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Exploring the Link Between Career Engagement and Career Self-Efficacy Among Engineering and Science Students in Hong Kong

Lillian Yun Yung Luk, and Kelly Chen Ye
Teaching and Learning Innovation Centre (TALIC), The University of Hong Kong, Hong Kong[a]
Corresponding Author's Email: lyyluk@hku.hk

ABSTRACT

BACKGROUND & CONTEXT

Active engagement in career-oriented behaviors during university plays a crucial role in facilitating a smoother transition into the workplace, thereby serving as a key predictor of future career success. In this context, our study focuses on engineering students at universities in Hong Kong, examining the extent of their engagement in career development learning activities and identifying the key factors that influence their career readiness and planning.

PURPOSE OR GOAL

Building upon existing career engagement scales and frameworks, this study introduces a new career engagement scale specifically adapted for university students in Hong Kong.

APPROACH OR METHODOLOGY

This scale comprises three dimensions: Engagement in Career Development Activities, Confidence in Career-related Tasks, and Self-Perception of Career Clarity and Goals, totaling 44 items. The data will be collected from undergraduate engineering students across three universities in Hong Kong.

OUTCOMES

The expected findings are anticipated to provide significant insights into the variations in career development behaviors and self-confidence across different groups and the overall attitudes and readiness of students toward career development. During the presentation, the results from the pilot study will be showcased.

CONCLUSIONS

Based on the findings, targeted recommendations will be proposed to enhance the career development activities and practices at universities in Hong Kong, aiming to better align them with the actual needs of students.

KEYWORDS

Career development, career self-efficacy, career engagement, employbility.

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Introduction

Undoubtedly, one of the primary goals of STEM education is to cultivate the next generation of engineers. However, numerous studies indicate that many engineering graduates choose to leave the field or pursue careers outside of engineering (Beasley & Fischer, 2012; Jensen & Cross, 2021). According to these studies, the combination of high stress and anxiety stemming from demanding coursework, interest shift, insufficient support and inclusion, and low levels of career self-efficacy significantly contributes to engineering students' decisions to leave the field (Beasley & Fischer, 2012; Godfrey et al., 2010; Striolo et al., 2021).

Social Cognitive Career Theory (SCCT) posits that career self-efficacy, a critical determinant of persistence in STEM fields, is cultivated through mastery experiences gained from career engagement behaviors (Lent et al., 1994; Lent & Brown, 2013). Yet, engineering programs frequently prioritize technical skills at the expense of intentionally designed career development activities, despite the proven importance of experiential learning for students' professional growth (Webber et al., 2025). This lack of focus on career development can adversely impact students' employability, leaving graduates unprepared for the job market and lacking essential skills for navigating their careers effectively.

Targeted engagement, such as industry internships, AI-assisted career preparation, and mentoring, may address this gap by providing structured mastery experiences. These interventions enable students to rehearse professional skills, internalize success, and ultimately enhance their self-efficacy (Byars-Winston et al., 2015). Thus, this paper will explore how various career engagement behaviors, including the use of Generative AI tools and participation in training programs, contribute to the development of career self-efficacy, offering a feasible approach to reducing attrition rates in engineering.

Career Engagement

Hirschi et al. (2014, p.577) define Career Engagement as “The degree to which somebody is proactively developing his or her career as expressed by diverse career behaviors”. The key distinction between career engagement and concepts such as work engagement and career adaptability is that career engagement is characterized by observable behaviors rather than internal intentions, hopes, or readiness (Hirschi et al., 2014). In other words, career engagement is reflected in specific behaviors, such as career exploration and career planning.

Notably, career engagement is not a stable personality trait; rather, it is more likely to vary with changes in situational, personal, and external factors (Nilforooshan & Salimi, 2016). Internal factors, including inherent personal traits, significantly influence career-related behaviors (Rogers et al., 2008). For instance, an individual's self-efficacy, or confidence in their ability to execute career-related tasks, alongside their expectations of career outcomes, serve as critical predictors of career engagement. Those who possess a strong belief in their capacity to succeed in career tasks are more inclined to actively participate in career-related activities. In addition to external factors, contextual elements such as social support also play a crucial role in shaping career engagement (Rogers et al., 2008).

