

THE IMPACT AND RIPPLE EFFECT OF MAKER-TRAINING: A Longitudinal Study among Young Latent Entrepreneurs in Rural India

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ABSTRACT

Entrepreneurs create jobs, generate wealth and solve problems in communities. Developing entrepreneurship may be the fastest way to transform a community with limited resources. What if more entrepreneurs can be catalyzed and nurtured in communities from ordinary people to realize their potential? Would a Maker Intervention impact them as individuals and make a lasting contribution to their community?

To put these questions to the test, one of the authors, Nair¹ conducted workshops at three colleges in rural India in 2014. 130 students were trained in ideation, making skills, design thinking, and startup process over multiple weeks. Their attitudes toward entrepreneurship were collected before and after the workshop. Four years later, to verify whether the immediate boost in entrepreneurial attitude had sustained over time and how the intervention has impacted their life, 69 of the students were contacted again.

This paper will cover the methodology used to train students, in addition to the context selection, measurements and analyses. We find that the Maker Training not only had an immediate positive effect on the human capital of the participants, but also had sustained its positive impact provided that the participants had contributed to the Ripple Effect of Makers by engaging in further advocacy behaviors to share and demonstrate their Maker Skill learnings to help others.

¹ Nair, Rajesh (2014). "Catalyzing Entrepreneurship from the Ground Up: An Experiment in Small-Town India", MIT-SDM MS Thesis, 2014

INTRODUCTION

The study examines an alternative route to developing entrepreneurs that brings individuals who participate in intensive short-course training programs, specifically Maker Trainings, contextually closer to the discipline of entrepreneurship. The objective of increasing the number of entrepreneurs within economies is underpinned by the motivation of governments and development institutions to attain more inclusive growth. While the International Monetary Fund (IMF) projects an upward trend for GDP growth in 2018, there is also concerns about a historic growth in inequality globally (Alvaredo, Chancel, Piketty, Saez, & Zucman, 2017). Entrepreneurship is seen as a key contributor to bridging this gap given its impact on job generation and diversifying access to income opportunities for the labor force (Audretsch & Fritsch, 2003; George, McGahan, & Prabhu, 2012).

Data from the Global Entrepreneurship Monitor (GEM) shows that entrepreneurial intentions² among surveyed economies are actually quite significant: more than 1 out of five people (20.94% in 2014 and 21.65% in 2017). Moreover, this percentage is generally much higher in emerging economies compared to developed economies.³ However, the higher portion is unfortunately not automatically a sign for more inclusive growth. For these countries, it is possibly a symptom of economic institutions' inability to provide adequate access to income opportunities for its labor force, hence the reliance on self-employment (Hall, Matos, Sheehan, & Silvestre, 2012; Mayoux, 2001). GEM's motivational index⁴ supports this hypothesis, as the ratio of opportunity-driven entrepreneurs is significantly lower in emerging economies both in 2014 and 2017. Much of the entrepreneurial activity in those economies is unfortunately more necessity-motivated.⁵

Hence, developing more entrepreneurs within economies is not just about the numbers generated, but also assessing how self-employment can be accessible to a broader audience to encourage more opportunity-driven entrepreneurship, especially in emerging

² Percentage of 18-64 population (individuals involved in any stage of entrepreneurial activity excluded) who are latent entrepreneurs and who intend to start a business within three years

³ Disaggregating the GEM data further using World Bank's Atlas Method, which categorizes different economies using GNI per capita in USD according to: High-income (> 12,735 in 2014, > 12,055 in 2017); Upper middle income (4,126-12,734 in 2014, 3,896-12,054 in 2017); Lower middle income (1,046-4,125 in 2014, 996-3,895 in 2017); and Low income (<= 1,045 in 2014, <=995 in 2017). **2014 GEM Data:** High = 14.32%; Upper middle = 26.98%; Lower middle = 27.93%; Low = 51.27%
2017 GEM Data: High = 16.85%; Upper middle = 28.53%; Lower middle = 29.10%; Low = 39.84%

⁴ Percentage of those involved in TEA that are improvement-driven opportunity motivated, divided by the percentage of TEA that is necessity-motivated

⁵ **2014 GEM Data:** High = 3.67; Upper middle = 2.34; Lower middle = 1.40; Low = 2.62
2017 GEM Data: High = 3.38; Upper middle = 2.59; Lower middle = 1.86; Low = 2.16%

economies. Entrepreneurship Education and Training (EET) is the most prominent development approach that enhances the human capital of its participants for innovative and productive activities. The approach assumes that individuals with more human capital are better poised to take advantage of new or emerging economic activities (Davidsson & Honig, 2003). EET, however, typically focuses on very specific audiences: nascent entrepreneurs or those who are already entrepreneurs. Such a focus limits its impact when increasing the number of opportunity-driven entrepreneurs because EETs do not engage the larger group of latent entrepreneurs, who could be persuaded to become self-employed and equipped with the appropriate skills to become opportunity-driven entrepreneurs, rather than necessity-driven.

