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Knowing thoughts by seeing deeds: The role of creative self-concept, entrepreneurial mindset, and creative behaviour in innovation and entrepreneurship education

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Abstract

Despite increasing investment in Innovation and Entrepreneurship (IE) education, universities do not necessarily see higher levels of entrepreneurial activities among graduates. We aimed to deepen our understanding of IE education by examining the relationships among pre-educational creative self-concept (CSC), entrepreneurial mindset (EM), creative behaviour (CB), and entrepreneurial intention (EI) for students who transferred from community colleges to universities. 463 students in a university in Hong Kong responded to a pre-course questionnaire. Path analyses revealed that those who exhibited higher CSC and more positive EM also tended to engage in more creative activities (i.e., CB). This helped them to develop better EI. Furthermore, CSC and EM reinforced each other in promoting EI. Our results demonstrate that promoting entrepreneurship requires the development of corresponding belief and attitude, but only through their manifestations in creative endeavours, including problem-solving exercises that can be administered more quickly and cost effectively than conventional entrepreneurial activities.

Keywords

Creative behaviour, creative self-concept, entrepreneurial mindset, entrepreneurship education, entrepreneurship intention, higher education

Introduction

Innovation and entrepreneurship (IE) have attracted increasing attention recently, particularly among university educators. Although typically associated with start-up activities, entrepreneurial behaviours are also closely linked to employee proactiveness, problem-solving ability, and on-the-job learning initiatives (Hughes et al., 2018; Kraus et al., 2019; Ritala et al., 2021). As the world races to tackle complex problems such as climate change, IE education is vital to the development of the next generation of innovators, change makers, and problem solvers (Winkler, 2023). In response to the rising popularity of entrepreneurship as a career option among students and a healthy demand for innovative employees among organisations, universities around the world have invested heavily to set up on-campus entrepreneurial ecosystems. These ecosystems include design and innovation laboratories, entrepreneurship centres, incubators, and accelerators (Bodolica and Spraggon, 2021).

Despite the abovementioned, universities do not necessarily see higher levels of entrepreneurial activities. This is especially the case in the Asia Pacific setting. According to the Global Entrepreneurship Index, while Hong Kong has done well in building up the ecosystem for entrepreneurship, at the individual level, there is a lack of recognition that there are good opportunities for entrepreneurship and that it can be a good career option (Ács et al., 2019). This is consistent with the observations by Wu (2017). This gap between the individuals and the ecosystem reveals that there is still a great deal we do not understand about promoting entrepreneurial behaviour in higher education (Martins and Perez, 2020). First, entrepreneurial intention must exist before entrepreneurial behaviours do. There is a complex

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web of intervening individual and contextual factors between IE education and entrepreneurial intention (Hoang et al., 2021; Memon et al., 2019). Second, the degree to which IE education successfully fosters entrepreneurial intention may vary depending on the beliefs and attitudes that university students bring to the programme. Little research exists on these pre-educational conditions and intentions (Liguori et al., 2019). Finally, Liguori and colleagues (2019) also call for more attention to students who have received their education from community and vocational colleges. Some of these students continue their their education in universities, where they have a short two-year runway before beginning their employment. Educators can better prepare these students for their careers by being aware of their demands.

In this connection, we aim to deepen our understanding of IE education by investigating the relationships among pre-educational creative self-concept (CSC), entrepreneurial mindset (EM), creative behaviour (CB), and entrepreneurial intention (EI) for students who enrolled in a university in Hong Kong after completing their community college education. We focus on these factors for three reasons. First, EI is a necessary condition for entrepreneurial activities. Pre-educational EI is also a good baseline measure for understanding the students who are receiving the IE training. Second, while concepts similar to CSC, EM, and CB (i.e., entrepreneurial self-efficacy, individual entrepreneurial orientation, and prior exposure to entrepreneurship, respectively) have been connected to EI, they fall short in capturing the pre-educational context because most students in that setting would have limited understanding of entrepreneurship. Nevertheless, we draw on such prior research to explain the associations among CSC, EM, CB, and EI in the pre-educational context. Finally, in the context of education, CSC, EM, and CB are all factors that can be moulded. By understanding their associations with EI, we can identify critical factors in designing effective entrepreneurial ecosystems.

In the next section, we review the current understanding of EI and examine its connections to CSC, EM, and CB. Based on this discussion, we develop our hypotheses. After that, we describe our sample and methodology before presenting our findings. Finally, we conclude with implications for research and education.

Conceptual framework

Predicting entrepreneurial intention (EI)

Scholars have argued that EI depends on individual and contextual factors (Bird, 1988; Hoang et al., 2021). Among the individual factors, risk-taking propensity, proactiveness, and competitive drive are often found to be antecedents to EI (Gregori et al., 2021; Maheshwari, 2021). Contextual factors, on the other hand, include social, political, and economic conditions. Cultural norms surrounding entrepreneurial endeavours are among the examples. Research on EI has primarily drawn on the theory of planned behaviours (TPB) to organise these individual and contextual factors systematically. According to TPB, individuals formulate their behavioural intentions based on their attitude toward the behaviour, the subjective norms about the behaviour, and the perceived control or ease of carrying out the behaviour effectively. In other words, students are more likely to explore entrepreneurship as a post-graduation option if they possess a more positive attitude toward entrepreneurship, sense more positive subjective norms about entrepreneurship, and perceive friendlier entrepreneurial environment or process. Research has confirmed the TPB hypotheses directly in various cultural contexts (Duong, 2022; Maheshwari, 2021; Ng et al., 2021). Others have also identified indirect support for TPB. Notably, students who were business majors, seniors, and male showed higher EI. This was likely a result of more positive attitudes and/or subjective norms toward entrepreneurship among peers (Borges et al., 2021; Polin, 2023; Salavou et al., 2021).