In this paper, we concentrate on internal factors, with a particular emphasis on career self-efficacy, to investigate its impact on engineering and science students' career engagement. Unlike the study by Rogers et al. (2008), which focused on Australian high school students, our research targets students in higher education. Moreover, our sample is notably more diverse, encompassing not only local students from Hong Kong, Macau, and mainland China but also international students.

Career Self-Efficacy

Building on the internal focus outlined above, we turn to the construct of career self-efficacy, which refers to an individual's confidence in their ability to successfully perform tasks relevant to career development, such as making informed decisions, pursuing specific fields, and

navigating professional challenges (Lent & Hackett, 1987). It reflects a cognitive appraisal of one's capabilities in career-specific domains, and unlike general self-efficacy, it is domain-specific—that is, contextually bound to career-related situations (Betz & Hackett, 2006). This specificity means that career self-efficacy can vary across different facets of career behavior and must be assessed in particular contexts or outcomes of interest.

In this study, we chose career self-efficacy rather than general self-efficacy, as it provides a more theoretically aligned and empirically valid predictor of career engagement (Abele & Spurk, 2009). Drawing on the specificity matching principle (Chen et al., 2001), we argue that a construct situated at a moderate level of specificity, such as career self-efficacy, is particularly well-suited to predict behavioral outcomes, like career engagement, which involves concrete actions, including planning, exploration, and skill development. In contrast, general self-efficacy is often too broad to account for the nuances of career-specific processes, while overly narrow forms of efficacy (e.g., confidence in a single task) may lack generalizability across the range of career behaviors.

Thus, career self-efficacy offers the most appropriate conceptual and operational fit for examining the internal psychological mechanisms that influence students' proactive engagement in their career development.

Social Cognitive Career Theory

Our emphasis on self-efficacy as a core determinant of career engagement is grounded in Social Cognitive Career Theory (SCCT; Lent et al., 1994). SCCT posits that self-efficacy—defined as individuals' beliefs in their capabilities to successfully perform career-related tasks—is shaped through four primary sources: (a) mastery experiences (e.g., successfully completing career-related activities), (b) vicarious learning (e.g., observing role models), (c) social persuasion (e.g., feedback from mentors), and (d) physiological and affective states (e.g., anxiety management).

Within this framework, career engagement behaviors themselves—such as participating in skills training or using GenAI tools—can serve as mastery experiences. These activities not only support students' career preparation but also reinforce their self-efficacy, creating a feedback loop that sustains proactive career development (Lent & Brown, 2013).

While extensive research has examined the relationship between career self-efficacy and various career development behaviours, such as career exploration and adaptability, empirical work specifically investigating the link between career self-efficacy and career engagement remains limited. Notably, existing studies have established positive associations between occupational self-efficacy and work engagement within corporate or professional contexts (e.g., Chaudhary et al., 2012; Hartman & Barber, 2019). However, two critical research gaps persist:

1. The construct of career engagement, defined as a sustained, intentional investment in one's long-term professional development (Hirschi et al., 2014), has received comparatively little attention in university settings, particularly among students at an early and formative stage of career construction.
2. The mechanisms through which self-efficacy influences career engagement in higher educational contexts (e.g., through mentorship, internship experiences, or career guidance services) remain underexplored.

This study aims to address these gaps by examining how career self-efficacy shapes the career engagement of undergraduate students in engineering and science disciplines.

Specifically, the study is guided by the following research questions:

1. What is engineering and science university students' career self-efficacy and career engagement in Hong Kong?
2. What is the relationship between career self-efficacy and career engagement among engineering and science university students in Hong Kong?

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Method

Participants

This study employed a convenience sampling strategy to recruit full-time undergraduate and postgraduate students enrolled in science or engineering programmes at the University of Hong Kong (HKU). Data collection was conducted using a dual-mode approach, comprising both online surveys administered via Qualtrics and paper-based questionnaires distributed on campus. From an initial pool of 226 responses, a rigorous data screening process was applied. Exclusion criteria included: responses with more than 20% missing data, submissions from students outside STEM disciplines, and duplicate submissions. After screening, a final sample of 50 valid responses was retained for analysis (see Table 1 for participant demographics).