The paper is the first to then focus on the impact of the Maker Movement, as an alternative EET to serve as a platform to engage a broader and younger audience; of which some are *latent entrepreneurs* who have hardly considered entrepreneurship as a future career path. Specifically, the study investigates the impact of Maker Training on human capital assets, specifically an individual's self-efficacy and how such programs aim to encourage *opportunity-driven entrepreneurial* paths. This research asks the following questions: What is the impact of Maker-EET interventions on the entrepreneurial self-efficacy of its participants? And how long does its impact last? We conducted a quantitative inquiry on the impact of EET interventions by surveying individuals who participated in a maker training in India in 2014. Pre-tests and post-tests are administered in each intervention (2014) to understand the immediate impact on its 130 participants. Four years later, in 2018, the same participants were engaged to participate in a survey that measures similar constructs related to self-efficacy while closely examining social and network dynamics using the lens of the ripple effect.

This research contributes to the literature on entrepreneurship development by building on sparse evidence that focuses on latent entrepreneurs. Findings of this research are relevant for institutions with strong interest to mobilize individuals who are not specifically considering self-employment, contributing to the acceleration of developing entrepreneurs.

RELEVANT LITERATURE

Entrepreneurship Education and Training (EET) are programmatic interventions with the aim of imparting entrepreneurial knowledge, skills, and attitudes for its participants. Literature shows that adequately understanding EET entails identifying critical nuances between

entrepreneurship education and entrepreneurship training. Literature prominently follows Hynes' (1996) definition as he describes that:

“Enterprise education is the process or series of activities which aims to enable an individual to assimilate and develop knowledge, skills, values and understanding that are not simply related to a narrow field of activity, but which allow a broad range of problems to be defined, analysed and solved. Education can be on a formal or informal basis.” (Hynes, 1996: p. 10)

“Enterprise training can be defined as a more planned and systematic effort to modify or develop knowledge, skills, etc., through learning experiences to achieve effective performance in an activity or range of activities.” (Hynes, 1996: p. 10)

A meta-analytic review done by Martin, McNally, and Kay (2013) compares the outcome effects of Academic (education) Programs to those of Training, and also finds that EET studies often entail academic interventions (25 out of 42 articles studied by Martin et al) on the undergraduate and postgraduate level. These studies often examine the differences in knowledge, skills, and attitudes between individuals that chose to take entrepreneurial degrees and courses, over those that did not. In effect, likely nascent entrepreneurs are compared to non-entrepreneurs (or latent entrepreneurs) in the control group.

Table 1 gives an overview of 16 EET studies specifying their audiences and program content/delivery: though overall, academic entrepreneurial interventions are addressing nascent entrepreneurs latent entrepreneurs. For Trainings, which are relatively, short interventions focusing on core entrepreneurship knowledge and skills, the audiences typically tend to be either nascent entrepreneurs or already-entrepreneurs. Often, entrepreneurial training studies primarily observe the impact on micro-entrepreneurs, small business owners, or start-ups.

We think that with the objective of engaging nascent entrepreneurs and entrepreneurs in mind: (1) EET content mainly focuses on business concepts such as human resource management, marketing strategies, and operations (Berge, Bjorvatn and Tungodden, 2015); and (2) EET delivery is focuses on pedagogical methodologies appropriate for nascent entrepreneurs or already-entrepreneurs that include education programs through: (1) bachelor's and master's concentrations on entrepreneurship and (2) complementary educational programs in management and/or entrepreneurship (e.g. internships) or education trainings through: (1) competitions and hackathons and (2) intensive short-courses among

others (Athayde, 2009; Charney & Libecap, 2000; DeTienne & Chandler, 2004; Harris, Gibson, & Taylor, 2008). To fully understand the impact of an EET intervention, person, context, and pedagogical indicators relevant to the zeitgeist of the study is necessary (Nabi et al., 2017).

Considering educational psychology theory first posited by Thorndike and Woodworth (1901), the transfer of learning is significantly influenced by the perceived relevance of content taught. In that respect, conducting an EET training for nascent entrepreneurs and (already) entrepreneurs makes sense as an appropriate learning approach since it is contextually “near” to the target audience (Haskell, 2001; Barnett & Ceci, 2002). This is consistent in current EET literature as most interventions engage individuals who are already taking preparatory steps towards entrepreneurship, or at the very least, develop entrepreneurial qualities and characteristics. However, that also implies that teaching EE to a broader audience (that may not be interested in pursuing an entrepreneurial career) may be less effective, as the content material could be considered to be “far” or father (irrelevant, less relevant) from the many different participants’ application situations.

Given this, there is an opportunity to contribute to the body of literature that specifically looks at the “true latent entrepreneurs”, following Gohmann’s (2012) definition that describes individuals who prefer to be self-employed but are not currently self-employed or actively working towards that status. This investigation focuses on this group of individuals and understanding how a broader audience can be reached to consider self-employment as a legitimate career choice. As past research on EET has mainly assessed the effectiveness of training among groups immediately interested in entrepreneurship, or business, or out of necessity, this study views Maker Trainings, and the development of Maker Skills among participants, as an alternate and contextually *nearer* intervention to traditional EET that can potentially engage a much broader audience who are not (yet) directly interested in an entrepreneurial career.