One oft-cited factor that influences EI is entrepreneurial self-efficacy (ESE). Entrepreneurship scholars define ESE as "the strength of a person's belief that he or she is capable of successfully performing the various roles and tasks of entrepreneurship" (Chen et al., 1998: 295). Individuals with higher ESE have higher perceived control over their entrepreneurial behaviours. Therefore, following TPB, they should also express higher EI. Much research has confirmed this (Farrukh et al., 2021; Gregori et al., 2021; Neneh, 2020). More specifically, Liguori et al. (2020) found that students with prior exposure to entrepreneurship and those who thought there were more robust social support systems for it were also likely to have higher EI due to higher ESE. Similarly, individuals with high ESE were found to expect more positive outcomes and have higher EI (Santos and Liguori, 2020).

In the pre-education context, assuming students to have formed an accurate assessment of their ESE, given their limited understanding of entrepreneurship, would be a leap. Consequently, we consider a more expansive and general concept, creative self-concept (CSC). CSC is defined as an individual's conviction or belief about their ability to function creatively and solve problems with original thinking in or across specific domains, including but not restricted to entrepreneurship (Beghetto and Karwowski, 2017; Karwowski, 2015). CSC is particularly appealing in the education context because, despite being trait-like and thus relatively stable, it is malleable (Zandi et al., 2022). In other words, with the right educational interventions, CSC can be shaped and sustained. Building on the TPB logic, we contend that students with higher CSC would have a greater sense of agency and

control over their creative work. This would heighten their intention to invest and pursue creative work, including entrepreneurship.

H1: Students with higher CSC will have higher EI.

Although beliefs such as CSC are important, one's attitude toward innovation is also consequential in determining EI (Bolton and Lane, 2012). In fact, this is consistent with the TPB argument as well. An attitudinal construct that has garnered significant attention among entrepreneurship researchers is individual entrepreneurial orientation (IEO). IEO is typically defined as people's perceptions of their own behaviours and attitudes regarding risk willingness, innovativeness, and proactiveness. Drawing primarily on TPB, research has shown IEO to be positively related to EI (Hassan et al., 2021; Martins et al., 2022).

IEO captures the intention to pursue entrepreneurial opportunities proactively and achieve results accordingly. Missing in this conceptualisation of a positive attitude toward entrepreneurship is what comes before – the opportunity identification component. We add to the existing research on IEO by expanding the attitudinal construct to include this opportunity recognition element. The resultant concept is entrepreneurial mindset (EM), which is the attitude toward identifying and exploiting opportunities without regard to the resources controlled. A positive attitude of opportunity recognition is necessary for opportunity identification and exploitation. Opportunity recognition hinges on one's capacity to remain openminded while actively exploring and seeking novel information (Lv et al., 2015). Students with a more proactive attitude toward identifying and exploiting opportunities without regard to the resources they now possess are more likely to come across prospects that appeal to them. They are more inclined to pursue an entrepreneurial future. In contrast, students who are not proactive in scanning for new information and feel more conscious about their current resources when considering opportunities are less likely to pursue an entrepreneurial future.

H2: Students with higher EM will have higher EI.

The mediating role of creative behaviour (CB)

To assess whether one can be successful in entrepreneurial activities by extrapolating one's belief about one's creativity can be somewhat far-fetched when one has limited entrepreneurial exposure. This is particularly pertinent in a pre-education setting. As was already established, people's sense of agency and control over their creative work is a crucial link between CSC and EI. This could be based on objective feedback or, more likely, subjective perception individuals formulate through experience (Beghetto and Karwowski, 2017). This is consistent with social learning theory (Bandura and Walters, 1977), which states that people's intention or motivation to carry out an activity, such as a career choice, is often influenced by their self-perceptions of their skills in task accomplishment. These self-perceptions, in turn, stem from personal and vicarious experiences, among others. Such experiences may be personal experience with entrepreneurship, which has indeed been shown to be positively related to EI (Memon et al., 2019). More likely in the pre-educational setting, however, it would come from other creative endeavours. We define creative behaviour (CB) as actions or processes that generate new, original, and valuable ideas or solutions. CB is an active manifestation of creativity in all areas of life and work, including arts, science, business, and everyday problem solving.

It is worth noting that not everyone is equally keen to seek out these creative experiences. The anxiety that one may fail can hinder the pursuit of certain tasks. Therefore, if an individual's self-appraisal of their ability to attain a creative goal is low, they are less likely to pursue creative behaviours (Boyd and Vozikis, 1994; Chen, 2016). Those who do not identify themselves as creatives are also less inclined to pursue creative behaviours for feedback proactively. Hence, we contend that students with high CSC are more likely to engage in creative behaviours, and it is through the feedback they gather about these behaviours that they form expectations about their possible success in entrepreneurial activities, resulting in higher EI. This is a mediation relationship, per Baron and Kenny (1986).

H3: The positive relationship between CSC and EI is mediated by CB, such that students with higher CSC also have higher levels of CB.

Similar to CSC, EM is not readily apparent. Like any attitude, EM is a learned tendency to evaluate entrepreneurial activities, including scanning for opportunities and following up on the opportunities. It has a cognitive dimension, an affective dimension, and may manifest itself through behaviours. Students with positive EM would believe entrepreneurial activities to be generally positive and beneficial and would feel positive emotions (e.g., excitement and curiosity) about them. They may attempt creative behaviours in general to determine whether they think and feel positively about entrepreneurship. In contrast, students with negative EM may consider entrepreneurial activities threatening and form negative feelings (e.g., anxiety and fear) about them. In such a case, the corresponding behavioural reaction would be avoidance. To a certain extent, this is corroborated by prior research, which has shown IEO to be positively related to CB (AlQhaiwi and Abukaraki, 2021). People who try more creative behaviours are better positioned to get insightful feedback regarding

their potential as entrepreneurs. The behavioural manifestations reinforce students' evaluation of their future as entrepreneurs, influencing their EI.

