

Who Needs Entrepreneurial Role Models? Driving Forces of Students' Cyber-Entrepreneurial Career Intention

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ABSTRACT

Cyber-entrepreneurship has become an important topic of debate in academia primarily because of an increasingly competitive nature of E-commerce industry and internet. Since cyber-entrepreneurial career-decision encompasses higher degree of personal risks and commitments among those aspiring to become 'cyber-entrepreneurs', there is need for in-depth understanding on the driving factors that influencing Cyber-entrepreneurial intentions. By integrating the concepts of social cognitive theory and goal-setting theory, the current research aims to explore the effects of Cyber-entrepreneurial self-efficacy (CESE) and goal commitment (GC) on Cyber-entrepreneurial intentions (CEIs) in the context of undergraduate entrepreneurship education, and inquires whether the presence of entrepreneurial role models (ERMs) has any effect on the CEIs among undergraduates. Structural equation modeling and multi-group analysis were used to analyze the data collected from 279 undergraduate students from several universities in Taiwan—among which 146 were with entrepreneurial role models and 143 were without. The results showed that GC has a partial mediation effect between CESE and CEI only in the cases of students without ERMs. Multi-sample SEM revealed a significant difference between the effects of CESE on CEI in students with and without ERMs. These findings may have important theoretical and practical implications to students undertaking entrepreneurship degrees and those making leap-decisions to enter the cyber-entrepreneurial field.

Keywords: career decisions, cyber entrepreneurial intentions, cyber entrepreneurial self-efficacy, entrepreneurship education, goal commitment

INTRODUCTION

The advancement of information and communication technology has led to a boom in e-commerce and created an alternative to traditional entrepreneurship. Today, e-commerce accounts for 89.7% of the global annual sales amount, and is mainly concentrated in three regional markets – Asia-Pacific, North America, and Western Europe. Comparatively, Asia-Pacific demonstrates the strongest potential growth with the expected compound annual growth rate increase to 15.8% in 2014 (eMarketer, 2014). The emergence of mobile technology in recent years further launched cyber entrepreneurship into an innovative, dynamic and cost-effective alternative to the traditional model (Matlay & Westhead, 2007; Wang et al, 2016). In light of these changes, the Taiwanese government has proposed relevant policies to promote the growth and development of the e-commerce industry and entrepreneurship; cyber-entrepreneurship-related courses, therefore, have also flourished in Taiwanese universities (Ministry of Economic Affairs, 2016).

Contribution of this paper to the literature

- Integrating the concepts of social cognitive theory and goal-setting theory, the current research explored the effects of Cyber-entrepreneurial self-efficacy (CESE) and goal commitment (GC) on Cyber-entrepreneurial intentions (CEIs) in the context of undergraduate entrepreneurship education, and further investigated whether the presence of entrepreneurial role models (ERMs) has any effect on the CEIs of students.
- Research results showed that students' CESE has positive effect on their GC and CEIs individually, and their GC has a positive effect on their CEIs. However, GC only has a partial mediation effect between CESE and CEIs in no presence of entrepreneurial role models (NERMs) but not in presence of entrepreneurial role models (PERMs).
- This research concluded that cyber-entrepreneurship educators and practitioners will be able have a better understanding of the students' CESE through their levels of GC, and come up with better methods or designs for the entrepreneurial curricula that will further promote students' CEIs.

Creativity, innovation, and entrepreneurship have been integrated into one widely-discussed hot topic in higher education (Edwards-Schachter et al, 2015; Lubart, 2008). These concepts increasingly recognized as the engines that foster an entrepreneurial culture (OECD, 2011). Creative thinking aims to explore and formulate the originality, take risks and tolerate ambiguity to bring the value of creative act, product, or idea (Anderson, Thier, & Pitts, 2017). Creative skills enable students to discover ideas and opportunities conducive to innovation; entrepreneurship programs and courses provide the context and materials that allow students to learn and apply skills and behaviors needed to create value in entrepreneurial firms (Gundry, Ofstein, & Kickul, 2014). The incorporation of these topics as part of the 'core competency' of educational programs has become a central theme in the face of today's turbulent markets and the complex demands by the rapid technological and societal changes (Gattie, Kellam, Schramski, & Walther, 2011; Vanevenhoven, 2013).

Interdisciplinary learning is an important part of talent cultivation. Entrepreneurship education aims to offer students alternative career choices by fostering their entrepreneurial intentions and skills (Huang, 2017; Jiang, Xiong, & Cao, 2017; Sánchez, 2011). Furthermore, entrepreneurial courses further enabled the students to balance theory and practice through the principle of learning by doing to choose to start their own business (Wu, Kuo, & She, 2013).

With the encouragement of the Taiwanese government, innovation and entrepreneurship platforms have been established one after another by colleges and universities, and entrepreneurship courses increased sevenfold over the past ten years (Ministry of Education, 2016). For example, TiC100, founded in 1999 by Advantech, provided the entrepreneurial events by means of entrepreneurial contests, innovative business model competitions and internet of thing (IoT) application development contests to cultivate thousands of university students' into entrepreneurship fields (TiC 100, 2018). Furthermore, to assist young people to start-up their own business, the Ministry of Education Youth Development Department (2012) promulgates "...cultivating quality manpower and promoting employment programs" to provide venture fund and incubators for university graduates who showed and demonstrate entrepreneurial intentions and competencies.

In spite of government efforts, less than 25.9% (ranked 53rd among the 54 economies) of the Taiwanese adults believe they have entrepreneurial capabilities even though 71.1% (11th) of them believe entrepreneurship to be a good career choice. Moreover, Taiwan ranked 22nd in the fear of failure during entrepreneurial process category (Global Entrepreneurship Research Association, 2018). One probable explanation is that the cost of entrepreneurial opportunities might be higher for the highly educated technicians and professionals, and that their risk of failure might be greater in entrepreneurship than in employment (Liu, Wen, & Hsieh, 2011). This discrepancy between entrepreneurial intentions and behaviors highlights the importance of having educational programs and curricula designed to foster the development of entrepreneurship (Geldhof et al, 2014). Previous findings have already shown that participation in entrepreneurial courses has a positive effect on people's entrepreneurial potential and attitudes (Stokes & Wilson, 2010). The investigation of the factors that influence CEIs and their causal relationships is therefore of paramount importance to entrepreneurship education.

