

The Ripple Effect of Maker-Training Impact: A Longitudinal Study among Young Latent Entrepreneurs in Rural India

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Abstract

Entrepreneurship Education and Training (EET) is the most used pedagogical approach used to increase the skills of aspiring and active entrepreneurs (Martin, McNally, & Kay, 2013). This research focuses on a different group, a broader and younger audience from underserved communities of which some are latent entrepreneurs who have not considered entrepreneurship as a future career path. The value of EET diminishes for latent entrepreneurs since EETs are conceptually too far from their context (Lichtenstein & Lyons, 2001). The study investigates the impact of Maker Training, as an alternative and more conceptually close course, on human capital assets. The ripple effect of the training is observed, referring to the spreading of workshop lessons to non-participants in training sites. Pre- and post-tests are administered (2014) to understand the immediate impact on 130 participants. Four years later, the same participants partake 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.

Initial analyses reveal that the Maker Training positively impacted self-efficacy in maker skills, self-efficacy in entrepreneurial activities, and entrepreneurial intention. The study also illustrates the importance of post-training processes, such as the Ripple Effect of advocacy behaviors.

Keywords

Entrepreneurship Education and Training, Maker Education, Social Networks, Longitudinal Study, Pre-entrepreneurship

1 Introduction

Several researchers in the field of entrepreneurship believe that everyone has the potential to become an innovator and entrepreneur through building skillset and confidence to venture out of one's comfort zone, and initiative and resourcefulness to pursue a vision. The Zero to Entrepreneur (Z2E) framework, a learning methodology that Rajesh Nair developed at MIT as part and used in nearly 60 workshops conducted in 7 countries for more than 2,700 learners is used to create a critical mass of Pre-Entrepreneurs, with the right mindset and skillset for entrepreneurship, who in turn build sustainable ecosystems. Figure 1 is a visual representation of this approach which focuses on five key stages:

- **ZERO:** the majority of uninitiated youth, with unrecognized potential, pursuing an ostensibly steady job
- **MAKER:** the creative thinker and doer, one who thinks outside safe spaces, connects disparate ideas, and designs and makes things.
- **INNOVATOR:** a problem solver who can synthesize observations, and interactions to identify unmet community/human needs, and create and validate desirable solutions for social impact or financial gain.
- **ENTREPRENEUR:** The value creator who converts a problem into a commercial opportunity through creating an organization, a team, suppliers, and sales channels, all from resources that she did not possess.
- **ECOSYSTEM:** building a vibrant community, consisting of makers to entrepreneurs as role models and mentors, that attracts new candidates and nurtures them through their developmental process of becoming a Pre-Entrepreneur.

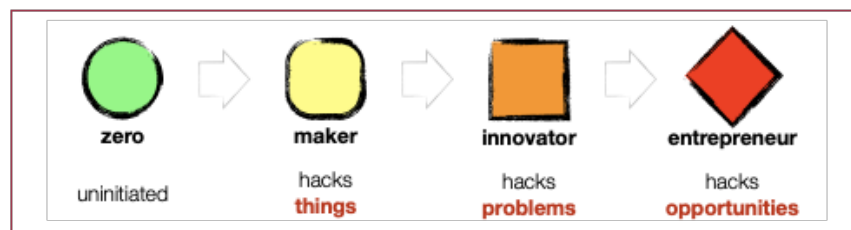


Figure 1: Zero to Entrepreneur Framework

Our study uses the lens of the Z2E framework as an alternative training approach for the uninitiated using Maker Trainings as a vehicle for learning, which is contextually closer to the discipline of entrepreneurship. Nurturing a critical mass of entrepreneurs is underpinned by the desire of communities to achieve inclusive growth. Entrepreneurship plays a key role in bridging this gap given its impact on job generation, diversifying access to income opportunities, and unlocking the innovation and creative potentials of individuals (Audretsch & Fritsch, 2003; George, McGahan, & Prabhu, 2012).

Today, we see that Entrepreneurship Education and Training (EET) is the most prominent approach adapted by different governments and educational institutions to “create more entrepreneurs”. EET theory assumes that individuals with more human capital are more able, therefore more likely, to take advantage of productive enterprising activities (Davidsson & Honig, 2003). EETs however often focus on very specific audiences: nascent and active entrepreneurs. This leaves a broader and equally capable mass of individuals who could otherwise also pursue entrepreneurial paths, but are unable to do so due to the disconnect prominent in EETs.

This study is the first to focus on the impact of Maker Trainings, as an alternative EET to engage a broader, younger, and equally capable audience who have hardly considered entrepreneurship as a future career path. 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 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.

2 Relevant Literature

2.1 Enterprise Education and Training for Nascent and Active Entrepreneurs

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 predominantly 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.