The final cohort consisted of 35 female students (70.0%) and 15 male students (30.0%). The majority were local students from Hong Kong (54.0%, n = 27), followed by students from Mainland China (32.0%, n = 16), international backgrounds (12.0%, n = 6), and Macao (2.0%, n = 1). Most participants were in their early academic years (Year 1: 36%, Year 2: 20%), and 70% reported GPAs between 2.40–3.59. In terms of disciplinary distribution, science students represented the majority (76%), compared to engineering students (24%).

Ethical approval for this study was granted by the HKU Human Research Ethics Committee (HREC), and written informed consent was obtained from all participants before their involvement in the study.

Measure

This study employed a structured questionnaire comprising three sections. The first section gathered participants' demographic and academic information, including gender, place of origin, year of study, GPA, and programme of study (see Table 1).

The second section measured students' career engagement with a 5-point Likert scale. This was adapted from the Career Engagement Scale developed by Hirschi et al. (2014) intended to measure three dimensions: behavioural engagement, cognitive engagement, and affective engagement. Given the study's context at the University of Hong Kong, several modifications were made to enhance relevance. For instance, the original item "Undertook things to achieve your career goals" (Hirschi et al., 2014, p. 579) was rephrased to "Undertake activities that you believe will help you to achieve your career goals" to better reflect students' day-to-day experiences.

In light of recent developments in artificial intelligence, and recent research indicating that students are increasingly using AI tools for career exploration (Gedrimiene et al., 2024; Westman et al., 2021), two additional items were incorporated under the behavioural engagement dimension. These items were: "Seek feedback from Generative Artificial Intelligence (GenAI) applications on your CV/cover letter or interview skills", and "Seek career advice from Generative Artificial Intelligence (GenAI) applications (e.g., ChatGPT)."

The third section of the questionnaire assessed students' career self-efficacy, drawing primarily from the Career Development Self-Efficacy Inventory developed by Yuen et al. (2005). As with the career engagement scale, several items were adjusted for local contextual relevance. For example, the original item "Choose tertiary institution courses rightly to prepare myself for my future career" (Yuen et al., 2005, p. 62) was revised to "Choose courses in the university rightly to prepare myself for my future career."

The internal consistency of the career engagement measure and career self-efficacy measure were assessed using Cronbach's alpha. The Career Engagement scale demonstrated high reliability ($\alpha = 0.895$), while the Career Self-Efficacy scale showed excellent reliability ($\alpha = 0.915$).

Table 1: Demographic Characteristics of Participants (N = 50)

Variable	Category	n	%
Gender			
	Male	15	30
	Female	35	70
Origin			
	Local	27	54
	Mainland China	16	32
	Macau	1	2
	International	6	12
Year			
	Year 1	18	36
	Year 2	10	20
	Year 3	8	16
	Year 4	9	18
	Postgraduate	5	10
GPA			
	1.70 – 2.39	1	2
	2.40 – 3.59	35	70
	3.6 & above	13	26
	Missing	1	2
Discipline			
	Science	38	76
	Engineering	12	24

Data Analysis

To analyse the relationship between students' career engagement and career self-efficacy, SPSS Version 29.0 was used. Frequency analyses were conducted on individual items to identify patterns of engagement and perceived self-efficacy. In addition, Pearson's product-moment correlation analyses were performed to explore the extent of the linear association between the two constructs.

Findings

Career Engagement Patterns

Descriptive frequency analysis revealed marked variations in students' career engagement behaviours (Table 2). Higher levels of engagement were observed in introspective and planning-oriented activities. For instance, 60% of respondents reported frequently developing career plans (Q9), engaging in self-reflection on personal values (Q10), and assessing their own strengths and weaknesses (Q11).