Studies have found that the environmental and situational factors and opportunities can directly affect an individual's career (Callanan & Zimmerman, 2016; Liñán & Fayolle, 2015; Shepherd, Williams, & Patzelt, 2015). The role of self-efficacy in occupational choice and preparation has been the focus of research on career choice and development in social cognitive theory (Betz & Hackett, 1997; Lent, Brown, & Hackett, 1994). This study helps to clarify the impact of self-efficacy on decision-making behaviors. However, several publications have claimed that the belief in one's capabilities not only has no determinative function, it can even be self-deprecating (Vancouver et al, 2002; Vancouver, Thompson, & Williams, 2001). For their part, Bandura and Locke (2003) presented a large body of evidence that disproved such findings. Confronted with these contradictory results, further investigation

is required to verify if CESE and other factors indeed affect cyber-entrepreneurial career decisions and if so, in what ways for potential/aspiring cyber entrepreneurs.

The goal-oriented behavior of entrepreneurs is becoming an area of great interest among researchers. Commitment is a force that binds an individual to a course of action and its associated target (Meyer, Becker, & Van Dick, 2006). While self-efficacy may be a motivational or de-motivational force depending on a person's self-enhancing or self-deprecating beliefs (Bullough & Renko, 2013), GC might be one of its determining factors (Callanan & Zimmerman, 2016; Przepiorka, 2016). Goal-setting theory proposed four mechanisms through which goals affect performance: choice, effort, persistence, and strategies (Locke & Latham, 2002). For entrepreneurs, the decision to start a company is the result of careful planning and deliberate action that entails great energy and commitment. Goal commitment is an individual's willing to accomplish his/her setting target (Locke, Shaw, Saari, & Latham, 1981) and it will be influenced by self-efficacy (Locke & Latham, 2002). Entrepreneurial educators could improve students' entrepreneurial self-efficacy by entrepreneurial role modeling or entrepreneurial models with whom the aspiring/wannabe entrepreneurs can identify (Bandura, 1997; Locke & Latham, 2002; White & Locke, 2000). Moreover, Callanan and Zimmerman (2016) suggested the application of a structured career management model to all phases of the entrepreneurial career decision-making process; and pointed out that the establishment of realistic goals can facilitate the development and implementation of career strategies. The present study seeks to integrate the concepts of social-cognitive theory and goal-setting theory in examining the relationships among CESE, GC, and CEI to effectively promote students' CEI in the context of undergraduate education.

Entrepreneurship education and entrepreneurial role models both have impacts on the entrepreneurial intentions of students in developing countries (Muofhe & Du Toit, 2011). Muofhe and Du Toit (2011) observed that positive relationships exist between entrepreneurship education and entrepreneurial intentions, and entrepreneurial role models and entrepreneurial intentions. Some studies have also confirmed that the entrepreneurial competence of young adults is predictable by their entrepreneurial personality traits, the authoritative parenting style of their parents, and the presence of entrepreneurial role models in their lives (Obschonka, Silbereisen, & Schmitt-Rodermund, 2011). Adult entrepreneurial mentors such as parents may be the key to the development of entrepreneurial intentions in young adults careers (Schmitt-Rodermund, 2004). In light of the above, we divided our samples into the categories of students who have the presence of entrepreneurial role models in their lives (PERMs) and students who do not have (NERMs) to compare and explore the differences between their CESEs, GCs, and CEIs. Here, ERM refers to family member, teachers/professors, and/or friends.

THEORETICAL FRAMEWORK AND HYPOTHESES

The Effect of Students' Cyber-Entrepreneurial Self-Efficacy (CESE) on their Cyber-Entrepreneurial Intentions (CEIs)

The making of an entrepreneur is dependent on the contribution of multiple factors, e.g., personal attributes, background, experience and trait combinations (Arenius & Minniti, 2005; Baron, 2004; Shane, Locke, & Collins, 2003). One of such factors is entrepreneurial self-efficacy (ESE). It refers to a person's ability to believe that he/she can successfully achieve the tasks necessary for an entrepreneur (McGee, Peterson, Mueller, & Sequeira, 2009). Commitment can be accompanied by different ways of thinking that plays a role in shaping behavior and may even lead to the persistence to a course of action, even in the face of conflicting motives or attitudes (Meyer & Herscovitch, 2001). ESE has a high degree of influence over the entrepreneurial intention of and the extent of effort made by a potential entrepreneur; and it affects his/her willingness to withstand the changes and challenges they encounter during the entrepreneurial process in order to become a successful entrepreneur (Trevelyan, 2011).

ESE is an important antecedent and an effective predictor of entrepreneurial intentions (Barbosa, Gerhardt, & Kickul, 2007; McGee et al., 2009). Empirical studies have confirmed its significant effect on students' entrepreneurial intentions (BarNir, Watson, & Hutchins, 2011; Carr & Sequeira, 2007; Kickul, Gundry, Barbosa, & Whitcanack, 2009; Liñán, 2008; Piperopoulos & Dimov, 2015; Sesen, 2013; Zhao, Seibert, & Hills, 2005). Base on the above claims findings, we propose the following hypothesis.

H1: Students' CESE has a positive effect on their CEI. ($X \rightarrow Y, c$)

The Effect of Students' Cyber-Entrepreneurial Self-Efficacy on their Goal Commitment

An established goal is a driving force that makes people focus, take action, persist and persevere in tackling with increasingly difficult tasks until the desired outcome is achieved (De Clercq, Menzies, Diochon, & Gasse, 2009). Self-efficacy, on the other hand, affects an individual's goal setting (Boyd & Vozikis, 1994), and is proven to be an important factor conducive to the enhancement of goal commitment (Locke & Latham, 2002). Empirical studies have shown that when an individual's self-efficacy is higher, their goal commitment becomes stronger as well (De

Clercq et al., 2009; Locke, Frederick, Lee, & Bobko, 1984; Wood & Bandura, 1989; Wu, 2002). In light of that, the following hypothesis is proposed.

