VII. FUTURE RESEARCH

The teaching and learning approach used in the Berkeley Method of Entrepreneurship is already in use in engineering entrepreneurship education at UC Berkeley and the first feedback from students and instructors is positive. However, the method is still under development and further research is required. A current study is being performed with the aim of confirming or rejecting each of the ten behavioral patterns that characterize a successful entrepreneur. An empirical study among a group of international students participating in a global entrepreneurial boot camp is planned to take place in the fall of 2015. As encouraged by Verzat et. al.[71], research is also being conducted in the area of games. The research concerns tuning existing games, designing additional games and assessing the suitability of games for reinforcing behavioral patterns. The research project is being performed in the Global Venture Lab Network at UC Berkeley, which includes approximately 25 universities from all continents[72].

VIII. CONCLUSIONS

The Berkeley Method of Entrepreneurship is a holistic and student-centered teaching and learning approach that is hypothesized to enable engineers to be more entrepreneurial. It is currently under development. It encompasses three main elements: networks, mindset and frameworks. Entrepreneurship is an essential ingredient for economic development for any country. Schools, colleges and universities can help foster and accelerate the formation of successful entrepreneurs by including entrepreneurship in their curricula, as is done by many schools, colleges and universities today. Most entrepreneurial curricula include the two traditional elements of networks and frameworks; however, very few curricula explicitly include the mindset perspective.

The Berkeley Method of Entrepreneurship is based on the hypothesis that the mindset of successful entrepreneurs can be characterized by a distinct set of behavioral patterns and that an inductive game-based teaching approach is the best vehicle to introduce and reinforce these patterns in students. A list of ten behavioral patterns that captures the mindset of successful entrepreneurs is presented and a game-based teaching approach is used to let the students explore their current mindset and compare it with that of entrepreneurs. The result can be an ignition for the student (yes, I want to be an entrepreneur), an extinguisher for the student (no, entrepreneurship is not for me) or a wake-up call (ok, I need to learn more about this mindset).

The pedagogy of the Berkeley Method of Entrepreneurship is inductive in its nature and thereby focused around learning rather than teaching. The students are pushed to proactively develop their own understanding rather than to wait for someone to teach them what they need to know. The students are trained to frame problems and find ways to solve them and then reflect on what they have learned from the process, or the outcome of a game.

The Berkeley Method of Entrepreneurship has already been used in engineering entrepreneurship education at UC Berkeley. The first feedback received from students, instructors and visiting scholars is positive. Nevertheless, the underlying hypotheses have to be further investigated and validated. Current research therefore aims at the following: confirming or rejecting each of the set of behavioral patterns, tuning existing games and/or finding additional games that reinforce the behavioral patterns

and finding ways to measure the success of the game-based teaching approach in entrepreneurial curricula.

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