In contrast, engagement with institutional career support resources was notably low. Only 8% of participants reported regularly seeking career advice from the student supporting unit in the university (CEDARS; Q6), and another 8% frequently attended career-related training workshops (Q4). This result may suggest a disconnect between students' career development

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needs and the support mechanisms currently offered by the university. A potential explanation for this low engagement is that students may perceive institutional career services as insufficiently tailored to their specific academic disciplines, career aspirations, or developmental stages. This interpretation is further supported by the moderate uptake of generative AI tools for career guidance (e.g., ChatGPT) observed in this study, suggesting a growing preference for immediate, self-directed, and personalised sources of support. Such a shift may reflect changing patterns in students' career exploration behaviour, with greater emphasis on autonomy and on-demand access over conventional institution-led approaches.

Career Self-Efficacy

The results also revealed domain-specific variations in students' career self-efficacy (Table 2). High confidence was evident in academic-to-career alignment tasks: 80% of respondents felt confident in selecting university courses that aligned with their future career goals (Q4), and 74% expressed confidence in identifying jobs that matched their strengths and interests (Q12).

However, students reported lower levels of confidence in professional social interactions. Specifically, 58% expressed low confidence ("not at all confident" or "not very confident") in networking with professionals (Q18), and 46% lacked confidence when introducing themselves at job fairs or similar events (Q17). These findings suggest that while students are generally confident in academic and introspective career tasks, they face notable challenges in social-professional contexts.

Table 2: Student engagement-Frequency

Item	1 Almost never	2 Rarely	3Sometimes	4 Often	5 Very Often	n
Q1. Undertake activities that you believe will help you to achieve your career goals.	9 (18%)	12 (24%)	16 (32%)	11 (22%)	2 (4%)	50
Q2. Establish or maintain contacts with people who can help you professionally.	4 (8%)	14 (28%)	15 (30%)	14 (28%)	3 (6%)	50
Q3. Voluntarily participate in extracurricular activities or internship programs to support your career development.	3 (6%)	8 (16%)	22 (44%)	13 (26%)	4 (8%)	50
Q4. Attend training (e.g., CV and cover letter writing, interview training) to support your career development.	9 (18%)	17 (34%)	20 (40%)	3 (6%)	1 (2%)	50
Q5. Attend career coaching session(s) offered by Centre of Development and Resources for Students (CEDARS).	16 (32%)	12 (24%)	18 (36%)	3 (6%)	1 (2%)	50
Q6. Seek career advice from CEDARS.	20 (40%)	18 (36%)	8 (16%)	3 (6%)	1 (2%)	50
Q7. Take up positions (e.g., leader in a team, committee member in clubs & societies) that will help you progress professionally.	8 (16%)	10 (20%)	15 (30%)	14 (28%)	3 (6%)	50
Q8. Collect information about employers, professional development opportunities, or the job market in your desired area.	4 (8%)	7 (14%)	13 (26%)	16 (32%)	10 (20%)	50
Q9. Develop plans and goals for your future career.	4 (8%)	6 (12%)	10 (20%)	23 (46%)	7 (14%)	50

Q10. Sincerely think about personal values and interests.	1 (2%)	3 (6%)	14 (28%)	25 (50%)	7 (14%)	50
Q11. Reflect on my strengths and weaknesses.	0	5 (10%)	15 (30%)	23 (46%)	7 (14%)	50
Q12. Care for the development of your career.	1 (2%)	5 (10%)	11 (22%)	20 (40%)	13 (26%)	50
Q13. Feel positive about your future career.	6 (12%)	11 (22%)	22 (44%)	8 (16%)	3 (6%)	50
Q14. Feel confident that you will be able to pursue a career in your field of interest.	5 (10%)	11 (22%)	20 (40%)	10 (20%)	4 (8%)	50
Q15. Feel that you will be able to manage setbacks in your career.	1 (2%)	14 (28%)	18 (36%)	13 (26%)	4 (8%)	50
Q16. Seek feedback from Generative Artificial Intelligence (GenAI) applications (e.g., ChatGPT, DeepSeek) on your CV/cover letter or interview skills.	8 (16%)	8 (16%)	15 (30%)	10 (20%)	9 (18%)	50
Q17. Seek career advice from Generative Artificial Intelligence (GenAI) applications (e.g., ChatGPT, DeepSeek).	9 (18%)	10 (20%)	14 (28%)	10 (20%)	7 (14%)	50