H2: Students' CESE has a positive effect on their GC. ($X \rightarrow M, a$)

The Mediation of Goal Commitment

An individual's self-efficacy and personal goals are both important factors that influence their behavior (Bandura, 1997). Strong commitment to the goal and strong intentions to achieve it are demonstrated when one can accurately anticipate that the result of achieving the goal is important (Locke & Latham, 2002). A person's goal commitment mediates the effect his/her self-efficacy has on their learning performance (Chu & Peng, 2009). Moreover, entrepreneurial passion has the positive effects on new venture growth through the mediation of goal commitment (Drnovsek, Cardon, & Murnieks, 2009). According to the literature of organizational behavior, employees who are committed to specific challenging goals outperform those who either do not have goals or have only a weak commitment to them (Locke & Latham, 2006). Goal setting has the advantage of helping the entrepreneur direct his/her efforts in a more focused manner (Callanan, & Zimmerman, 2016).

Moreover, once the goals are in place, complementary behaviors and attitudes that reinforce them will occur naturally (Locke & Latham, 2006). Goals and self-efficacy have been found to have direct effects on venture growth and to mediate the effects of passion, tenacity, and new resource skills on subsequent growth (Baum & Locke, 2004).

Goal commitment, on the other hand, has been studied and verified to be important at different stages of the entrepreneurial process (Przepiorka, 2016). Empirical studies have found out that entrepreneurial role models (i.e., parents) not only predicted entrepreneurial intentions (Geldhof et al., 2014; Schmitt-Rodermund, 2004), but also the development of entrepreneurship (Bosma et al, 2012; McClelland, 1961). Considering all of the above, the following hypotheses were proposed.

H3: Students' GC has a direct effect on their CEI. ($M \rightarrow Y, b$).

H4: Students' GC mediates effect their CESE has on their CEI ($X, M \rightarrow Y, a*b, c'$).

H5: The presence or no presence of ERMs (PERMs/NERMs) has a significant categorical mediation effect on the relationship among model constructs.

Figure 1 showed the research model and illustrated the relationship among the 4 hypotheses.

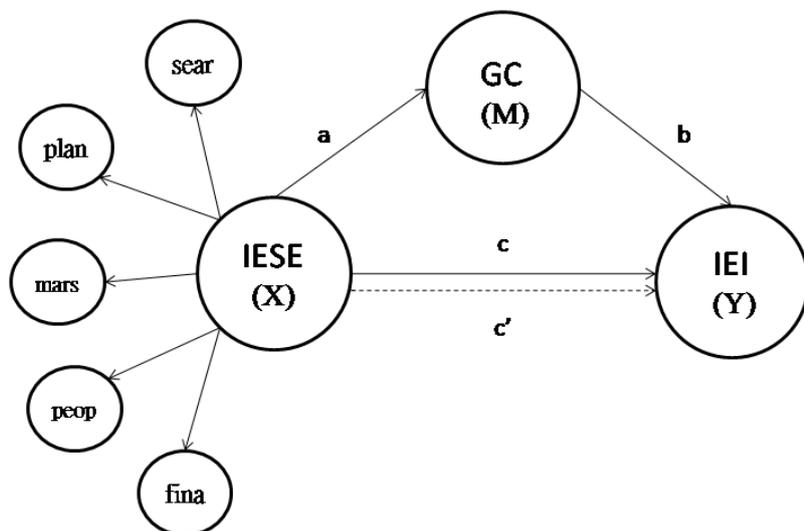


Figure 1. Research Model

METHODOLOGY OF RESEARCH

Samples and Procedure

All participants were undergraduate students from the colleges and universities in Taiwan. Armstrong and Overton (1977) suggested that researchers could divide the questionnaires into two groups, the first two weeks

($n=130$) and the last two weeks ($n=149$) according to the survey interval, to test the differences of constructors. Therefore, this study conducts the t -test (CESE $t=0.244$, $p>.05$; GC $t=1.270$, $p>.05$; CEI $t=0.804$, $p>.05$) ($p > 0.05$) to ensure that the samples does not suffer from bias.

This study is part and parcel of the cyber entrepreneurship education program, so the participants were asked to first write down one e-commerce- or entrepreneurship-related course they had taken before they proceeded to complete the questionnaire. Of the 279 viable samples, 146 students had entrepreneurial role models (PERMs) and 133 students had none (NERMs); 55.9% were males and 44.1% were females; 52.3% majored in business (or information) management, 29.8% majored in science, engineering and technology, 7.5% majored in education, 6.1% majored in medicine, and 4.3% majored in others subjects. The majority (82%) undertook in the business-management and science/engineering/technology (STEM) majors (see [Table 1](#)).

Table 1. Number and Percentage of Students in Each Major

Major	Population		Sample	
	Number	Percentage (%)	Number	Percentage (%)
Science, Engineering and Technology	327,272	36.54	83	29.75
Business Management	263,415	29.41	146	52.33
Education	21,386	2.39	21	7.53
Medicine	92,437	10.32	17	6.09
Others	191,234	21.35	12	4.30
Total	895,744	100.00	279	100.00

Measuring Instruments

To ensure construct validity, items selected for the measurement of constructs here were mainly adapted from previous studies and slightly modified to fit the context of cyber entrepreneurship. The instruments used to measure CESE, GC, and CEI were as follows:

Cyber-Entrepreneurial Self-Efficacy (CESE)

Our “Cyber Entrepreneurial Self-Efficacy (CESE) Scale” was adapted from the “Entrepreneurial Self-Efficacy (ESE) Scale” developed by McGee et al. (2009). The items in the measure were pretested by experts associated with the fields of cyber entrepreneurship and entrepreneurship education, and then adjusted to ensure articulacy. The scale contains 18 items divided into five subscales of searching, planning, marshaling, implementing-people, and implementing-financial. It employs a 5-point Likert scale ranging from the choices of “strongly disagree” to “strongly agree”. Higher scores signified higher levels of confidence. Sample questions were “Brainstorm (come up with) a new idea for a product or service” (Searching), “Estimate customer demand for a new product or service” (Planning), “Get others to identify with and believe in my vision and plans for a new business” (Marshaling), “Supervise employees” (Implementing-people), and “Organize and maintain the financial records of my business” (Implementing-financial).