H4: The positive relationship between EM and EI is mediated by CB, such that students with more positive EM also have higher levels of CB.

The interaction between CSC and EM

While individuals with higher CSC tend to pursue CB more actively on average, not everyone considering themselves highly creative would pursue CB to the same degree. Individuals with high CSC are more likely to pursue CB if they have a mindset of constantly looking for opportunities to pursue and wanting to take advantage of these opportunities even in the face of restricted resources (i.e., positive EM). In contrast, people with negative EM might not try to engage in creative endeavours unless necessary, even if they consider themselves highly creative. Stated differently, not all individuals with positive EM would pursue CB equally – those with higher CSC would be more willing and able to move forth. Therefore, we posit a positive interaction between CSC and EM on CB.

H5: There is a positive interaction between CSC and EM on CB, such that students with more positive EM are more likely to pursue CB if they have high levels of CSC.

Methodology

We tested our hypotheses by administering a survey among students who had previously attended community colleges and subsequently enrolled in a university in Hong Kong. During 2022-2023, 1748 such students enrolled in the university. All were required to complete an e-module on Innovation and Entrepreneurship, and were invited to take part in an online pre-course survey. With 463 valid responses, we had just under 26.5% response rate. We anticipated such low response rate because we only interacted with these students via the e-learning platform and because they often had tightly packed schedules.

EI was our primary outcome variable. We adopted a subset of measures that capture an individual's propensity to become an entrepreneur listed by Bolton and Lane (2012). On a 5-point Likert scale, students were asked to rate the likelihood that they would "plan to start own business in the future," "partner with someone to establish a business," and other statements. Appendix 1 shows the twelve items we retained for this scale.

CSC was captured by the 11-item scale from Shaw et al. (2021). Students rated on a 5-point Likert scale the extent to which they would describe themselves as "a creative person" and "being creative as important" to themselves, etc. Our definition of EM includes both opportunity recognition and proactiveness toward entrepreneurial achievements. Therefore, we adopted the *active learning and analysis* and the *passion and self-achievement* measures from Lv et al. (2015) to capture these dimensions respectively. The former included nine items and the latter included four items, all rated on a 5-point Likert scale. Finally, we adapted the nine-item creativity scale used in Tierney et al. (1999) to measure CB. On a 5-point Likert scale, students indicated how often they carried out a list of creative behaviours, such as "take risks in terms of producing new ideas in doing a job" and "try out new ideas and approaches to problems". Appendixes 2–4 include the three scales, respectively. We also controlled for several variables that prior research has shown to be significant to EI. These variables include gender, age, multicultural experience, work experience, entrepreneurial experience, and study major.

Results

Descriptive statistics

Our sample of 463 students included more females than males. The majority were between the ages of 19 and 21, had never lived abroad, and had only worked part-time for less than 2 years. While the majority of respondents did not have any entrepreneurial experience, over 10% of them reported having one or more entrepreneurial ventures. Students studying business made up just under 15% of the total. Table 1 presents detailed descriptive statistics of our sample.

Measurement model assessment

We employed SmartPLS to conduct our analyses. SmartPLS is a statistical software application that is for Structural Equation Modelling (SEM) using the Partial Least Squares (PLS) path modelling approach. As all of our key constructs were captured through the measurement of multiple items, this methodology allowed us to test the relationships among these constructs through Path Analysis. SmartPLS was also particularly useful for our purpose because of its capability to manage models with both mediating and moderating effects.

We began with the principal component extraction method with Varimax rotations and Kaiser normalisation to simplify our dataset. Principal component extraction is a statistical technique that helps discern the underlying structure within a large set of variables. It allows researchers to build composite factors that are captured from different angles by a set of different observable variables. To help with our data analysis, the rotation and normalisation were used to highlight the high-loading versus the low-loading items. Even though we tried our best to modify the items from earlier studies to fit our context, we suspected some would not apply to our respondents. Indeed, we found that a handful of the items included initially did not achieve a high enough loading (<0.6). We henceforth dropped the low-loading items from our model and re-ran the analysis. The

Table 1. Sample descriptive statistics.

	Number of students	Percentage (%)
Gender		
Male	198	42.76
Female	247	53.35
Non-binary/third gender	4	0.86
Prefer not to tell	14	3.02
	463	100.00
Age		
18 or below	1	0.21
19 to 21	329	71.06
22 or above	133	28.73
	463	100.00
Have you had experience living outside of your home country?		
Yes	103	22.25
No	360	77.75
	463	100.00
How much work experience have you had?		
None	57	12.31
Below 2 years of part-time experience	273	58.96
More than 2 years of part-time experience or some full-time experience	133	28.73
	463	100.00
Have you had prior entrepreneurial experience?		
No	400	86.39
Once	48	10.37
More than once	15	3.24
	463	100.00
Are you a business student?		
Yes	67	14.47
No	396	85.53
	463	100.00

Cronbach's Alpha for our model was 0.968, indicating overall solid reliability of our variables. Appendixes 1–4 indicate which items were included in our final model. The principal component loadings, means, and standard deviations of all the included items are reported in Table 2.

To assess construct reliability for the four key variables, we computed the Cronbach's alpha and composite reliability indicators (rho_a and rho_c). All four variables exhibited high Cronbach's alpha values, ranging from 0.889 (EM) to 0.926 (EI). This suggested robust internal consistency within each variable. Similarly, measures of composite reliability indicators, rho_a and rho_c, revealed strong reliability, with all variables showing numbers well above the generally accepted threshold of 0.7. We further assessed convergent validity for our variables via the average variance extracted (AVE) measure. The AVE for all variables were above 0.5, implying that more than 50% of the variance in the items was accounted for by the variables, demonstrating strong convergent validity. We report these findings in Table 3.

