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University students' socio-emotional skills: the role of the teaching and learning environment

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ABSTRACT

Socio-emotional skills are vital for individuals to thrive academically, personally, and socially in the twenty-first century. However, limited attention has been devoted to the factors that might facilitate or hinder the development of socio-emotional skills among university students. To address this gap, we explored the association between the teaching and learning environment and socio-emotional skills using both variable-centered (Study 1) and person-centered (Study 2) approaches. A survey was conducted among 1,136 students in 21 universities. In Study 1, the variable-centered approach showed that active learning, good teaching, and clear goals and standards were positively associated with socio-emotional skills, while feedback and appropriate assessment had no significant or negative influence on socio-emotional skills. In Study 2, the person-centered approach identified three groups of students characterized by low, medium, and high socio-emotional skills. Students who experienced higher levels of active learning and clear goals and standards were more likely to belong to the high socio-emotional skills group. Surprisingly, students who received more frequent feedback from their teachers were more likely to belong to the low socio-emotional skills group, which we speculated might be due to low levels of feedback literacy. These findings underscore the importance of the teaching and learning environment in developing students' socio-emotional skills in the higher education context.

Beyond academic knowledge and cognitive skills, there is a growing recognition of the significance of socio-emotional skills[1] in the twenty-first century (Organisation for Economic Co-operation and Development [OECD] 2021). Many international multi-sectoral organizations, such as the OECD (OECD 2018), the World Economic Forum (2023), and the World Bank (Acosta, Muller, and Sarzosa 2015), have emphasized the critical role of socio-emotional skills in individuals' academic development, well-being, and future work success.

Previous studies primarily focused on understanding the outcomes associated with socio-emotional skills (Albani et al. 2023; Santos et al. 2023). However, little attention has been given to

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identifying factors that may facilitate or hinder the development of these skills. While several studies have demonstrated that socio-emotional skills are malleable, most of these studies have focused on the K-12 educational settings (Jagers, Rivas-Drake, and Williams 2019; OECD 2018). A noticeable gap remains in our understanding of how university teaching and learning environments affect these skills.

To address the existing research gap, this study examined the role of the teaching and learning environment on university students' socio-emotional skills. Two studies were conducted. Study 1 adopted a variable-centered approach to explore the general relationship between teaching and learning environment and socio-emotional skills across the overall sample. Study 2 employed a person-centered approach to investigate the potential existence of distinct socio-emotional skills profiles.

Literature review

Socio-emotional skills

Socio-emotional skills encompass a combination of 'knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions' (Collaborative for Academic, Social, and Emotional Learning [CASEL] 2020). The CASEL framework, defining socio-emotional skills from a developmental perspective, is one of the most widely used theoretical frameworks in existing research (Jagers, Rivas-Drake, and Williams 2019).

This framework conceptualizes socio-emotional skills into five intrapersonal and interpersonal skills (Anthony et al. 2020; Mahoney et al. 2021). The intrapersonal skills of *self-awareness* and *self-management* emphasize students' ability to understand and manage their own emotions, thoughts, and behaviors. The interpersonal skills of *social awareness* and *relationship skills* refer to students' ability to show care and concern for others' emotions and maintain healthy relationships with others. *Responsible decision-making* is a hybrid of intrapersonal and interpersonal skills, highlighting students' competency in making constructive and respectful choices about their personal and social behaviors.

Socio-emotional skills have been identified as a key factor contributing to critical life outcomes (Santos et al. 2023; Schoeps, de la Barrera, and Montoya-Castilla 2020). For example, a large-scale study conducted by the World Bank found that individuals with higher socio-emotional skills enjoyed higher salaries, greater job satisfaction, and increased employability (Chua 2017). The recently released *Future of Jobs Report* by the World Economic Forum (2023) indicated that socio-emotional skills such as self-management, self-awareness, and relationship skills will be increasingly important in the next five years. Furthermore, a landmark OECD (2021) study which involved more than 50,000 students across nine countries concluded that socio-emotional skills were associated with academic achievement, psychological well-being, and positive social interactions.