Goal Commitment (GC)

The 4-item scale we used to measure goal commitment was derived from the 4-item model designed by Klein et al. (2001). A 5-point Likert scale was used with choices ranging from “strongly disagree” to “strongly agree”. Higher scores signified higher degrees of commitment to the goal. Sample questions were “I am strongly committed to pursuing this goal” and “I think this is a good goal to shoot for”.

Cyber-Entrepreneurial Intentions (CEI)

We compiled our “Cyber-Entrepreneurial Intentions (CEI) Scale” based on the “Entrepreneurial Intentions (EI) Scale” developed by Liñán and Chen (2009). The resultant 6-item 5-point Likert scale offered answer choices ranging from “strongly disagree” to “strongly agree”. Higher scores indicated stronger desire for cyber entrepreneurship. Sample questions were “My professional goal is to become a cyber entrepreneur”, and “I have a strong ambition to start a cyber enterprise someday”.

Data Analysis

Partial least squares (PLS) testing was performed using the Smart PLS 3.2.6 software (Ringle, Wende, & Becker, 2015) to examine and analyze the measurement and structural model of the total sample and the two subsamples

(PERMs and NERMs). First, we tested the validity of all scales with a confirmatory factor analyses (CFAs) to ensure the convergent validity of the tools. Secondly, we applied partial least squares structural equation modeling (PLS-SEM), using the Bootstrap resampling technique to resample 5,000 times (Hair, Ringle, & Sarstedt, 2011) to examine the significance and predictability (R^2) of the path coefficients in the structural model and to determine the goodness of fit with the standardized root mean square residual (SRMR). Lastly, we conducted PLS-MGA (multi-group analysis) to verify the difference in structural model between the PERMs and NERMs. For the differences in path coefficients, we opted for the permutation-based test procedures (Chin & Dibbern, 2010). The significance of the differences between the estimated parameters of the two, taken into consideration both the equal and different variances, was determined using the parametric approach (Chin, 2010).

RESULTS OF RESEARCH

Descriptive Statistical Analysis

Before analyzing the structural models, an independent samples t -test was conducted to determine whether significant differences existed between the variables of PERMs and NERMs. As illustrated in **Table 2**, no significant difference in GC was detected between the two groups; but in CESE and CEI, significant differences were detected. The mean values of both CESE and CEI were significantly higher in PERMs (CESE: $M = 3.494$, $t = 3.421$, $p < 0.01$; CEI: $M = 3.032$, $t = 2.150$, $p < 0.05$) than in NERMs and Total Students. This finding suggested the significant effect of PERMs on the CESE and CEI of students, which therefore called for the multi-group analysis (MGA) we subsequently performed.

Table 2. Descriptive Statistics for Total Students, PERMs and NERMs

Contracts	Total Students ($n = 279$)		PERMs ($n = 146$)		NERMs ($n = 133$)		Significance of difference between PERMs and NERMs	
	Mean	SD	Mean	SD	Mean	SD	t -value	sig.
CESE (X)	3.386	0.562	3.494	0.558	3.268	0.543	3.421	**
GC (M)	4.096	0.445	4.125	0.439	4.064	0.452	1.145	ns
CEI (Y)	2.943	0.722	3.032	0.760	2.847	0.668	2.150	*

Notes: SD: standard deviation. PERMs = presence of entrepreneurial role models; NERMs = no entrepreneurial role models; CESE = cyber-entrepreneurial self-efficacy; GC = goal commitment; CEI = cyber-entrepreneurial intentions.

* $p < 0.05$, ** $p < 0.01$ (two-tail t distribution)

Reliability and Validity of the Scales

First, we examined the measurement model. The results of PLS analysis revealed that the factor loadings of all measuring instruments were above 0.7, signifying indicator and construct reliability; the values of composite reliability (CR) all exceeded 0.7, signifying high internal consistency of measures; and the average variance extracted (AVE) values all exceeded the 0.5 benchmark (Hair, Anderson, Babin, & Black, 2009; Hair, Hult, Ringle, & Sarstedt, 2014), signifying the convergent validity of our instruments (See **Table 3**).

Table 4 shows the discriminant validity of each measure. The square roots of the AVE of our constructs (CESE, GC, and CEI) were all greater their correlations with each other (Fornell & Larcker, 1981); the heterotrait-monotrait (HTMT) values of all instruments were below the more conservative threshold value of 0.85 (Henseler, Ringle, & Sarstedt, 2015), thus confirming the excellent discriminant validity of the scales.