Next, we checked the discriminant validity of our variables by comparing the mean correlations of items across variables with the mean correlations of items within variables. A Heterotrait-Monotrait Ratio (HTMT) value of 0.85 or lower would mean discriminant validity (Henseler et al., 2015). Table 4 shows the HTMT matrix for our key variables. All values were below 0.85, confirming discriminant validity. Finally, we checked for the possibility of multicollinearity via the Variance Inflation Factor (VIF), which provides an index that measures the extent to which an estimated regression coefficient's variance is inflated due to multicollinearity. Generally, a VIF value of 1 indicates no correlation among the independent variables, a VIF between 1 and 5 suggests a moderate correlation, and a VIF above 5 is usually a strong indication of multicollinearity (O'Brien, 2007). In our case, the outer model contained VIF values between 1 and 4.113, and the inner model contained VIF values between 1.006 and 1.981, suggesting no sign of strong multicollinearity.

Key findings

As mentioned above, we conducted Path Analysis to test our hypotheses with both a mediator and a moderator. Our

Table 2. Principal component loadings, means and S.D. of items included in the SEM model.

Variables	Items	Loadings	Mean	S.D.
Entrepreneurial intention (EI)	Partner with someone to start a business	0.617	3.45	0.972
	Be engaged in some positive action towards creating a new venture in the next 12 months	0.673	3.35	0.925
	Entrepreneurship within an existing company	0.644	3.31	0.943
	Entrepreneurship using research	0.661	3.34	0.926
	I plan to start my own business in the future	0.777	3.30	1.051
	I plan to start my own business immediately after graduation	0.786	2.95	1.103
	I feel prepared to own a small business	0.811	3.00	1.069
	I would like to work for myself	0.644	3.53	0.995
	I consider myself to be entrepreneurial	0.807	3.20	1.032
Creative self-concept (CSC)	I think I am a creative person	0.754	3.40	0.920
	My creativity is important for who I am	0.776	3.52	0.894
	I trust my creative abilities	0.684	3.46	0.854
	Being a creative person is important to me	0.683	3.66	0.870
	I am sure I can deal with problems requiring creative thinking	0.621	3.56	0.793
	Creativity is an important part of myself	0.690	3.58	0.857
	Ingenuity is a characteristic that is important to me	0.651	3.58	0.823
Entrepreneurial mindset (EM)	I can learn through multiple methods	0.606	3.79	0.693
	I can always bring out new ideas	0.724	3.50	0.761
	I can think critically	0.606	3.66	0.711
	I pay attention to the latest cutting-edge technology around me	0.620	3.58	0.823
	I can put what I learn into practice	0.632	3.66	0.727
	I can utilise my ideas/views for business	0.709	3.54	0.771
	I am full of passion for entrepreneurship	0.604	3.55	0.876
	I am full of confidence even in the face of adversity	0.627	3.53	0.874
Creative behaviour (CB)	Take risks in terms of producing new ideas in doing a job	0.676	3.33	0.860
	Find new uses for existing methods or equipment	0.668	3.43	0.815
	Try out new ideas and approaches to problems	0.652	3.50	0.811
	Identify opportunities for new processes/products	0.639	3.37	0.800
	Generate novel, but operable study- and/or work-related ideas	0.717	3.26	0.849
	Serve as a good role model for creativity	0.682	3.26	0.863
	Generate ideas revolutionary to my field	0.704	3.27	0.865

Table 3. Reliability and convergent validity of key variables.

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EI	0.926	0.929	0.939	0.631
CSC	0.921	0.924	0.937	0.679
EM	0.889	0.893	0.911	0.563
CB	0.919	0.921	0.935	0.674

estimated model's Standardised Root Mean Square Residual was below the threshold at 0.071, suggesting a good fit. However, the Normed Fit Index (NFI) for the estimated model was 0.798, which just missed the desired threshold, suggesting slight limitations to our model.

We predicted in H1 that there would be a positive relationship between CSC and EI. We found a significant total indirect effect of CSC on EI ($\beta = .232$, $p = .000$), suggesting that the two variables were meaningfully associated with each other via a mediator. We also predicted in H3 that CB would mediate this relationship. Our analysis suggested that this was the case. We found a significant direct effect of CSC on CB ($\beta = 0.374$, $p = .000$) and a significant specific indirect effect for the path from CSC to CB to EI ($\beta = 0.232$,

$p = .000$). Taken together, these results showed that CB fully mediated the relationship between CSC and EI. Thus, both H1 and H3 were supported.

We also predicted very similar paths for EM. Specifically, we predicted that EM would predict EI in H2 and that CB would mediate this relationship in H4. We found a total indirect effect of EM on EI ($\beta = 0.292$, $p = .000$), suggesting that the two variables were meaningfully linked via a mediator. When considering CB as a mediator, we found a significant direct effect of EM on CB ($\beta = 0.47$, $p = .000$), as well as a significant specific indirect effect for the path from EM to CB to EI ($\beta = 0.292$, $p = .000$). Taken together, these results showed that CB also fully mediated the relationship between EM and EI, supporting both H2 and H4.

In H5, we predicted an interaction between CSC and EM on CB. Our data showed that this was the case, with a significant direct effect of CSC*EM on CB ($\beta = 0.046$, $p = .002$). Thus, H5 was supported. Finally, consistent with prior research findings, we found that entrepreneurial experience was significant ($\beta = 0.08$, $p = .030$) in influencing EI. Our findings are presented in Table 5 and Figure 1.