Table 3: Students' Self-Efficacy-Frequency

Item	1 Not at all confident	2 Not very confident	3 Neutral	4 Confident	5 Extremely confident	n
1. Strike a balance between interest and future prospects.	1 (2%)	7 (14%)	26 (52%)	10 (20%)	5 (10%)	49
2. Explore different careers within my interests.	1 (2%)	10 (20%)	23 (46%)	13 (26%)	2 (4%)	49
3. Understand my abilities so as to help myself choose a career.	0	8 (16%)	21 (42%)	18 (36%)	2 (4%)	49
4. Choose courses in the university rightly to prepare myself for my future career.	2 (4%)	3 (6%)	17 (34%)	21 (42%)	6 (12%)	49
5. Assess and modify my career goals according to the change in external situation.	0	4 (8%)	27 (54%)	15 (30%)	3 (6%)	49
6. Solve the problems I encounter in the process of achieving my career goal.	1 (2%)	9 (18%)	20 (40%)	17 (34%)	2 (4%)	49
7. Constantly improve my study and career plan to work toward my career goal.	1 (2%)	6 (12%)	17 (34%)	22 (44%)	3 (6%)	49
8. Master general interview techniques (e.g., appearance, ways of speaking, etc.).	2 (4%)	11 (22%)	19 (38%)	15 (30%)	2 (4%)	49
9. Produce a CV for myself.	1 (2%)	12 (24%)	14 (28%)	18 (36%)	4 (8%)	49

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10. Produce a cover letter for myself.	2 (4%)	14 (28%)	20 (40%)	12 (24%)	1 (2%)	49
11. Still have the stamina to look for different job opportunities when there are difficulties in job hunting.	1 (2%)	15 (30%)	8 (16%)	22 (44%)	3 (6%)	49
12. Look for suitable jobs according to my interests and abilities.	1 (2%)	3 (6%)	17 (34%)	24 (48%)	4 (8%)	49
13. Get help from the university to help me find a job.	6 (12%)	11 (22%)	13 (26%)	18 (36%)	1 (2%)	49
14. Get help from my personal network or connections to help me find a job.	5 (10%)	12 (24%)	18 (36%)	11 (22%)	3 (6%)	49
15. Find a suitable job successfully.	4 (8%)	9 (18%)	24 (48%)	10 (20%)	2 (4%)	49
Q16. Seek feedback from Generative Artificial Intelligence (GenAI) applications (e.g., ChatGPT, DeepSeek) on your CV/cover letter or interview skills.	8 (16%)	8 (16%)	15 (30%)	10 (20%)	9 (18%)	50
17. Introduce myself to recruiters at a job fair or professionals at a networking event.	7 (14%)	16 (32%)	15 (30%)	7 (14%)	4 (8%)	49
18. Conduct an effective conversation with professionals at a networking event to seek useful information.	2 (4%)	21 (42%)	14 (28%)	8 (16%)	4 (8%)	49
19. Understand the relationship between my interests and choosing a career.	1 (2%)	7 (14%)	16 (32%)	20 (40%)	5 (10%)	49
20. Understand my abilities so as to help myself choose a career.	0	8 (16%)	17 (34%)	21 (42%)	3 (6%)	49
21. Think over the relationship between my choice of courses and career prospects.	0	9 (18%)	15 (30%)	21 (42%)	4 (8%)	49
22. Select and enroll in some suitable courses to prepare myself for different economic situations and labor demand.	2 (4%)	10 (20%)	13 (26%)	19 (38%)	5 (10%)	49

Relationship Between Career Engagement and Self-Efficacy

A Pearson product-moment correlation analysis was performed to investigate the relationship between total student engagement (FQ_total) and total career self-efficacy (CQ_total). Results indicated a relatively strong positive correlation between the two variables, $r(47)= .67$, $p < .001$.