Table 3. Composite Reliability of the Scales

Construct/Indicator		Total Sample; n = 279			PERMs; n = 146			NERMs; n = 133		
2nd-order	1st-order	Loading	CR	AVE	Loading	CR	AVE	Loading	CR	AVE
	CESE		0.901	0.645		0.899	0.643		0.895	0.631
	search	0.829	0.893	0.735	0.816	0.906	0.763	0.830	0.866	0.683
	plan	0.831	0.830	0.619	0.839	0.830	0.619	0.819	0.829	0.618
	marsh	0.823	0.843	0.641	0.822	0.861	0.674	0.817	0.815	0.595
	people	0.822	0.900	0.600	0.839	0.898	0.595	0.797	0.899	0.598
	financial	0.703	0.908	0.766	0.681	0.906	0.764	0.702	0.901	0.754
	GC		0.853	0.593		0.868	0.624		0.838	0.565
	gc_1	0.719			0.722			0.707		
	gc_2	0.835			0.856			0.813		
	gc_3	0.793			0.800			0.799		
	gc_4	0.727			0.775			0.678		
	CEI		0.933	0.737		0.939	0.756		0.925	0.711
	cei_1	0.869			0.878			0.873		
	cei_2	0.811			0.829			0.794		
	cei_3	0.872			0.888			0.836		
	cei_4	0.898			0.906			0.883		
	cei_5	0.840			0.845			0.826		

Notes: PERMs = presence of entrepreneurial role models; NERMs = no entrepreneurial role models; CESE = cyber-entrepreneurial self-efficacy; GC = goal commitment; CEI = cyber-entrepreneurial intentions. CR: Composite reliability; AVE: Average variance extracted.

Table 4. Discriminant Validity of the Scales

Construct	Fornell-Larcker Criterion								
	Total sample; n = 279			PERMs; n = 146			NERMs; n = 133		
	CESE	GC	CEI	CESE	GC	CEI	CESE	GC	CEI
CESE	0.803			0.803			0.795		
GC	0.431	0.770		0.445	0.790		0.409	0.752	
CEI	0.439	0.355	0.858	0.559	0.365	0.870	0.267	0.338	0.843

Construct	Heterotrait-Monotrait Ratio (HTMT)								
	Total sample; n = 279			Model; n = 146			No-Model; n = 133		
	CESE	GC	CEI	CESE	GC	CEI	CESE	GC	CEI
CESE									
GC	0.521			0.528			0.493		
CEI	0.493	0.413		0.626	0.413		0.292	0.394	

Notes: Fornelle-Larcker Criterion: Diagonal elements (bold) are the square root of the variance shared between the constructs and their measures (AVE). Off-diagonal elements are the correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements. PERMs = presence of entrepreneurial role models; NERMs = no entrepreneurial role models; CESE = cyber-entrepreneurial self-efficacy; GC = goal commitment; CEI = cyber-entrepreneurial intentions.

Structural Model and Hypothesis Testing for the Mediation Effects

Structural model fit

Next, we examined the structural model before we proceeded to hypotheses testing. Hair et al. (2011) suggested that collinearity could be a potential issue when the variance inflation factor (VIF) value is 5 or above. Our collinearity assessment results showed that the inner VIF values of the total sample and the two subsamples were all lower than 5 (CESE→GC [1.000, 1.000, 1.000]; GC→CEI [1.228, 1.247, 1.200]; CESE→CEI [1.228, 1.247, 1.200]), indicating the absence of collinearity between predictor variables (Hair et al., 2011).

In assessing the structural model fit, the standardized root mean square residual (SRMR) was applied (Henseler et al., 2014). The results showed that the SRMR values of our total and sub- samples were all above than 0.08 (SRMR has a 0-1 range), and however values as high as 0.08 are deemed acceptable (Total sample, SRMR=0.087; PERMs, SRMR=0.093; NERMs, SRMR=0.099) (Hu & Bentler, 1999). The causal relationships within latent variables were verified using PLS-SEM; the explanatory power of our study was determined by the use of R-squared (R²) (Pavlou & Fygenson, 2006).

Multi-group analysis

The permutation algorithm was used to carry out the measurement invariance of composite models (MICOM) presented by Henseler, Ringle, and Sarstedt (2016). The purpose of checking measurement invariance is to verify that the factors are indeed measuring the same underlying construct within each group. It is therefore a prerequisite to conducting MGA tests. The results are shown in Table 5. As can be seen, our data corroborated the configural, compositional and scalar invariance; "full measurement invariance" was therefore obtained, signifying the cross-sample validity and stability of our scales.

Table 5. Measurement Invariance (MICOM) Tests

Composite	Correlation c value (=1)	95% confidence interval	Compositional invariance?
Compositional invariance			
CESE	1.000	[0.999; 1.000]	Yes
GC	0.996	[0.983; 1.000]	Yes
CEI	0.999	[0.998; 1.000]	Yes
Composite	Difference of the composite's mean value (=0)		Equal mean values?
Scalar invariance			
CESE	0.001	[-0.235; 0.235]	Yes
GC	0.001	[-0.231; 0.237]	Yes
CEI	-0.002	[-0.235; 0.241]	Yes
Composite	Logarithm of the composite's variances ratio (=0)		Variances values?
CESE	0.000	[-0.395; 0.396]	Yes
GC	0.000	[-0.368; 0.372]	Yes
CEI	0.001	[-0.365; 0.381]	Yes

Note: 5000 permutation run; two-tailed 0.05 significance level.

We proceeded to compare the mediating path coefficients of the PERMs and NERMs using the permutation test (5000 permutation runs; two-tailed 0.05 significance level) to determine whether there were significant differences. As shown in Table 6, there were significant differences in the coefficients of the total effects of CESE on CEI ($p = 0.004 < 0.01$) and the coefficients of the direct effect of CESE on CEI ($p = 0.005 < 0.01$) between the two groups; but no significant difference was detected in the coefficients of the direct effects of CESE on GC or GC on CEI, or the indirect effect of GC on the CESE-CEI relationship between the groups. H5 was therefore only partially supported.