INSERT TABLE 1 HERE

The Maker Movement is as a catalyst for latent entrepreneurs and opportunity-driven ventures. The Maker Movement has been defined as “consisting of people utilizing technology to collaborate in creating tangible, material artifacts.” (cf. Anderson 2012;

Browder, Aldrich, & Bradley, 2017). This community practice of collaborating creates tangible, material artifacts, as “made with skill” referring to the original Latin meaning of the word. There are three key dimensions that the Maker Movement provides access to: (1) Technology, referring to hardware tools (e.g. 3D printers) that allow fabrication, production, and manufacturing; (2) Community, referring to maker, hackers, and tinkerers who collaborate and share technologies and designs with each other; and (3) Space, referring to a physical set-up where the Maker Movement community can collaborate together - these are sometimes called makerspaces and fabrication (fab) labs (Browder et al., 2017; Mortara & Parisot, 2016). Maker Movements rapidly accelerate the act of “making” artifacts through collaboration, rapid prototyping, and learning by doing (Levy, 2001). The act of making is defined as:

“Constructing activities and related ways to fabricate real and/or digital things using technological resources, including fabrication, physical computing, and programming. Making focuses on the process that occurs in an environment that is not always merely learning oriented, but promotes design thinking, computational concepts, collaborative work, and innovation, among other things.” (Papavlasopoulou, Giannakos, and Jaccheri, 2017: p. 58)

The three dimensions serve as the foundations of the Maker Movement and allow for increased access to the process of making. Theorists describe the Maker Movement as a democratization of access to information on using tools for making (Van Holm, 2015) and entrepreneurship itself (Aldrich, 2014). As makers create new products that are useful to their immediate environments (Papavlasopoulou et al., 2017), the shift from simply making, referred to as *hobbyists*, to individuals that develop entrepreneurial intent, referred to as *lifestyle entrepreneurs*, is natural (Bowder et al., 2017).

Although there is sparse literature on the connection between making and entrepreneurship, the process of making itself is a conceptually nearer pedagogical approach to entrepreneurship for individuals with no specific interest for entrepreneurship to transition towards latent entrepreneurship, compared to EETs. The study aims to contribute to the stream of research that examines the impact of Maker Movements, specifically Maker Trainings, on the development of entrepreneurs by encouraging individuals with no specific desire for self-employment to develop into latent entrepreneurs. Three separate training interventions were conducted in India in 2014 to test this.

HYPOTHESES

Our research model aimed at explaining the temporal effects of Maker Training includes three main hypotheses. Many other EET studies (Martin et al, 2013) found a positive impact on developing the participant's human capital assets. Similarly, we hypothesize a positive impact of the Maker Training on the latent entrepreneur's self-efficacy in maker skills and entrepreneurial activities to increase. Hence:

H1: The Maker Training positively affects the self-efficacy in maker skills and in entrepreneurial activities among young latent entrepreneurs

Second, the positive effect of entrepreneurial training is known to have a temporal component (Gielnik et al., 2017). Similar to the study from De Mel et al. (2014), the effect on human capital is strongest immediately after the training. Then after the initial boost, without rehearsal or repetition, the training effect slowly wears off, because lack or limited application leads to memory failure and forgetting, as empirically shown by Ebbinghaus (1885; Loftus, 1985). Over time, the training loses its effectiveness among the latent entrepreneurs. Hence:

H2: The positive effect of Maker Training on the self-efficacy in maker skills and in entrepreneurial activities is strongest at the beginning and lessens over time.

Third, the loss in impact of the Maker Training over time on Maker Skills and ESE is however dependent on advocacy behaviors undertaken by participants after the workshop. Repeated practice to promote the Maker Skills and Entrepreneurial activities among people in her own social network has participants rehearse the material. Teaching learnt material has shown to have a positive pedagogical impact, according to several education studies (Heinrich, 2007; Martin, 1985; Aslan, 2015). This sort of rehearsal as a form of post-training processes, is expected to make the Maker Training impact last longer. We therefore hypothesize:

H3: The loss of the effect of Maker Training on self-efficacy in maker skills and entrepreneurial activities is reversed by the intensity of advocacy behaviors.

INSERT FIGURE 1 HERE

DATA AND MEASUREMENT OPERATIONALIZATION

The data was collected in three waves: first at three engineering colleges, before and after the interventions, and then 4 years later via online reaching out to the participants. The first college was in Trivandrum, Kerala (52 respondents). The second was in Muzaffarnagar (49 respondents), and the third in Warananagar, Kolhapur, in the state of Maharashtra, India (29 respondents). We used a longitudinal pre-post design with three measurement waves (T1, T2, and T3) over a period of 48 months. The first measurement wave (T1) took place in the month before the training. The second measurement wave (T2) took place in the month after the training. The third and final measurement (T3) took place 48 months after the training.

Sample. The first intervention was at Mar Baselios College of Engineering and Technology in Trivandrum, Kerala State. The college was chosen specifically because Trivandrum is significantly smaller than other major Indian metropolises and the college itself is not one of the nation's top tier academic institutions. The second was an eighteen-day workshop, focused on the local industries and rural problems, in Shri Ram Group of Colleges in Muzaffarnagar, Uttar Pradesh. This college saw its first batch of graduates in the summer of 2014. The third site was at TKIET, Tatyasaheb Kore Institute of Engineering & Technology, then 31 years old institution in the city of Kolhapur. The population of Trivandrum is 1 million and that of both Muzaffarnagar and Kolhapur are about 500,000; in comparison, the population of other major cities in India varies from 5 million to 13 million.