Enterprise Trainings are short interventions that focus on core entrepreneurship knowledge and skills, and audiences typically tend to be either nascent entrepreneurs or active 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 focuses on pedagogical methodologies appropriate for nascent entrepreneurs or active 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).

The transfer of learning educational psychology theory conceptualized by Thorndike and Woodworth (1901) says that one's learning is significantly influenced by the perceived relevance of subject material taught. In that respect, conducting an EET training for nascent entrepreneurs and active entrepreneurs is an appropriate learning approach since it is contextually “near” to the target audience (Haskell, 2001; Barnett & Ceci, 2002). However, that also implies that teaching EET to a broader audience (that may not be interested in pursuing an entrepreneurial career) may be less effective, as the content material could

considered to be “far” or father (irrelevant, less relevant) for individuals who have no immediate intention to pursue entrepreneurship.

There is an opportunity to contribute to the body of literature that specifically looks at those who are uninitiated, closer to the concept of 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. Past research on EET assessed the effectiveness of interventions among groups immediately interested in entrepreneurship, or business. Our study views Maker Trainings, and the development of Maker Skills among participants, as an alternate and contextually nearer approach that can engage a much broader audience who are not yet directly interested in an entrepreneurial career.

2.2 Maker Trainings for the “Uninitiated” Entrepreneurs

The Maker Movement is as a catalyst for latent entrepreneurs. This refers to: “consisting of people utilizing technology to collaborate in creating tangible, material artefacts.” (cf. Anderson 2012; Browder, Aldrich, & Bradley, 2017). There are three key dimensions to the Maker Movement: (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 – sometimes called fabrication (fab) labs (Browder et al., 2017; Mortara & Parisot, 2016). Maker Movements rapidly accelerate the act of “making” artefacts through collaboration, rapid prototyping, and learning by doing (Levy, 2001).

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 (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.

3 Hypotheses

Our research model aims to explain the temporal effects of Maker Training and includes three main hypotheses. 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 reputation, 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 entrepreneurial self-efficacy 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 their 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.

4 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.

4.1 Sample.

The first intervention was at Mar Baselios College of Engineering and Technology (MBCET) 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 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.

	Total Sample (n = 130)	Wave 3 (n = 69)	Test-value (p-value)
Gender (female %)	44.6%	30.6%	$\chi^2 = 12.789 (<.01)$
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 1: Sample Description

4.2 Measurements

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.

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 her/his 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.

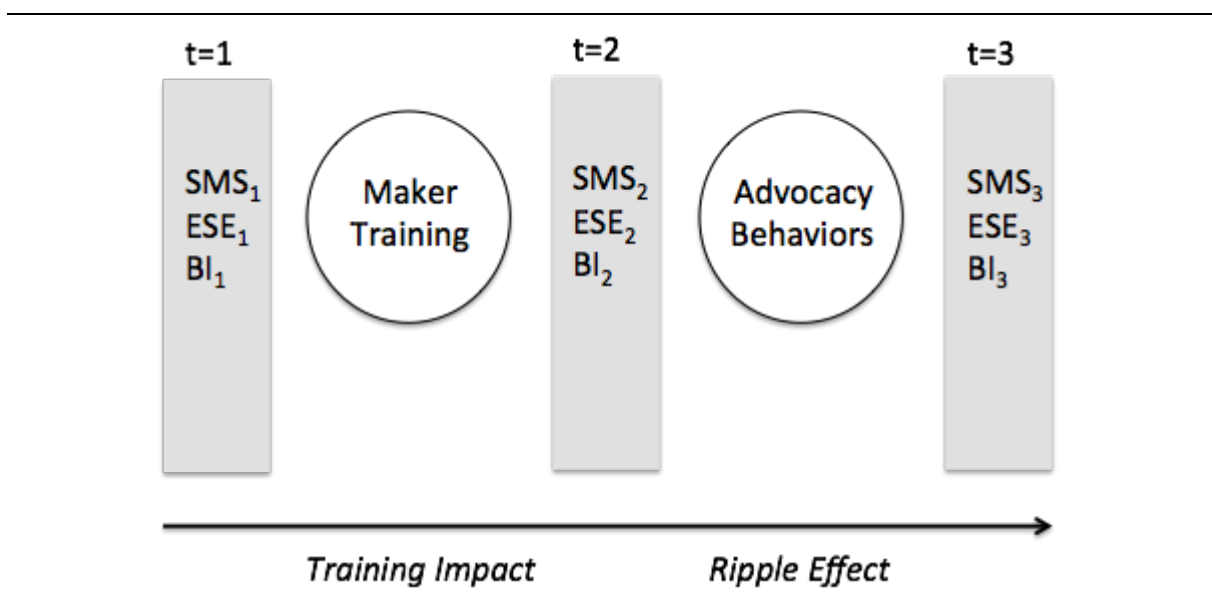


Figure 2: Research Model of Training Impact and Ripple Effect

5 Results

Table 2 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.