Table 6. The Analysis of Mediation

Path	Total (n = 279)		PERMs (n = 146)		NERMs (n = 133)		Difference between Coefficient	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Diff.	pHenseler
Direct Effects								
CESE→GC	a	0.431 7.590 ***	0.445 5.815 ***	0.409 4.950 ***	0.036	0.377	ns	
GC→CEI	b	0.203 3.215 **	0.145 1.904 ns	0.275 2.808 **	-0.131	0.853	ns	
CESE→CEI	c'	0.351 5.138 ***	0.495 6.636 ***	0.153 1.439 ns	0.342	0.005	**	
Indirect Effects								
CESE→GC→CEI	a*b	0.088 2.930 **	0.064 1.724 ns	0.113 2.469 *	-0.048	0.794	ns	
Percentile bootstrap 95% CI		[0.034, 0.153]	[-0.003, 0.142]	[0.035, 0.210]				
Total Effects								
CESE→CEI	c = a*b+c'	0.439 7.518 ***	0.560 8.873 ***	0.266 2.798 **	0.294	0.004	**	
Mediation Effects								
VAF (Variance account of)								
a*b/(a*b+c')*100%		20.05%	11.45%	42.48%				

Notes. PERMs = presence of entrepreneurial role models; NERMs = no entrepreneurial role models; CESE = cyber-entrepreneurial self-efficacy; GC = goal commitment; CEI = cyber-entrepreneurial intentions.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (two-tail t distribution). ns = not significant.

Parameter estimation was conducted for the comparison of the two groups. The standard errors and parameters of the resamples were used to calculate the t-values to determine whether there were significant differences in the coefficients of the paths between the groups. This was done in case our data were distributed normally and/or the variances of the two groups were not too different from each other ($tParam \{EV\}$). A Welch-Satterthwait test - $tParam \{NEV\}$ was also done in case the variances between the two were very different (Sarstedt, Henseler, & Ringle, 2011). The results of the two tests were similar: Indirect Effects CESE→CEI - $tParam \{EV\} = 2.676 (p < 0.01)$, $tParam \{NEV\} = 2.639 (p < 0.01)$; Total effects CESE→CEI - $tParam \{EV\} = 2.628 (p < 0.01)$, $tParam \{NEV\} = 2.586 (p < 0.01)$.

< 0.05). The R-squared values were as follows: PERMs - CESE→GC (19.8%), CESE→GC→CEI (33.0%); NERMs - CESE→GC (16.7%), CESE→GC→CEI (13.4%). Significant differences were detected in all (See Figure 2).

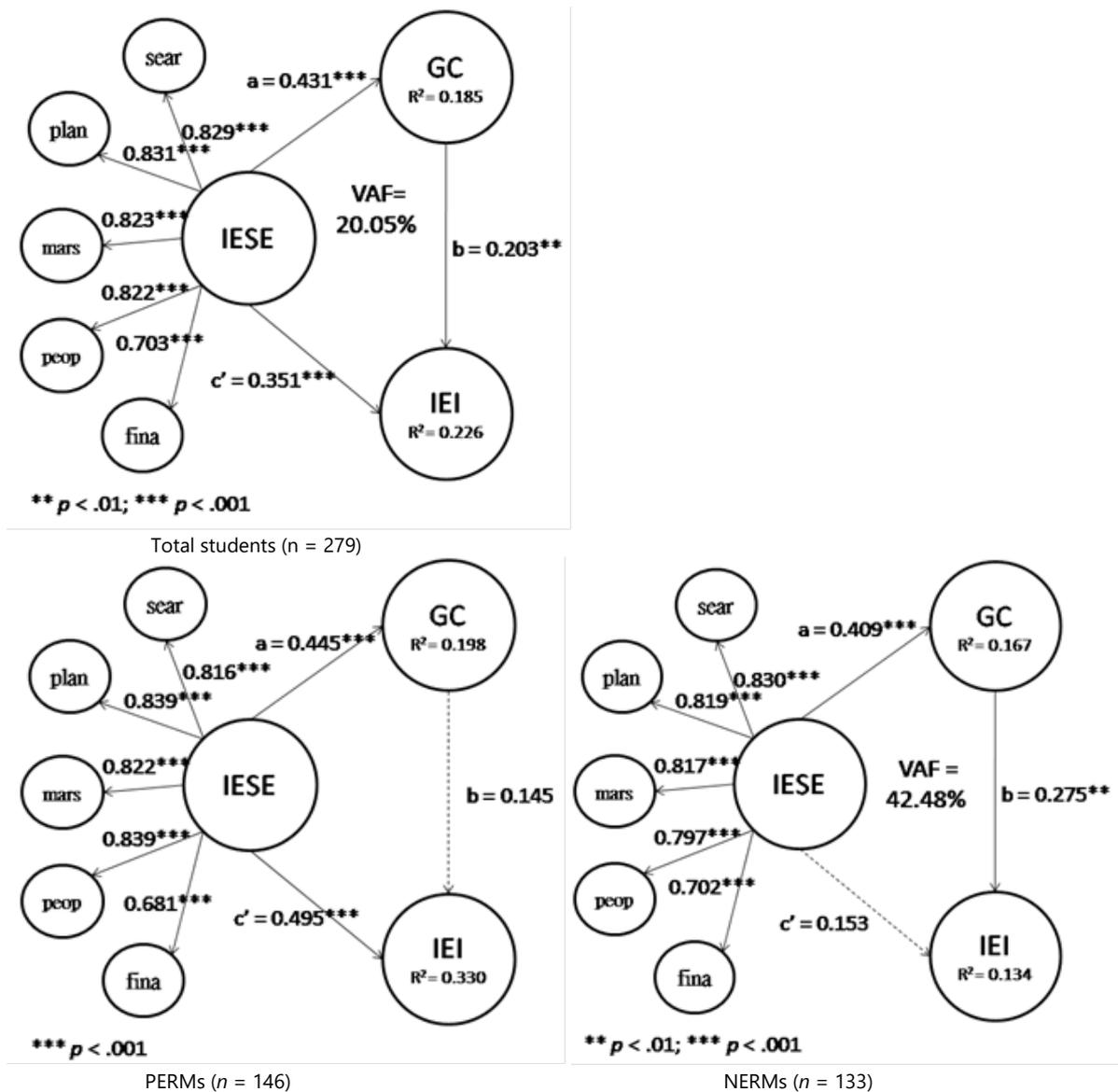


Figure 2. Results of Structural Model Analysis

Hypotheses testing for the mediation effects

Hypothesis 4 investigated the mediating role of goal commitment (GC), with student’s CESE as the independent variable (X), CEI as the dependent variable (Y), and GC as the mediator variable (M). The mediating effects of PERMs and NERMs were analyzed using the multi-group analysis (MGA). Sequential testing was conducted according to the suggestions offered by Hair et al. (2014) on mediation analysis: (1) X significantly predicts Y; (2) X significantly predicts M and M significantly predicts Y; (3) X and M both significantly predict Y.