Given the importance of socio-emotional skills, an essential question arises regarding what facilitates or inhibits these skills. Existing research has highlighted the importance of a caring, supportive, and nurturing teaching and learning environment in fostering socio-emotional skills (Mahoney et al. 2021). This can be achieved by implementing supportive teaching practices, providing well-scaffolded opportunities, and cultivating an active learning atmosphere (Jagers, Rivas-Drake, and Williams 2019; Jones, McGarrah, and Kahn 2019). However, it is noteworthy that most of these findings were derived from studies conducted in K-12 settings. Given the disparities between the teaching and learning environment in K-12 and higher education, acquiring a nuanced understanding of how these environments influence socio-emotional skills in the higher education context is essential.

Need to focus on university students' socio-emotional skills

Socio-emotional skills hold significant relevance throughout the lifespan, with particular importance in the university setting (Gilar-Corbí et al. 2018). This paper focuses on university students' socio-

emotional skills for two reasons. Firstly, university students face a more complex learning environment compared to their primary and secondary counterparts. Many students leave their homes and even the cities/countries they grew up in, necessitating a transition to greater independence and adaption to new academic and social environments. Hence, university students face key challenges in knowledge acquisition, interpersonal relationships, and emotional regulation (Stallman 2010).

Secondly, from a developmental perspective, university students, typically aged between 18 and 22 years old, are in a phase known as emerging adulthood (Arnett 2000). This is a key period for individuals to explore possible life directions, make independent decisions, and establish healthy relationships with others (Arnett 2004). However, emerging adulthood is also characterized by elevated rates of risky behaviors (e.g. suicide, abuse, and violence) because of the inherent instability of identity exploration and sensation seeking (Arnett 2000). The presence of socio-emotional skills can enhance students' adaptive functioning and prevent maladaptive outcomes, yielding key benefits for their long-term development.

Teaching and learning environment

The teaching and learning environment is a multidimensional concept encompassing students' perceptions of the university's curricular, instructional, and assessment contexts (Fryer, King, and Zeng 2024; Ginns, Prosser, and Barrie 2007; Zeng, Fryer, and Zhao 2023). Extensive research has demonstrated the critical role of the teaching and learning environment in university students' skill development. For example, research employing Biggs' 3P (presage-process-product) model has shown the importance of a good teaching and learning environment for cognitive and social development (Kember, Webster, and Chan 2020). Similarly, recent research grounded in the Self – versus External-Regulation in Behavioral Learning Theory has also emphasized the importance of the teaching and learning environment on motivational-affective variables (de la Fuente-Arias 2017). These studies indicate that a positive teaching and learning environment (e.g. structured learning activities and tailored goals) can enhance students' self-regulated learning outcomes (de la Fuente et al. 2020).

However, previous studies have predominantly operationalized the teaching and learning environment at the university level (Kuh 2001), with little attention devoted to the teaching and learning environment at the course level. The Student Learning Experience Questionnaire (SLEQ), adapted from the Course Experience Questionnaire (Ginns, Prosser, and Barrie 2007; Wilson, Lizzio, and Ramsden 1997), is one of the most widely used instruments for assessing the course-level teaching and learning environment in the higher education context (Webster et al. 2009). Studies using the SLEQ have indicated that a high-quality teaching and learning environment, characterized by the presence of good teaching, feedback, and appropriate assessment, could help students develop sophisticated learning approaches (Webster et al. 2009) and better learning outcomes (Yin and Wang 2015, 2016).

Teaching and learning environment and socio-emotional skills in Chinese higher education

The higher education system in China stands as the largest worldwide, with over 44 million students (Ministry of Education 2022). The remarkable growth of higher education in China has prompted a significant emphasis on quality assurance by the government. Recent policy initiatives, including the 'Opinions on Accelerating the Construction of High-level Undergraduate Education to Comprehensively Improve the Cultivation of Talents' (Ministry of Education 2018a) and the 'Opinions on Deepening the Reform of Undergraduate Education and Teaching and Comprehensively Improving the Quality of Talent Training' (Ministry of Education 2018b), highlight the need for enhancing university teaching and learning environments. These enhancements include promoting active learning, enhancing teacher-student interaction, and adopting student-centered teaching strategies. Consequently, several assessment programs have emerged to assess Chinese universities' teaching and