In the workshop, students learned to identify and evaluate problems/opportunities with societal impact and financial gain, ideate and fabricate solutions, and develop and pitch business plans. This process was repeated to develop team chemistry and confidence in the innovation process and their entrepreneurial capabilities.

INSERT TABLE 2 HERE

Measurements. Table 3 shows the descriptive statistics and the correlations among the variables under study. The first wave of questionnaires (T1) contained general questions on socio-economic background, like household size, relative family income, education history of parents, social exposure to starting a business. The third wave of questionnaires (T3) contained measures on the career path taken and on the Advocacy Behaviors. All three questionnaires included measures for the main constructs of study. Additionally, we tested the reliability of the multi-item measurement scales used.

INSERT TABLE 3 HERE

Self-Efficacy in Maker Skills (SMS). The first direct objective of Maker Trainings and the Maker Movement is to stimulate and promote so-called “Maker Skills”, i.e., the capacity of creating something (Browder et al., 2017). Following Bandura (1977), we asked the participants to self-report their self-efficacy in this respect. Self-efficacy can be understood as a person’s confidence in their own ability to perform a specific task. For Making Skills, we used three items: (1) How good are you with making things with locally available materials? (2) How good are you with providing new services for the local market? and (3) How is your capability to invent and design new products or services?

Entrepreneurial Self-Efficacy (ESE) is the second main construct of study. ESE has been receiving increasing attention in the literature (Chen et al 1998; Boyd and Vozikis 1994; Kasouf et al 2013 Lucas & Cooper 2005; Vanevenhoven & Liguori 2013; Zhao et al 2005). Similarly to Maker Skills, self-efficacy in entrepreneurial or gestation activities also follows Bandura (1977)’s format of self-reported measuring. In previous studies, ESE has found to strongly correlate to new venture creation (Zhao et al 2005) and is thought to be a strong predictor of intentions and actions (Boyd and Vozikis 1994). ESE also provides a legitimate and robust construct that can be used to evaluate entrepreneurial education (Chen et al 1998; Lucas & Cooper 2005; Vanevenhoven & Liguori 2013). The 10 item-scales used in the study contains three items on Opportunity Recognition, ($\alpha > .81$ for all T1, T2 and T3), four items on Opportunity Creation (team management) ($\alpha > .91$ for all T1, T2 and T3), and three items on Risk Management ($\alpha > .86$ for all T1, T2 and T3).

Intention to create a new business; the third dependent variable of the research model on the impact of Maker Training is the intention to create a new business. We employed a one-item measurement to gauge the participants’ intention to begin a new firm.

Advocacy Behaviors (Ripple Effect); the ripple effect of the training is essentially an effect that goes beyond directly impacting the workshop participants. The ripple effect (or spillover effect) of the training is made possible by spreading the learnings from the workshop training to people in their own social networks. Passing on Maker Skills and inspiring others to become more entrepreneurial is exhibited by the following four advocacy behaviors by participants: (1) sharing the workshop experience in person-to-person communications (e.g., face-to-face, messaging); (2) demonstrating the workshop experience in a group session (e.g., lectures, networking sessions), (3) helping others on their new venture, and (4) engaging further by mentoring and/or investing into the nascent entrepreneurs.

RESULTS

Table 4 presents the results of the paired tests on the study variables. The table shows that the Maker Training has an immediate positive effect on the Self-efficacy in maker skills ($m=5.14$ for T1; $m=6.26$ for T2; and $m=6.33$ for T3), and the self-efficacy in entrepreneurial activities ($m=5.96$ for T1; $m=7.45$ for T2; and $m=6.99$ for T3). Furthermore, the intention to start a business and think about self-employment also gets a positive impulse ($m=4.78$ for T1; $m=5.60$ for T2; and $m=6.82$ for T3). With all after-workshop scores significantly higher than the pre-workshop T1 scores, we therefore accept hypothesis 1 as the effect of the Maker Training is positive.

The table also shows that overall the Maker Training effect weakens: while the efficacy in maker skills does not grow further over time ($t=+.119$, $p=.906$), the self-efficacy in entrepreneurial activities even declines (paired- $t=-2.345$; $p=.022$). Still the level of ESE is greater than it was before the training (paired- $t=+4.152$; $p<.001$). We therefore accept hypothesis 2 as the effect of the Maker Training weakens over time.

INSERT TABLE 4 HERE

Table 5 shows the result of testing the moderation effect of Advocacy Behaviors of participants on the training impact, in terms of SMS, ESE and BI. We use a median-split to

divide the group into two. The first half had exhibited lower than average/median of advocacy behaviors; and the second half had

As Table 5B shows, all three effects of the Maker Training persists for the group of participants who have been intensively advocated their maker skill learnings: higher self-efficacy in maker skills ($m= 6.88$ for high advocacy; versus $m=5.78$ for low advocacy), higher self-efficacy in entrepreneurial skills ($m= 7.61$ for high advocacy; versus $m=6.41$ for low advocacy), and higher intension to establish a business ($m= 7.85$ for high advocacy; versus $m=5.79$ for low advocacy) We therefore accept hypothesis 3.