The findings support a significant positive association between overall student engagement and career self-efficacy, indicating that students who are more engaged in career-related activities may also exhibit stronger confidence in their career-related capabilities. This finding is consistent with Social Cognitive Career Theory (SCCT), which posits that individuals with higher levels of self-efficacy are more likely to engage in career-related activities (Lent et al., 1994).

Table 4: Descriptive Statistics and Correlations for Study Variables

Variable	n	M	SD	1	2
1. FQ_total	49	3.03	0.65	—	
2. CQ_total	49	3.12	0.56	.666**	—

Note. **Correlation is significant at the 0.01 level (2-tailed).

Recommendations and Implication

Based on the core findings of this study, it can be concluded that career engagement is significantly and positively correlated with career self-efficacy. However, students' engagement and self-efficacy in career development varies. More specifically, majority of the students indicated more frequent engagement in career planning activities compared to seeking advice or attending career coaching and CV writing training provided by the university career services. Majority of the students reported higher confidence in matching their interest and abilities with their career choice, compared to in engaging in career development activities which require professional communication and networking. These results suggest that although students are confident in making academic choices related to their careers, they may lack the experience needed to build self-efficacy in more external domains. Due to these findings, several recommendations emerge.

One key recommendation arising from this study is the need to bridge the disconnect between students and university career services. University career development (CD) services, typically staffed by professionally trained career practitioners, play an essential role in supporting students' career behaviours, such as setting career goals and providing guidance on job searches and internship opportunities (Brown et al., 2019). In recent years, many universities have attempted to integrate career development services and related learning into academic curricula. However, such integration remains challenging. A primary reason is that CD staff often provide generalist support, such as CV writing or interview preparation, without possessing in-depth knowledge of specific disciplines (Healy et al., 2022).

As a result, students in specialised fields such as engineering may struggle to access tailored guidance on labour market trends and employment pathways in their specific industries. This points to a latent need for CD services to collaborate more closely with faculties such as engineering and science to co-develop resources and initiatives that address the unique career landscapes of sub-fields like mechanical, electrical, and biotechnological engineering. These could include discipline-specific career roadmaps, employer networks, skill profiles, and industry insights.

Moreover, career development should not be the sole responsibility of centralised services. Faculties and departments must take a proactive role in embedding employability dimensions—such as communication, networking, ethical awareness, and industry knowledge—into curriculum design and assessment. Lecturers and academic advisors, especially those in mentoring roles, are instrumental in shaping students' self-efficacy beliefs. According to the SCCT (Lent & Brown, 1996), academic staff and mentors are often the most visible and relatable role models in students' academic and career journeys. By observing how their mentors navigate professional challenges and make career decisions, students can develop a stronger belief in their own capabilities—what SCCT terms vicarious experiences.

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Secondly, universities must systematically strengthen the development of professional communication and interpersonal skills. This is particularly crucial for engineering and science students, for whom soft skills are often undervalued advancement (Chan, Zhao, & Luk, 2017). In STEM-related disciplines, technical competencies such as mathematics, physics, chemistry, and logical reasoning are traditionally prioritised, whereas socio-emotional capabilities are frequently treated as secondary, or even neglected altogether. Many students and educators continue to view technical knowledge as the key to career success, thereby underestimating the role of soft skills in professional advancement (Lauana et al., 2022). The findings of this study affirm this concern, highlighting the urgent need for targeted soft skills training. Caeiro-Rodriguez et al. (2021) advocate for the use of diverse and innovative teaching strategies—such as problem- and project-based learning, gamification, and flipped classrooms—to foster students' interpersonal and communication competencies. These approaches simulate complex real-world scenarios and provide students with platforms to practise collaboration, leadership, creativity, and self-motivation, thereby enhancing their readiness for the workplace.

By implementing these recommendations, universities in Hong Kong can more effectively support engineering and science students in enhancing their career self-efficacy and fostering proactive career engagement.

However, it is important to acknowledge certain limitations of the present study. The sample size was relatively small, and engineering students accounted for only 24% of respondents. Future research could expand the sample—particularly the representation of engineering students. In-depth qualitative interviews could also provide a richer understanding of students' low utilization of career services, as well as their lived experiences and outcomes from using AI tool for career advice or support.

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