learning environment (Guo, Yang, and Shi 2017; Huang, Zhou, and Shi 2021; Yin, Wang, and Han 2016). For example, Tsinghua University launched the Chinese College Student Survey (CCSS), which measures university students' engagement (Shi et al. 2014). Based on CCSS data, research has highlighted the impact of the teaching and learning environment (e.g. classroom assessment, active learning, and teacher-student interaction) on key learning-related outcomes (Guo & Shi, 2014; Huang, Zhou, and Shi 2021; King, Luo, & Xie 2024; Xie, King, & Luo 2023). However, most of these studies have primarily focused on cognitive skills (e.g. Guo, Yang, and Shi 2017; Yin, Wang, and Han 2016), with less work focused on the development of socio-emotional skills.

'China's Education Modernization 2035' initiative highlights the necessity of fostering students' holistic development regarding social responsibility, collaboration, and self-awareness, which align closely with the literature on socio-emotional skills. Hence, there is a crucial need to explore how the teaching and learning environment influences students' socio-emotional skills in the Chinese context.

Controlling for the influence of demographic information

Existing research has highlighted the role of demographic factors such as socioeconomic status, academic major, gender, year level, and student age on university students' development. For example, socioeconomic status was highlighted as a crucial determinant of university students' success (Alam and Forhad 2022). Students from advantaged backgrounds are more likely to achieve academic and career success (Alam 2021; Gui, Alam, and Hassan 2023). Likewise, research has shown the impact of socioeconomic status on socio-emotional skills (Kuo et al. 2020). Gender has also been shown to play a role, with past studies showing that female students typically reported higher levels of emotional challenges than their male counterparts (e.g. Graves et al. 2021). To get a robust relationship between the teaching and learning environment and socio-emotional skills, we have included these background variables as covariates in our study.

Present Study

This study was informed by two distinct research traditions, the first being research on teaching and learning in higher education and the second on socio-emotional learning. First, past studies have revealed the critical role of the teaching and learning environment in university students' development (Kember, Webster, and Chan 2020). Second, research on socio-emotional skills has shed light on the importance of an active and engaging learning environment on socio-emotional skills (Jagers, Rivas-Drake, and Williams 2019). Two studies were conducted to explore the impact of university teaching and learning environments on socio-emotional skills. In Study 1, we adopted a variable-centered approach and tested the following hypothesis:

> H1. Students who experience a better teaching and learning environment will demonstrate higher levels of socio-emotional skills.[2]

Study 2 employed a person-centered approach to identify distinct profiles of students based on their socio-emotional skill levels and understand how teaching and learning environments are related to the socio-emotional skills profiles. Two hypotheses were tested:

> H2. There are distinct profiles of socio-emotional skills among university students.

> H3. Students who experience a better teaching and learning environment are more likely to be classified into the high socio-emotional skills profile.

Study 1: variable-centered approach

In Study 1, we applied hierarchical linear modeling to explore the overall relationship between the teaching and learning environment and socio-emotional skills across the overall sample. Figure 1

depicts the conceptual model underpinning Study 1. This model is grounded in prior work showing the critical role of the teaching and learning environment in facilitating socio-emotional skills (Jagers, Rivas-Drake, and Williams 2019).

Methods

Participants

A total of 1136 Chinese university students from 21 universities participated in this study, with an average of 54.09 (SD = 41) participants from each university. The numbers of students in Year 1, Year 2, Year 3, and Year 4 and above were 76 (6.7%), 177 (15.6), 429 (37.8%), and 454 (40.1%), respectively. Overall, there were 959 (84.4%) female and 177 (15.6%) male students.