We examined the mediation model through the assessment of the variance accounted for (VAF): VAF > 80% indicated full mediation; 20% ≤ VAF ≤ 80% indicated partial mediation; VAF < 20% indicated no mediation. Data were analyzed with SmartPLS 3.0 to see whether they supported our hypotheses. PLS-MGA was conducted to determine whether there was a significant difference between the path coefficients of the PERMs and NERMs.

The path coefficients, t-statistics, and their significance are shown in Table 6. According to the data of the total sample (n = 279), CESE (X) positively predicted CEI (Y) (c = 0.439, p < 0.001), indicating that H1 was supported;

CESE (X) positively predicted GC (M) ($a = 0.431, p < 0.001$), indicating that H2 was supported; and GC (M) positively predicted CEI (Y) ($b = 0.203, p < 0.01$), indicating that H3 was also supported. The mediation analysis revealed that the indirect effect of CESE (X) on CEI (Y) ($a*b = 0.088, p < 0.01, 95\% \text{ CI } [0.034, 0.153]$) was smaller than the direct effect of CESE (X) on CEI (Y) ($c' = 0.351, p < 0.001$); VAF-value was 0.201 ($20\% \leq \text{VAF} \leq 80\%$), indicative of partial mediation. This shows that in the causal relationship of CESE (X) and CEI (Y), GC (M) exhibited the effect of partial mediation; H4 was thereby supported. The results of the hypotheses testing are illustrated in **Figure 2**. For the effect of students' CESE (X) on their GC (M), the explanatory power was 18.5% ($R^2 = 0.185$); for the effect of students' CESE (X) on their CEI (Y) via the mediation of their GC (M), the explanatory power was 22.62% ($R^2 = 0.226$).

According to the data of the PERMs ($n = 146$), CESE (X) positively predicted CEI (Y) ($c = 0.560, p < 0.001$), indicating that H1 was supported; CESE (X) positively predicted GC (M) ($a = 0.445, p < 0.001$), indicating that H2 was also supported; GC (M), however, failed to significantly predict CEI (Y) ($b = 0.145, p > 0.05$), H3 was therefore not supported. Because M failed to significantly predict Y, our model did not fit the sequence of mediation analysis proposed by Hair et al. (2014); therefore there was no mediation, and H4 was not supported (See **Figure 2**).

According to the data of the NERMs ($n = 133$), CESE (X) positively predicted CEI (Y) ($c = 0.266, p < 0.01$), indicating that H1 was supported; CESE (X) positively predicted GC (M) ($a = 0.409, p < 0.001$, indicating that H2 was supported; and GC (M) positively predicted CEI (Y) ($b = 0.275, p < 0.01$), indicating that H3 was also supported. The mediation analysis revealed that the indirect effect of CESE (X) on CEI (Y) ($a*b = 0.113, p < 0.05, 95\% \text{ CI } [0.035, 0.210]$) was smaller than the direct effect of CESE (X) on CEI (Y) ($c' = 0.153, p > 0.05$); VAF-value was 0.425 ($20\% \leq \text{VAF} \leq 80\%$), indicative of partial mediation. This shows that in the causal relationship of CESE (X) and CEI (Y), GC (M) exhibited the effect of partial mediation; H4 was thereby supported. For the effect of students' CESE (X) on their GC (M), the explanatory power was 16.7% ($R^2 = 0.167$); for the effect of students' CESE (X) on their CEI (Y) via the mediation of their GC (M), the explanatory power was 13.4% ($R^2 = 0.134$) (See **Figure 2**).

DISCUSSION AND IMPLICATIONS

The present study investigated the mediation effect of GC on the relationship between CESE and CEI in the context of undergraduate entrepreneurship education. We hope to add to the literature of cyber entrepreneurship education and contribute to the further development of this field. The discussion and implications of our study are as follows.

Cyber-entrepreneurial Self-efficacy has a Direct Positive Effect on Cyber-entrepreneurial Intentions

The results of the analyses revealed that students' CESE has a direct positive effect on their CEI in the context of cyber entrepreneurship education. Such finding is correspondent with the results of previous research (Barbosa et al., 2007; BarNir et al., 2011; Carr & Sequeira, 2007; Kickul et al., 2009; Liñán, 2008; Piperopoulos & Dimov, 2015; Sesen, 2013; Trevelyan, 2011; Zhao et al., 2005). As social cognitive theory claims, no mechanism of personal agency is more central or pervasive than beliefs of self-efficacy (Bandura, 1989). Any factor that may serve as a guide or a motivator is rooted in the core belief that one's actions can lead to desired effects; otherwise, one would have little or no incentive to act or persevere in the face of difficulties (Bandura, 2002). Studies have found that when subjected to equally painful events, those who are led to believe that they have personal control over the events display lower autonomic arousal and less performance impairment than those who believe the opposite (Geer, Davison, & Gatchel, 1970; Glass et al., 1973). It is therefore important for teachers and researchers of cyber entrepreneurship education to find out how to enhance CESE in students.

Cyber-entrepreneurial Self-efficacy has a Direct Positive Effect on Goal Commitment

The results of our analyses indicated that students' CESE has a direct positive effect on their GC, which conforms to the findings of previous studies (Baum & Locke, 2004; Locke et al., 1984; Locke & Latham, 2002, 2006; Wu, 2002). Bouffard-Bouchard (1990) experimentally induced high and low self-efficacy perceptions in college students with equivalent knowledge and experience in a performance domain, and found out that students with fictitiously induced high self-efficacy set higher goals for themselves, used more efficient problem-solving strategies, and achieved higher intellectual performances than did students with induced low self-efficacy. This proved the effect of perceived self-efficacy on goal setting and aspiration (Bandura & Locke, 2003; Geldhof et al., 2014; Wood & Bandura, 1989). Our finding is consistent with the belief in social cognitive theory that ESE is an important factor that improves GC (Bandura & Locke, 2003; Lock & Latham, 2002).