INSERT TABLE 5 HERE

Table 6 examines the relationship between Ripple Effect and various impact measures of Maker Training in an OLS framework. Columns (1) and (2) examines the impact on the Maker Skills (SMS). Confidence in Maker Skills before the training and advocacy behaviors after the training have statistically significant effects on the Maker Training impact. Both estimates are statistically significant at the 5 percent level. Self-efficacy prior to the training reduces the impact of the training ($b=-.918$; $p<.001$), advocacy behaviors increases it ($b=+.919$; $p<.026$). Similar patterns in the effects are found for the training impact on ESE and BI (columns 3 to 6). The OLS regressions in Table 6 all control for gender, year of study, family household size, family income status, and family self-employment.

INSERT TABLE 6 HERE

DISCUSSION

The growth of the Maker Movement has been tremendous. Well illustrated by the establishment of nearly 1,400 active Maker Spaces worldwide in the past decade. That is 14 times as many as in 2006 (Lou and Peek, 2016). Browder, Aldrich and Brandley (2017) view “... the maker movement [h]as a powerful potential as a mechanism for innovation and entrepreneurial action on a societal scale.”

As such, increasingly, Maker Training is seen as a tool aiming to develop talent among the youth. To the best of our knowledge this study is the first to examine whether Maker Trainings can actually help to stimulate opportunity-driven entrepreneurship among a group that mostly have hardly considered self-employment as a career choice; and how “natural” the shift from simply making to developing entrepreneurial intent is (Browder, et al., 2017). By doing so, this paper contributes to the still-limited literature connecting makers and entrepreneurship with notable exceptions like Aldirch (2014), Mortara & Parisot (2016).

Specifically, this research set out to test whether suchlike Maker training interventions are effective in building human capital and developing entrepreneurial intent. Furthermore, we have investigated how long the impact lasts and whether the Ripple Effect embodied by participants’ advocacy behaviors strengthens and extends the training impact. We find support for all three hypotheses and the Ripple Effect has clear implications for the management of post-training processes.

Limitations. We are aware of some of the limitations in this study. Unfortunately, no control group measurements were conducted before the workshop. Participants voluntarily participated in the training and therefore we cannot exclude the influence of self-selection, mortality and maturation biases. To research and uncover the potential influence of these biases, we are currently collecting data on a comparison group of people who studied at the same colleges but did not take the training.

Future Research. This study illustrated the importance of post-training processes, such as the Ripple Effect of sharing, demonstrating, helping and engaging. For when we roll out the Maker Training study on a national level in India, one of our objectives will be to influence (control) and measure the advocacy behaviors (Ripple Effect) of the Maker Training participants and diffusion of maker skills through their social networks.