Instruments

Teaching and learning environment.[3] SLEQ was used to measure the university teaching and learning environment. This questionnaire has demonstrated reliability and validity across different contexts (Fryer, Zeng, and Zhao 2021; Ginns, Prosser, and Barrie 2007; Webster et al. 2009; Zhao, Huen, and Prosser 2017). The SLEQ measures teaching and learning environment regarding *active learning* (3 items, e.g. 'I was given the chance to participate in a variety of activities in class'; Cronbach alpha = 0.80 and McDonald's Omega = 0.80), *feedback from the teacher* (4 items, e.g. 'The teachers normally gave me helpful feedback on my progress'; Cronbach alpha = 0.88 and McDonald's Omega = 0.88), *good teaching* (2 items, e.g. 'The teachers motivated me to do my best work'; Cronbach alpha = 0.71 and McDonald's Omega = 0.71), *clear goals and standards* (3 items, e.g. 'I usually have a clear idea of where I am going and what is expected of me'; Cronbach alpha = 0.76 and McDonald's Omega = 0.76), and *appropriate assessment* (3 items, e.g. 'I am assessed on my analytical skills'; Cronbach alpha = 0.82 and McDonald's Omega = 0.83). All items were rated on a 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). This instrument demonstrated good construct validity with *CFI* = 0.940, *TLI* = 0.922, *RMSEA(90%CI)* = 0.064 (0.058, 0.069).

Socio-Emotional Skills. Socio-emotional skills were adapted from Anthony et al. (2020), which was developed based on CASEL's theoretical framework, including self-awareness (4 items, e.g. 'I ask for help when I need it'; Cronbach alpha = 0.64 and McDonald's Omega = 0.70), self-management (4 items, e.g. 'I stay calm when dealing with problems'; Cronbach alpha = 0.65 and McDonald's Omega = 0.74), social awareness (4 items, e.g. 'I help my friends when they are having a problem'; Cronbach alpha = 0.73 and McDonald's Omega = 0.76), relationship skills (4 items, e.g. 'I work well
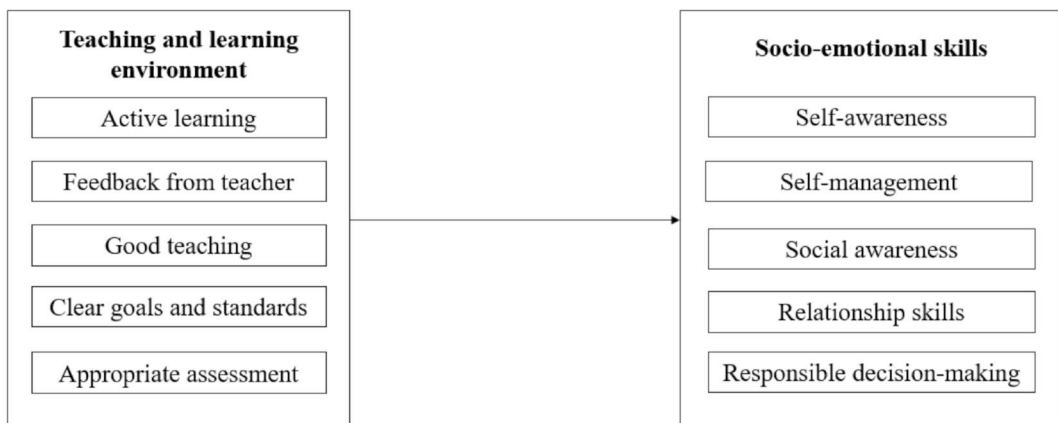

Figure 1. Conceptual model of study 1.

with my classmates'; Cronbach alpha = 0.67 and McDonald's Omega = 0.83), and responsible decision-making (4 items, e.g. 'I do the right thing without being told'; Cronbach alpha = 0.68 and McDonald's Omega = 0.81). All items were rated on a 4-point scale, ranging from 1 (*not true*) to 4 (*very true*). This instrument demonstrated good construct validity with *CFI* = 0.923, *TLI* = 0.909, *RMSEA* (90%*CI*) = 0.085 (0.082, 0.089).

Covariates. We included gender (1 = male, 0 = female), year level, student age, major (1 = sciences, 0 = humanities), and socioeconomic status measured by the highest education level of parents as covariates.

Procedure

Following the guidelines provided by the International Test Commission (2018), the scales were translated and adapted to ensure their applicability in Chinese higher education. Two team members independently translated the questionnaire from English to Chinese and made adaptations specific to the Chinese context. Discrepancies were recorded, and a third team member facilitated the resolution process. The final version of the questionnaire was digitized and uploaded to the 'Wenjuanxing' online survey platform.