Additional findings

The 463 valid responses came in two waves (in two different semesters). The majority (326) were submitted in the first semester. We were curious whether the timing of the responses made a difference in the measurement items included. Hence, we ran an independent samples t test to evaluate the mean differences between these two groups. We found that while there were significant differences for only one item each for EI and EM, there were substantial differences in the mean values for four of the seven items for CSC and five items for CB. This was particularly interesting as strict pandemic control measures were still in place during the first semester while everything opened up during the second semester. These additional findings suggested that CSC and CB might be quite malleable as the environment changed.

Table 4. Heterotrait-monotrait ratio (HTMT) – matrix of key variables.

	EI	CSC	EM	CB
EI				
CSC	0.616			
EM	0.712	0.764		
CB	0.680	0.751	0.794	

Discussion

Research implications

We set out to understand the relationships among pre-educational CSC, EM, CB, and EI for students who had completed their education in community or vocational colleges before enrolling in a university. What we discovered, by and large, supported our predictions. Specifically, we discovered that students who considered themselves to be more creative (i.e., higher CSC) and students who were always on the lookout for opportunities to exploit regardless of resources (i.e., more positive EM) tended to attempt creative activities (i.e., CB). Through these activities, they formed a stronger intention to pursue entrepreneurship as a career option (i.e., EI). Furthermore, we found that CSC and EM reinforced each other in fostering EI. Our findings confirmed the TPB argument that beliefs (like CSC) and attitudes (like EM) were critical to subsequent actions. The fact that CB was the lynchpin of the relationships was also noteworthy. Belief and attitude were important to entrepreneurial intention, but only through their manifestations in creative endeavours, whether they were in entrepreneurship.

Our findings add to the research in IE education in three ways. First, we heeded the call to examine the pre-educational conditions of students who had previously attended community college (Liguori et al., 2019). These students have particular requirements because they have a shorter period between the start of their IE education and graduation. Educators may be able to mentor students better if they have a better understanding of their initial entrepreneurship-related attitudes, beliefs, and goals. Second, we tested a set of constructs that were more appropriate for a pre-educational context but were similar to those frequently used in IE education literature. Our findings corroborated with previous research on entrepreneurial self-

Table 5. Hypothesis testing.

Hypothesis	Path	T-statistics	β	p-value	Decision
H1	CSC → EI (total indirect effect)	7.256	0.232	0.000	Supported
H2	EM → EI (total indirect effect)	8.409	0.292	0.000	Supported
H3	CSC → CB (direct effect)	8.620	0.374	0.000	Supported
	CSC → CB → EI (specific indirect effect)	7.256	0.232	0.000	
H4	EM → CB (direct effect)	10.385	0.470	0.000	Supported
	EM → CB → EI (specific indirect effect)	8.409	0.292	0.000	
H5	CSC × EM → CB (direct effect)	3.047	0.046	0.002	Supported

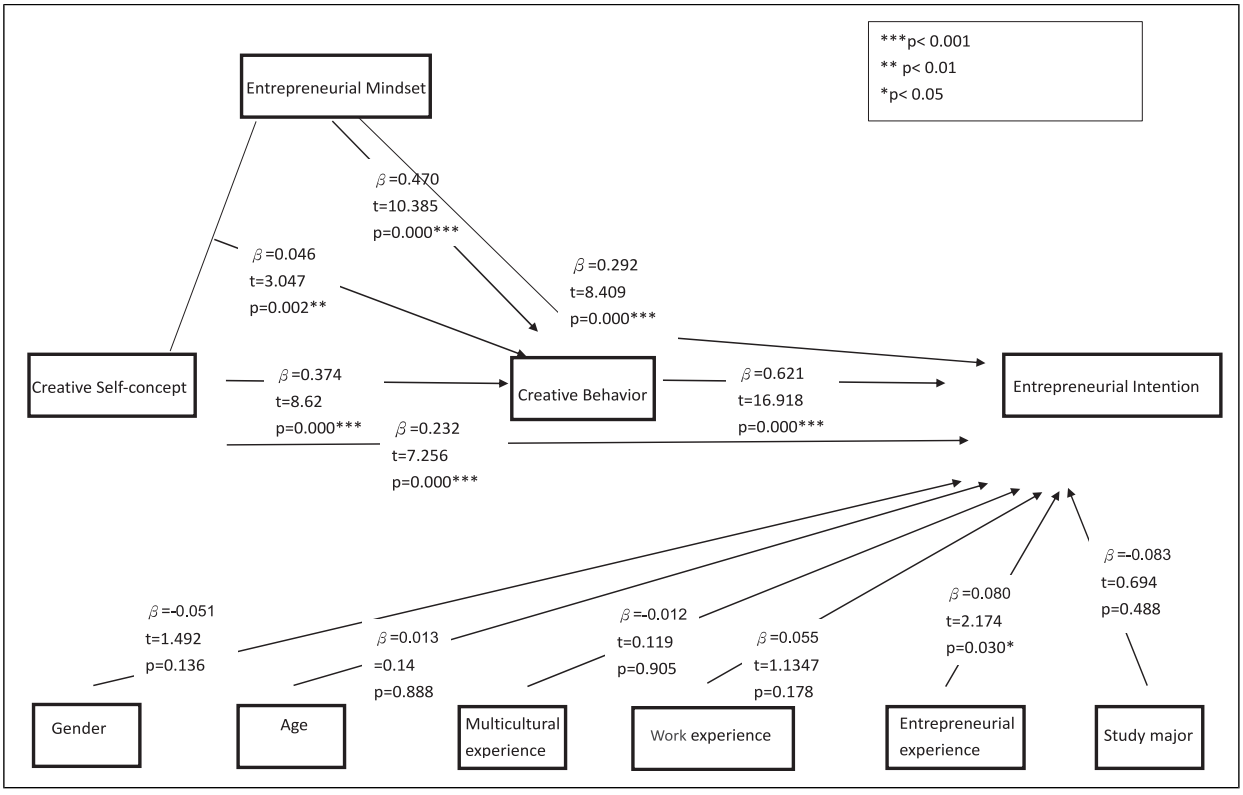

Figure 1. Path analysis findings.

efficacy and individual entrepreneurial orientation (Farrukh et al., 2021; Gregori et al., 2021; Martins et al., 2022; Neneh, 2020). Finally, and most importantly, we discovered CB's centrality in promoting EI. This finding is important because CB is not limited to entrepreneurship and can be easily implemented in the education context.