	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)

Table 2: Analysis of the Training Impact

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 higher than the average/median.

	Low Intensity Advocacy Behaviors				High Intensity Advocacy Behaviors	
	(n ₁₊₂ = 67)		(n ₁ = 33)		(n ₂ = 34)	
	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)
Sharing						
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
Demonstrating						
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
Helping						

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
Engaging						
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
Advocacy Behaviors	1.834	0.785	1.143***	0.375	2.503***	0.398

Table 3: Descriptive Statistics of the Ripple Effect

As Table 6 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.

		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

Table 4: Moderation Analysis of the Ripple Effect

5.1 Case highlight: Mar Baselios College of Engineering and Technology

Recently, the team revisited one of the intervention sites, MBCET, to conduct a qualitative study inquiring about the progress of students who underwent the training since 2014. Figure 3 reveals the most striking finding that supports the hypothesis of this study related to the ripple effect. This reveals that among the 52 students who participated in the intervention 21 startups were created over four years reaching out to 24 other students who had not participated in the intervention, but either joined enterprising activities of intervention participants or pursue a business of their own. Ten startups emerged in the year of the intervention primarily by the participants in the program (orange in Fig 3) with a few non-participants. Eight of these ventures closed in the same year. The participants starting ventures started including more non-participants in their start-up teams. The college administration supported by establishing a design center to nurture innovators and entrepreneurs. Before this intervention in 2014 MBCET had one student start-up in the previous twelve years since its establishment.

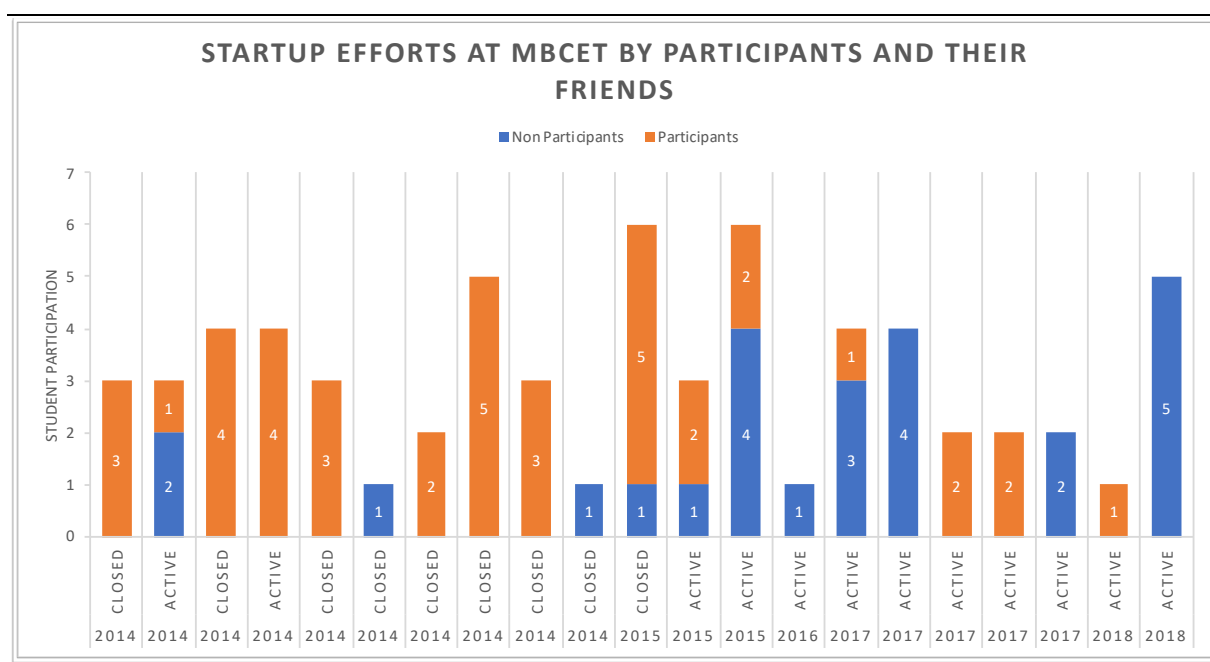


Figure 3: Startup Efforts by MBCET graduates

6 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 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 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.

6.1 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.

6.2 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. There is also opportunity to dive deeper towards nuanced studies that further dissect human capital concepts that Maker Trainings impact complemented by more rigorous methodologies to strengthen analysis.

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