The Mediation Effect of Goal Commitment

People are aspiring and proactive beings, who motivate and guide themselves by setting personal goals and performance standards, and then invest energy and resources to achieve them (Bandura & Locke, 2003). Przepiorka (2016) identified the differences between entrepreneurs and non-entrepreneurs with respect to goal-commitment (effort, persistence, goal satisfaction) and found out that entrepreneurs with greater goal-commitment (who put in more effort and were more persistent and satisfied with their goals) during the prelaunch phase of the entrepreneurial process had greater intention to succeed.

Other studies have also found that GC has an indirect effect between self-efficacy and learning performance (Chu & Peng, 2009). In the current study, partial mediation effect of GC was observed between the CESE and CEI of Total Students and NERMs; furthermore, such effect was greater in NERMs than in Total Students. These results are in accordance with the findings of earlier research (Geldhof et al., 2014; Schmitt-Rodermund, 2004).

Comparison of Categorical Effects of PERMs and NERMs

Role models have long been suggested to have a profound influence on career decisions (Krumboltz, Mitchell, & Jones, 1976). ERMs have been shown to enhance ESE and EI (Boyd & Vozikis, 1994; Fayolle, Gailly, & Lassas-Clerc, 2006). In the present study, we found that the presence of entrepreneurial role models made a significant difference to the effect of students' CESE on their CEIs, but not so much to the relationships between their CESE and GC and their GC and CEI. Interestingly, the partial mediation effect of GC was only found between the CESE and CEIs of the NERMs and not those of the PERMs. One probable explanation is that ERMs lead by example, so that in their presence, the students can foresee their own future as an internet entrepreneur fairly clearly and know fairly well what such a career entails through their observations of the ERMs.

Consequently, the degree of such students' GC cannot have as much impact on their CEIs as the GC of NERMs would on theirs. Without the presence of ERMs, the NERMs will probably need a much higher degree of GC in order to have the courage and motivation to generate a genuine CEI. Fayolle et al. (2006) have stated that EI becomes stronger when self-efficacy is enhanced by the presence of ERMs. St-Jean and Mathieu (2015), however, observed that mentoring appears to have a direct negative effect on the intension (to stay in the profession) of novice entrepreneurs; and suggested that mentoring should come earlier in the entrepreneurial process.

Our study seems to support their claims. In terms education, Fayolle et al. (2006) found that the entrepreneurship education programs they tested had a significant impact on the EI of the students. Piperopoulos and Dimov (2015) discovered that among the students taking theoretically-oriented entrepreneurship courses, higher self-efficacy is associated with lower EIs; and among the ones taking practically-oriented entrepreneurship courses, higher self-efficacy is associated with higher EIs. The findings of the current study seem to suggest that the students with PERMs developed more ambitious EIs under the positive influence of their ERMs. For those with NERMs, such EIs may need to be developed more indirectly.

CONCLUSION

Our research aims to integrate the concepts of social cognition theory and goal-setting theory in an investigation of the effects of CESE and GC on CEIs in the context of undergraduate entrepreneurship education. The results showed that students' CESE has a positive effect on their GC and CEIs individually, and that their GC also has a positive effect on their CEIs. However, we found that GC only has a partial mediation effect between CESE and CEIs in NERMs but not in PERMs. These results have important implications for the practice and research of higher entrepreneurship education. It means that cyber-entrepreneurship educators and practitioners will be able have a better understanding of the students' CESE through their levels of GC, and come up with better methods or designs for the entrepreneurial curricula that will better promote students' CEIs. Our findings also suggest that when designing the curriculum, entrepreneurship educators should take into consideration the different effects the presence/absence of ERMs might have on the CEIs of students.

Based on the findings of prior research and this study, we propose the following recommendations for schools that offer entrepreneurship education: (1) invite entrepreneurs to serve as mentors/coaches for university students of NERMs, because they could learn the practical cyber entrepreneurship from the interaction with mentors or coaches to cultivate CESE and GC. Moreover, media role models and mentoring are proved to effectively motivate and guided students by foresight of goals (risk control), not just by hindsight of shortfalls (fear of risk or failure). (2) offer innovative interdisciplinary courses or integrated curricula (e.g. The remote role model-theme case study) to integrate the knowledge and practice. (3) establish open-loop university (Cheng, 2016) to allow and encourage potential/aspiring entrepreneurs or students to return to school whenever they desire or feel the need to. (4) create a virtual community with entrepreneurship and innovative atmosphere for potential/aspiring entrepreneurs and experienced ones to continually enhance their CESE and GC by exchanging their knowledge and experiences. (5)

bring all courses together on a common "learning and application platform" that is fully linked and collaborative with external networks such as those of the government agencies and business organizations. Such platform can help students form a clearer concept of entrepreneurial career intentions, and enhance their CESE and GC before they reach their entrepreneurial goals.

Although we strove to conduct the entire research in the most rigorous manner, some limitations and flaws nevertheless existed; we hereby acknowledge them. First, in terms of the participants, we have surveyed only the undergraduate students in Taiwan majored mostly in business management or STEM. Therefore, the generalizability of our results might be somewhat limited. Secondly, in terms of the variables, even though we have proven that students' GC partially mediates the relationship between their CESE and CEIs, the total variance explained was low. This means that besides CESE and GC, there may be other factors such as perceived collective efficacy (Prussia & Kinicki, 1996) affecting the level of students' CEIs. In light of the aforementioned limitations, we suggest that future research may survey students from more diverse academic backgrounds and ethnicity, and in different stages of learning to improve generalizability. Future researchers may also want to include more variables in their study to more extensively explore the factors influencing students' CEIs.

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