Although we conceptualised EI as a multidimensional construct that includes different ways of engaging in new ventures, we did not fully consider it in the context of other employment options, such as assuming an innovative role in an established organisation. Entrepreneurship, however, can be a mindset and an approach to problem solving. It applies to a non-startup context, too. Indeed, Freyman and Durst (2023) highlight this concern. They contend that entrepreneurship and innovation can be pursued in various ways. In additional, studies have demonstrated that students view launching new ventures as one of several possibilities and that EI (particularly full-time engagement) can be a function of one's perceived employability elsewhere (Neneh, 2020). Future research should consider a measure that takes a fuller conceptualisation into account.

Implications for IE education

Our findings suggest that we can shape the intention to consider entrepreneurship by shaping attitudes such as EM. Research has found that mere exposure to IE education can influence one's EI by changing one's attitude toward entrepreneurship (Otache et al., 2021). This is probably due to students' better understanding of entrepreneurship. Chaker and Jarraya (2021) found that training students how to identify opportunities and different creative techniques helped improved their EM. With knowledge comes acceptance. Exposure to positive role models on campus is another possibility. One's experience can influence attitude. If students are provided ample opportunities to interact with positive role models in entrepreneurship, they may form more positive attitudes toward entrepreneurship. Indeed, Xu et al. (2021) found that students were more motivated when student entrepreneurs were engaged as guest speakers, as they could see possibilities at "their own doorstep." Roslan et al. (2020) also points to tighter industry-university collaborations, social networking opportunities, and injection of innovation into service-learning subjects as possible solutions.

Beliefs such as CSC are somewhat more complex. While CSC is critical to EI, mere exposure to IE education does not necessarily lead to higher CSC among students (Memon et al., 2019). How the IE education is set up would be important. For instance, students tend to gauge their abilities by comparing with their peers. Those exposed to an environment where many peers are successfully pursuing their entrepreneurial activities are also more likely to be confident about their own entrepreneurial abilities (Karwowski,

2015). Raible and Williams-Middleton (2021) highlight the importance of entrepreneurial narratives. When introducing entrepreneurial examples, it is important to be sensitive to stereotypes and provide realistic examples that are relatable to students. Such awareness can go a long way in nurturing students' CSC. Engagement in collaborative learning, meaningful interactions with faculty, higher-order learning, reflective and integrative learning, and high-impact practices were also beneficial (Alvarez-Huerta et al., 2021).

Our findings also open up the possibility of directly inducing EI through CB. Although CSC is one way to encourage CB, there are other antecedents to CB. In the work setting, knowledge sharing and relationships among peers engaging in the same tasks are key to CB, with the latter further enhanced by supervisor knowledge sharing (Kim et al., 2021). Applying this to the educational context, it is possible to see how knowledge sharing by educators/innovators and among peers could have the same implication. More importantly, CB is not limited to activities associated with entrepreneurship. It might involve everything from basic problem-solving activities, planning social gatherings, and being involved in arts and crafts. For instance, Mason and Arshed (2013) demonstrated the effeicacy of limited-duration experiential assignments, such as the value challenge, in which groups of students were given a week to generate returns from a small investment. Many such activities can be conducted in much quicker successions and with lower costs. This opens the door for educators to explore how to incorporate CB into the curriculum to give students more chances for feedback and increase their confidence in taking on entrepreneurial endeavours. Students on a tight timeline will benefit from this greatly.

Conclusion

Many scholars have attempted to envisage how a well-rounded and effective IE education ecosystem should look like. Ustav and Venesaar (2018) point out that to move the needle on EI, IE education needs to address meta-competencies. Metacompetencies include metacognition (e.g., knowledge about one's own knowledge and self-awareness), metaconation (e.g., awareness of one's own motivators and volition), and meta-affection (e.g., awareness of one's own moods and emotions). By demonstrating that EI results from knowing, doing, and being, our findings contribute to the existing body of literature. For IE education to effectively promote entrepreneurship, it must encompass more than just imparting knowledge and giving students a place to put it into practice. Our results demonstrate that promoting entrepreneurship requires the development of corresponding belief and attitude, but only through their manifestations in creative endeavours, including activities that can be administered more quickly and cost effectively than conventional entrepreneurial endeavours.

E. M. Forster once wrote, "How do I know what I think until I see what I say?". Our research indicates that in IE education, to see one's deeds of creative endeavours is to know one's thoughts about their future in entrepreneurship. Knowing the craft of entrepreneurship is, of course, important. However, without the corresponding work to cultivate positive beliefs and attitudes about entrepreneurship and a rich and varied ecosystem of creative activities on campus, universities would have to work much harder to develop future entrepreneurs and problem solvers.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

Ács ZJ, Szerb L, Lafuente E, et al. (2019) *Global Entrepreneurship Index 2019*. London: Global Entrepreneurship and Development Institute.

AlQhaiwi LA and Abukaraki RB (2021) The impact of entrepreneurial orientation on supporting creative behavior of managers (an empirical study on medium-sized enterprise in Amman City – Jordan). *International Journal of Entrepreneurship* 25: 1–23.