FIGURE 1: RESEARCH MODEL OF TRAINING IMPACT AND RIPPLE EFFECT

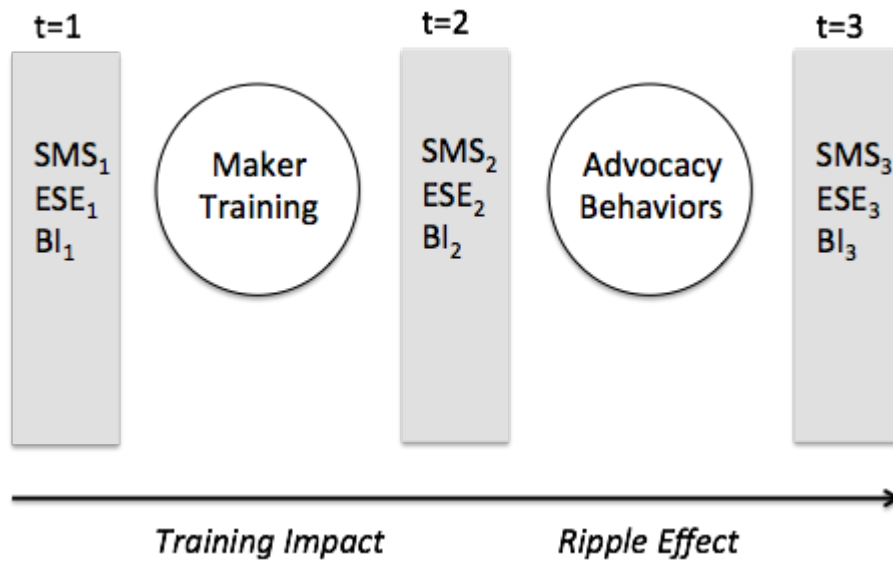


TABLE 1: EET STUDIES AND AUDIENCE TYPES

EET TYPE	STUDY	E	NE	LE	Nature Treatment Sample	Age	Gender (female)	Country / Area
Academic	Charney & Libecap, 2000:		Y		Entrepreneurship alumni (n = 105) (undergraduate and master) versus Non-entrepreneurial alumni (406)	not provided	not given	not given
Academic	DeTienne & Chandler, 2004:		Y	Y	Senior-level undergraduates enrolled in a strategic management class (n = 130)	24 (mean), average jobs of 2.9 (longer than 3 mos)	not given	no data
Academic	Fayolle, Gailly, & Lassas-Clerc, 2006:		Y	Y	Undergraduate students in a French engineering school	23 (mean)	not given	France
Academic	Cooper, Durand, & Lucas, 2007:		Y		48 high-school and university students from Scotland and USA	not provided	not given	Scotland and USA
Academic*	Mentoor & Friedrich, 2007		Y	Y	New first year students from a university in South Africa (n = 436) Control = 43, Business Com (general) = 277, Business Administration = 52, Business Com (Accounting) = 89	not provided	not given	South Africa
Academic	Harris, Gibson, & Taylor, 2008:		Y		Undergraduate students from Northeast, Southeast, Southwest, Midwest USA (n = 358)	not provided	51.40%	USA
Academic	Athayde, 2009		Y		High School students (n = 249); Private (122), State schools (135)	15-19 years	51%	UK
Academic	Oosterbeek, van Praag, IJsselstein, 2010:		Y		Undergraduate students (n = 250 final sample)	20 (median)	45%	Netherlands
Academic	Fayolle & Gailly, 2015:		Y	Y	Masters Students taking entrepreneurship courses (n = 275)	25 (mean)	not given	France
Training	Miron & McClelland, 1979	Y			Small business owners from three different trainings (n = 146; SMU = 23, 14% college graduates; SBA = 107, 15% college graduates Pep Up = 16, 35% college graduates)	SMU median: 40 SBA median: 40 Pep Up median: 35	not given	USA
Training	Chrisman & McMullan, 2004:	Y			Pennsylvania Small Business Development Center Clients (28.5% bachelors, .6% less than HS, 13.3% some college, 9.5% 2-year degrees, 17.1% masters, 5.1% PhD)	Avg. business age = 5.2	not given	USA
Training	Cruz, Escudero, Barahone, & Leitao, 2009:	Y			Entrepreneurs (owners and managers, n = 354); 5 or more employees; 28.8% higher vocation, 27.6% first level vocation, 21.2% bachelors, 14.5% first level finished, 7.9% MBA/PhD	42 (median) (19-70)	16%	n.a.
Training	de Mel, McKenzie, & Woodruff, 2013:	Y			Women business owners (n = 800); profits below 10,000Rs; at least one child; over ten years of education	36 (mean)	100%	n.a.

EET TYPE	STUDY	E	NE	LE	Nature Treatment Sample	Age	Gender (female)	Country / Area
Training	Peterman & Kennedy, 2013		Y		Students from schools in Queensland with the Young Achievement Australia (YAA) program. (n = 236) Treatment (n = 117), Control (n=119) Micro-entrepreneurs who are clients of microfinance institutions in two locations (n = 239)	Median age = 16 (15-18), same for control and treatment	62%	Australia
Training	Karlan & Valdivia, 2006		Y		Ayacucho: n = 55 mandatory treatment group (required for training) n = 34 voluntary treatment group (required for training only until loan was paid) n = 51 control (no services beyond normal credit program) Lima n = 49 mandatory treatment n = 50 control	not provided	not given	Peru
Training	Berge et al, 2015:		Y		Micro-entrepreneurs (typically 1 employee), 8 years of schooling	38 (mean)	70%	Kenya

*Note: E = Entrepreneurs, NE = Nascent Entrepreneurs, LE = Latent Entrepreneurs; *We reclassified the Mentoor & Friedrich study as an academic program, as it concerns a course module of over 100 hours of study time.*