Alvarez-Huerta P, Muela A and Larrea I (2021) Student engagement and creative confidence beliefs in higher education. *Thinking Skills and Creativity* 40: 100821.

Bandura A and Walters RH (1977) *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall.

Baron RM and Kenny DA (1986) The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* 51(6): 1173–1182.

Beghetto RA and Karwowski M (2017) Toward untangling creative self-beliefs. In: Karwowski M and Kaufman JC (eds) *The Creative Self: Effect of Beliefs, Self-Efficacy, Mindset, and Identity*. Cambridge, UK: Cambridge University Press, 3–22.

Bird B (1988) Implementing entrepreneurial ideas: the case for intention. *Academy of Management Review* 13(3): 442–453.

Bodolica V and Spraggon M (2021) Incubating innovation in university settings: building entrepreneurial mindsets in the future generation of innovative emerging market leaders. *Education + Training* 63(4): 613–631.

Boyd NG and Vozikis GS (1994) The influence of self-efficacy on the development of entrepreneurial intentions and actions. *Entrepreneurship Theory and Practice* 18(4): 63–77.

Chaker H and Jarraya H (2021) Combining teaching "about" and "through" entrepreneurship: a practice to develop students' entrepreneurial competencies. *Industry and Higher Education* 35(4): 432–442.

Chen BB (2016) The creative self-concept as a mediator between openness to experience and creative behaviour. *Creativity: Theories, Research, Applications* 3(2): 408–417.

Chen CC, Greene PG and Crick A (1998) Does entrepreneurial self-efficacy distinguish entrepreneurs from managers? *Journal of Business Venturing* 13(4): 295–316.

Duong CD (2022) Exploring the link between entrepreneurship education and entrepreneurial intentions: the moderating role of educational fields. *Education + Training* 64(7): 869–891.

Farrukh M, Raza A, Sajid M, et al. (2021) Entrepreneurial intentions: the relevance of nature and nurture. *Education + Training* 63(7/8): 1195–1212.

Freyman J and Durst S (2023) Business transfer paradox in entrepreneurship education: research directions for increasing the number of successors. *Journal of Innovation Management* 11(2): 1–21.

Gregori P, Holzmann P and Schwarz EJ (2021) My future entrepreneurial self: antecedents of entrepreneurial identity aspiration. *Education + Training* 63(7/8): 1175–1194.

Hassan A, Anwar I, Saleem I, et al. (2021) Individual entrepreneurial orientation, entrepreneurship education and entrepreneurial intention: the mediating role of entrepreneurial motivations. *Industry and Higher Education* 35(4): 403–418.

Henseler J, Ringle CM and Sarstedt M (2015) A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academic of Marketing Science* 43: 115–135.

Hoang G, Le TTT, Tran AKT, et al. (2021) Entrepreneurship education and entrepreneurial intentions of university students in Vietnam: the mediating roles of self-efficacy and learning orientation. *Education + Training* 63(1): 115–133.

Hughes M, Rigtering JPC, Covin JG, et al. (2018) Innovative behaviour, trust and perceived workplace performance. *British Journal of Management* 29: 750–768.

Karwowski M (2015) Peer effect on students' creative self-concept. *Journal of Creative Behavior* 49(3): 211–225.

Kim SL, Cheong M, Srivastava A, et al. (2021) Knowledge sharing and creative behavior: the interaction effects of knowledge sharing and regulatory focus on creative behavior. *Human Performance* 34(1): 49–66.

Kraus S, Breier M, Jones P, et al. (2019) Individual entrepreneurial orientation and intrapreneurship in the public sector. *The International Entrepreneurship and Management Journal* 15: 1247–1268.

Langkamp Bolton D and Lane MD (2012) Individual entrepreneurial orientation: development of a measurement instrument. *Education + Training* 54(2/3): 219–233.

Liguori E, Corbin R, Lackeus M, et al. (2019) Under-researched domains in entrepreneurship and enterprise education: primary school, community colleges and vocational education and training programs. *Journal of Small Business and Enterprise Development* 26(2): 182–189.

Liguori E, Winkler C, Vanevenhoven J, et al. (2020) Entrepreneurship as a career choice: intentions, attitudes, and outcome expectations. *Journal of Small Business and Entrepreneurship* 32(4): 311–331.

Lv RW, Lai C and Liu J (2015) Entrepreneurial capability scale and new venture performance: the moderating role of entrepreneurship education. In: Paper presented at the XIII triple helix conference, Beijing, China, 21–23 August 2015. https://www.triplehelixassociation.org/wp-content/uploads/2015/09/THC2015_NO.152-Entrepreneurial-capability-scale-and-new-venture-performance-Rebecca-Wenjing-Lv.pdf

Maheshwari G (2021) Factors influencing entrepreneurial intentions the most for university students in Vietnam: educational support, personality traits or TPB components? *Education + Training* 63(7/8): 1138–1153.

Martins I and Perez JP (2020) Testing mediating effects of individual entrepreneurial orientation on the relation between close environmental factors and entrepreneurial intention. *International Journal of Entrepreneurial Behavior & Research* 2 6(4): 771–791.

Martins I, Perez JP and Novoa S (2022) Developing orientation to achieve entrepreneurial intention: a pretest-post-test analysis of entrepreneurship education programs. *International Journal of Management in Education* 20(2): 100593.

Mason C and Arshed N (2013) Teaching entrepreneurship to university students through experiential learning: a case study. *Industry and Higher Education* 27(6): 449–463.

Memon M, Soomro BA and Shah N (2019) Enablers of entrepreneurial self-efficacy in a developing country. *Education + Training* 61(6): 684–699.

Neneh BN (2020) Entrepreneurial self-efficacy and a student's predisposition to choose an entrepreneurial career path: the role of self-perceived employability. *Education + Training* 62(5): 559–580.