TABLE 2: SAMPLE DESCRIPTION

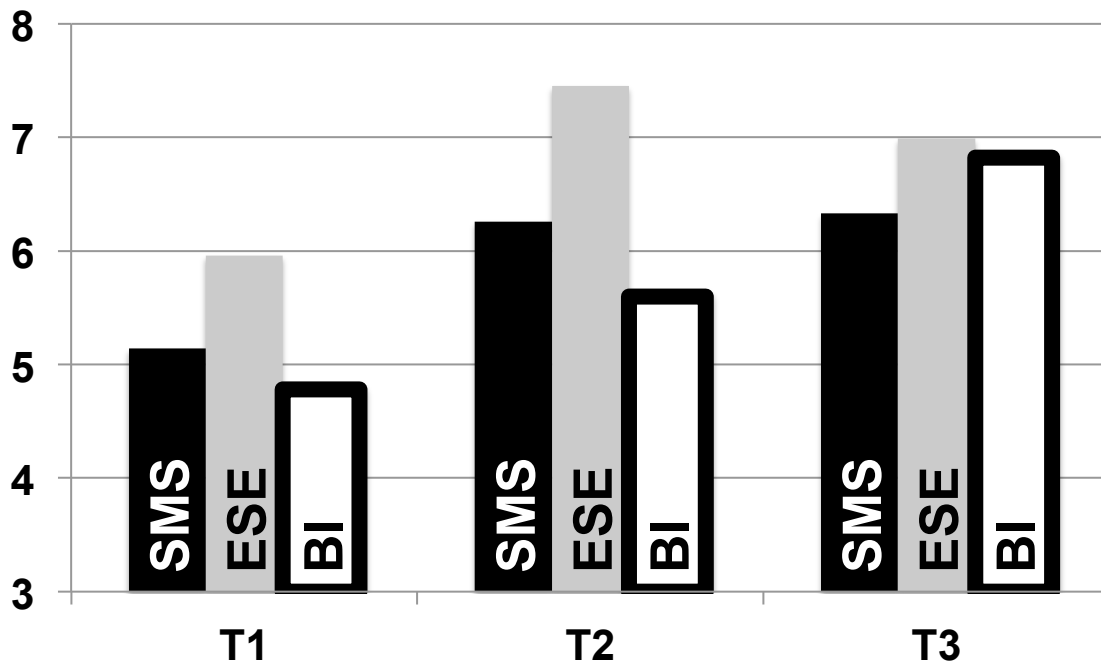
	Total Sample (n = 130)	Wave 3 (n = 69)	Test-value (p-value)
Gender (female %)	44.6%	30.6%	$\chi^2 = 12.789 (.00)$
Age	19.75(.997)	23.71(.956)	$t = .579 (.56)$
Year of Study at Start			
First Years	10.8%	12.5%	$\chi^2 = 2.925 (.40)$
Second Years	26.2%	23.6%	
Third Years	45.4%	50.0%	
Fourth Years	17.7%	13.9%	
Family Size			
Household Size	4.47(1.34)	4.29(.96)	$t = 1.66 (.10)$
Siblings	1.45(1.07)	1.29(.94)	$t = 1.91 (.06)$
Annual Family Income			
Top 25% group	2.0%	-%	$\chi^2 = 5.439 (.25)$
25-50% group	40.8%	48.1%	
50-75% group	42.9%	40.7%	
Bottom 25% group	14.3%	11.1%	
Parents' Highest Education			
High School	25.0%	19.6%	$\chi^2 = .506 (.41)$
Diploma	1.0%	1.8%	
Bachelor degree	29.0%	33.9%	
Master degree	33.0%	32.1%	
PhD degree	1.0%	-%	
Professional (Engg, Medicine, Law)	11.0%	12.5%	
Social exposure to Business in Family			
Started a business	49.2%	47.22%	$\chi^2 = .508 (.48)$
Business conversations at home	3.7(2.73)	3.62(2.81)	$t = .349 (.73)$

TABLE 3: DESCRIPTIVES AND CORRELATIONS

	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) Gender	.554	.499																	
(2) Age	19.750	.997	-.035																
(3) Year of Study	2.700	.886	-.112	.697**															
(4) Household Size	4.470	1.335	-.076	-.195*	-.133														
(5) Number of Siblings	1.450	1.074	-.050	-.218*	-.220*	.706**													
(6) Annual Income Family	2.690	.738	-.024	-.123	-.146	.076	.090												
(7) Family Business Business Conversations in	.500	.502	-.047	.040	-.018	.078	.113	-.118											
(8) Family	3.700	2.728	-.025	.047	-.125	.204*	.150	.042	.259**										
(9) SMS T1	4.973	2.319	.166	.007	-.120	.129	.129	-.032	.073	.414**									
(10) SMS T2	6.265	2.183	.255**	.192*	.190*	.102	.070	-.050	.023	.247**	.456**								
(11) SMS T3	6.331	2.168	.392**	.109	.073	-.103	-.082	.193	-.015	.051	.250*	.343**							
(12) ESE T1	5.824	1.839	.183*	-.086	-.287**	.098	.100	.035	.098	.325**	.579**	.098	-.047						
(13) ESE T2	7.276	1.589	.244**	.153	.128	.151	.082	-.002	.103	.183*	.174	.640**	.335**	.171					
(14) ESE T3	6.993	1.651	.332**	-.057	-.183	.088	.115	.177	-.133	.085	.165	.270*	.623**	.151	.478**				
(15) BI T1	4.202	3.118	.078	-.007	-.148	-.091	-.111	-.158	.033	.358**	.332**	.125	.001	.353**	.206*	.130			
(16) BI T2	5.169	2.920	.238**	.020	-.010	.015	.020	.151	-.083	.093	.150	.248**	.130	.053	.468**	.220	.425**		
(17) BI T3	6.824	2.833	.361**	.092	-.011	.105	.158	.030	-.035	.178	.280*	.269*	.510**	.095	.287*	.596**	.280*	.281*	
(18) Advocacy Behaviors	1.834	.785	.360**	-.024	-.069	.099	.194	.304*	-.175	-.029	.217	.329**	.442**	.109	.249*	.511**	.077	.215	.442**

TABLE 4: ANALYSIS OF THE TRAINING IMPACT

	t=1 (pre-workshop)		t=2 (post-workshop)		t=3 (48 months later)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Self-Efficacy in Maker Skills (SMS)	5.14	(2.29)	6.26 ^a	(2.23)	6.33 ^a	(2.17)
Self-Efficacy in Opportunity Identification	5.41	(1.85)	7.16	(1.49)	6.61	(1.83)
Self-Efficacy in Opportunity Creation	7.02	(1.95)	7.96 ^b	(1.43)	7.95 ^b	(1.77)
Self-Efficacy in Risk Assessment	5.50	(1.60)	7.12	(1.55)	6.42	(1.93)
Entrepreneurial Self-Efficacy (ESE)	5.96	(1.57)	7.45	(1.42)	6.99	(1.65)
Intention to start a business (BI)	4.78	(3.12)	5.60	(2.81)	6.82	(2.82)



Note: The two pairs of values sharing the same superscripts are not statistically significantly different: ^a paired t=.119; p=.906; ^b paired t=.470; p=.640). All other differences are statistically significant (paired-t values > 3.470; p<.001).

TABLE 5A: DESCRIPTIVE STATISTICS OF THE RIPPLE EFFECT

			Low Intensity Advocacy Behaviors		High Intensity Advocacy Behaviors	
	Mean	(S.D.)	(n ₁ = 33)		(n ₂ = 34)	
			Mean	(S.D.)	Mean	(S.D.)
<i>Sharing</i>						
Face-to-face	0.925	0.265	0.848**	0.364	1.000**	-
Email	0.299	0.461	0.121***	0.331	0.471***	0.507
Blogging	0.105	0.308	0.061	0.242	0.147	0.359
Messaging	0.836	0.373	0.697***	0.467	0.9706***	0.172
Others	0.463	0.502	0.303***	0.467	0.6176***	0.493
Average	0.525	0.196	0.4061***	0.177	0.6412***	0.137
<i>Demonstrating</i>						
Lectures	0.224	0.420	0.030***	0.174	0.412***	0.500
Networking	0.209	0.410	0.030***	0.174	0.382***	0.493
MakerFests	0.299	0.461	0.061***	0.242	0.529***	0.507
Others	0.493	0.504	0.333***	0.479	0.647***	0.485
Average	0.306	0.281	0.114***	0.141	0.493***	0.257
<i>Helping</i>						
Ideas Generation	0.925	0.265	0.849**	0.364	1.000**	-
Prototyping	0.627	0.487	0.485**	0.508	0.765**	0.431
Validating	0.612	0.491	0.455***	0.506	0.765***	0.431
Other	0.731	0.447	0.546***	0.506	0.912***	0.288
Average	0.724	0.265	0.583***	0.291	0.860***	0.140
<i>Engaging</i>						
Mentoring	0.418	0.497	0.091***	0.292	0.735***	0.448
Investing	0.105	0.308	0.030	0.174	0.177	0.387
Other	0.313	0.467	.000***	-	0.618***	0.493
Average	0.279	0.326	0.040***	0.110	0.510***	0.299
<i>Advocacy Behaviors</i>	1.834	0.785	1.143***	0.375	2.503***	0.398

*p<.10; **p<.05; ***p<.01

TABLE 5B: MODERATION ANALYSIS OF THE RIPPLE EFFECT

		Total		Low Intensity Advocacy Behaviors		High Intensity Advocacy Behaviors	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
SMS	T1	5.14	2.29	4.89	2.44	5.42	2.11
	T2	6.26	2.23	5.89	2.21	6.68	2.22
	T3	6.33	2.17	5.78**	2.36	6.88**	1.83
ESE1	T1	5.96	1.57	5.81	1.61	6.13	1.54
	T2	7.45	1.42	7.27	1.35	7.65	1.49
	T3	6.99	1.65	6.41***	1.74	7.61***	1.32
BI	T1	4.78	3.12	4.21	3.00	5.41	3.18
	T2	5.6	2.81	5.11	2.90	6.15	2.64
	T3	6.82	2.82	5.79***	2.95	7.85***	2.32

*p<.10; **p<.05; ***p<.01

TABLE 6: OLS REGRESSIONS OF MAKER TRAINING IMPACT ON THE RIPPLE EFFECT

	<i>DV</i> <i>Impact SMS (delta SMS T3 – SMS T1)</i>				<i>DV</i> <i>Impact ESE (delta ESE T3 – ESE T1)</i>				<i>DV</i> <i>Impact BI (delta BI T3 – BI T1)</i>			
	<i>B</i>	<i>S.E.</i>	<i>B</i>	<i>S.E.</i>	<i>B</i>	<i>S.E.</i>	<i>B</i>	<i>S.E.</i>	<i>B</i>	<i>S.E.</i>	<i>B</i>	<i>Std. Error</i>
(Constant)	-1.927	2.907	.922	2.13	-1.245	2.518	4.63**	2.219	8.166**	3.589	-2.736	3.011
SMS at T1			-.918***	.137								
ESE at T1							-1.028***	.180				
BI at T1											-.618***	.113
Rippling Effect			.919**	.397			1.145***	.340			1.445***	.501
Gender (Male = 1)	1.489*	.861	1.837***	.668	1.106	.764	.871	.612	1.685	1.056	1.127	.870
Year of Study	-.09	.476	.222	.339	-.117	.440	-.32	.322	1.172*	.592	.692	.458
Household Size	.105	.444	.059	.311	.518	.444	.264	.317	1.195**	.551	.609	.415
Family Annual Income	.454	.631	.276	.444	-.257	.550	-.176	.393	.390	.774	-.096	.573
Family Self-Employment	.665	.802	.868	.582	-.077	.687	.095	.516	-.303	.977	.679	.755
Adjusted R-square	.025		.525		-.023		.485		.135		.535	
N	48		48		47		47		49		49	

Note: *p<.10; **p<.05; ***p<.01