Ng HS, Hung Kee DM and Khan MJ (2021) Effects of personality, education and opportunities on entrepreneurial intentions. *Education + Training* 63(7/8): 992–1014.

Otache I, Umar K, Audu Y, et al. (2021) The effects of entrepreneurship education on students' entrepreneurial intentions: a longitudinal approach. *Education + Training* 63(7/8): 967–991.

O'Brien RM (2007) A caution regarding rules of thumb for variance inflation factors. *Quality and Quantity* 41: 673–690.

Pinto Borges A, Lopes JM, Carvalho C, et al. (2021) Education as a key to provide the growth of entrepreneurial intentions. *Education + Training* 63(6): 809–832.

Polin BA (2023) Disentangling the roles of academic major and gender in determining entrepreneurial intentions among students. *Education + Training* 65(1): 22–43.

Raible SE and Williams-Middleton K (2021) The relatable entrepreneur: combating stereotypes in entrepreneurship education. *Industry and Higher Education* 35(4): 293–305.

Ritala P, Baiyere A, Hughes M, et al. (2021) Digital strategy implementation: the role of individual entrepreneurial orientation and relational capital. *Technological Forecasting and Social Change* 171: 120961.

Roslan MHH, Hamid S, Ijab MT, et al. (2020) Social entrepreneurship in higher education: challenges and opportunities. *Asia Pacific Journal of Education* 42(3): 588–604.

Salavou HE, Chalkos G and Lioukas S (2021) Linkages between entrepreneurial intentions and entrepreneurship education new evidence on the gender imbalance. *Education + Training* 63(6): 906–919.

Santos SC and Liguori EW (2020) Entrepreneurial self-efficacy and intentions: outcome expectations as mediator and subjective norms as moderator. *International Journal of Entrepreneurial Behavior and Research* 26(3): 400–415.

Shaw A, Kapnek M and Morelli NA (2021) Measuring creative self-efficacy: an item response theory analysis of the creative self-efficacy scale. *Frontiers in Psychology* 12: 678033.

Tierney P, Farmer SM and Graen GB (1999) An examination of leadership and employee creativity: the relevance of traits and relationships. *Personnel Psychology* 52(3): 591–620.

Ustav S and Venesaar U (2018) Bridging metacompetencies and entrepreneurship education. *Education + Training* 60(7/8): 674–695.

Winkler C (2023) Entrepreneurship education and pedagogy: an interview with Eric Liguori. *Entrepreneurship Education and Pedagogy* 7: 1–11.

Wu Y-CJ (2017) Innovation and entrepreneurship education in Asia-Pacific. *Management Decision* 55(7): 1330–1332.

Xu S, Xu Z, Li F, et al. (2021) Redefining peer learning: role of student entrepreneurs in teaching entrepreneurship in the UK higher education context. *Industry and Higher Education* 35(4): 306–311.

Zandi N, Karwowski M, Forthmann B, et al. (2022) How stable is the creative self-concept? A latent state-trait analysis. *Psychology of Aesthetics, Creativity, and the Arts*. 19(1), 101–111.

Appendix 1

Measurement items for entrepreneurial intention

Please indicate your likelihood of taking the following actions. (1 = unlikely to 5 = likely)	Eventual inclusion in analyses
I plan to partner with someone to start a business	✓
I plan to work for an immediate family business	
I plan to work for a small or new company	
I plan to work for a large company or corporation	
I will be engaged in some positive action towards creating a new venture in the next 12 months	✓
I will participate in entrepreneurship within an existing company	✓
I will participate in entrepreneurship using research	✓
I plan to start my own business in the future	✓
I plan to start my own business immediately after graduation	✓
I feel prepared to own a small business	✓
I would like to work for myself	✓
I consider myself to be entrepreneurial	✓

Appendix 2

Measurement items for creative self-concept

Below you will find several statements people use to describe themselves. To what extent does each of these statements represent you? There is no right or wrong answer. Please go with your instinct. (1 = definitely not to 5 = definitely yes)	Eventual inclusion in analyses
I think I am a creative person	✓
My creativity is important for who I am	✓
I know I can efficiently solve even complicated problems	
I trust my creative abilities	✓
My imagination and ingenuity distinguish me from my friends	
Many times, I have proved that I can cope with difficult situations	
Being a creative person is important to me	✓
I am sure I can deal with problems requiring creative thinking	✓
I am good at proposing original solutions to problems	
Creativity is an important part of myself	✓
Ingenuity is a characteristic that is important to me	✓

Appendix 3

Measurement items for entrepreneurial mindset

To what extent does each of these statements describe you? (1 = totally disagree to 5 = totally agree)	Eventual inclusion in analyses
I can learn through multiple methods	✓
I can always bring out new ideas	✓
I can think critically	✓
I pay attention to the latest cutting-edge technology around me	✓
I can put what you learn into practice	✓
I can utilize my ideas/views for business	✓
I am aware of the need for lifelong learning	
I dare to take risks properly in study or at work	
I can analyze logically and comprehensively	
I am full of passion for entrepreneurship	✓
I have strong desire for self-achievement	
I am not satisfied with the existing state of things	
I am full of confidence even in the face of adversity	✓

Appendix 4

Measurement items for creative behaviour

Please indicate how often the following statements characterize you. (1 = never to 5 = very often)	Eventual inclusion in analyses
Demonstrate originality in my study/work	
Take risks in terms of producing new ideas in doing a job	✓
Find new uses for existing methods or equipment	✓
Solve problems that have caused others difficulties	
Try out new ideas and approaches to problems	✓
Identify opportunities for new processes/ products	✓
Generate novel, but operable study- and/or work-related ideas	✓
Serve as a good role model for creativity	✓
Generate ideas revolutionary to my field	✓