A purposive sampling approach was employed to collect data for this study, primarily to secure a diverse sample encompassing various geographical regions and educational institutions. The universities included in this study are distributed across various regions, including Western, Eastern, and Central areas of the Chinese Mainland, ensuring geographical representation. Additionally, the universities included a range of prestige levels, encompassing tier 1 universities ('985' project)[4], tier 2 universities ('211' project)[5], and tier 3 universities (other institutions). This stratified selection deliberately captured a broad spectrum of the teaching and learning environment across different types of higher education institutions in China.

Sample size was determined *a-priori* using the power analysis tool G*Power 3.1. A sample of 1,077 participants was found sufficient to detect a small effect size (0.1) with a 95% power and a 5% level of statistical significance (Faul et al. 2007). The online survey was distributed to university students through WeChat groups, a widely utilized communication platform in China. This distribution strategy was chosen to reach a varied student demographic, thereby maximizing the diversity of the data. Participants were instructed to carefully read the survey's purpose and the procedure for completing the questionnaire. Participation was entirely voluntary, allowing participants to withdraw at any time. We anonymized the survey without collecting identifiable information to reduce social desirability bias.

Procedures in this study were approved by the Human Research Ethics Committee of The University of Hong Kong (Approval number EA210512).

Statistical analyses

Preliminary analysis. Descriptive statistics were calculated, including the mean, standard deviation, and correlations among variables. Harman's single-factor test was performed to examine whether the results were influenced by a common method bias, which refers to variance caused by the measurement method rather than the constructs under investigation. If the total variance explained by a single factor is less than 50%, it indicates the absence of a significant common method bias (Podsakoff et al. 2003).

Primary analysis. To examine H1, hierarchical linear modeling was employed to explore the relationship between teaching and learning environment and socio-emotional skills after controlling for the covariates. As a variable-centered method, hierarchical linear modeling assumes that the influence of teaching and learning environment on socio-emotional skills is similar across the whole population. This method allows for the exploration of general patterns of relationships among variables (Bray and Dziak 2018).

Separate models were tested for each of the five socio-emotional skills. R-square (R^2) was calculated to show the variance in each socio-emotional skill explained by teaching and learning environment variables.

The data used in this study is hierarchical, where students are nested in universities. In this case, students within the same university are correlated because they share the same teaching and learning environment. Hierarchical linear modeling with 'TYPE = COMPLEX' was used in *Mplus 8.0* to adjust the standard errors due to the clustering of students within universities (Muthén and Muthén 2017).

Results

Preliminary analysis

Table 1 summarizes the descriptive statistics, reliabilities, and correlation matrix. The correlation matrix shows that teaching and learning environment variables were correlated with socio-emotional skills, ranging from 0.16–0.72. All measured variables demonstrated satisfactory reliability, with McDonald's Omega values ranging from 0.64–0.88.

Harman's single-factor test indicated that the total variance explained by one factor was no more than 29.96%, demonstrating that the results were not substantially influenced by common method bias.

H1: The Relationship Between Teaching and Learning Environment and Socio-Emotional Skills

Table 2 shows the relationship between teaching and learning environment and socio-emotional skills. After controlling for covariates, active learning was positively linked with self-awareness ($\beta = 0.27$, $p < .001$), self-management ($\beta = 0.23$, $p < .001$), social awareness ($\beta = 0.27$, $p < .001$), relationship skills ($\beta = 0.29$, $p < .001$), and responsible decision-making ($\beta = 0.34$, $p < .001$). Good teaching has positive effects on self-awareness ($\beta = 0.09$, $p < .05$), relationship skills ($\beta = 0.12$, $p < .001$), and responsible decision-making ($\beta = 0.10$, $p < .05$). Clear goals and standards were positively related to self-awareness ($\beta = 0.21$, $p < .001$), self-management ($\beta = 0.22$, $p < .001$), social awareness ($\beta = 0.09$, $p < .01$), relationship skills ($\beta = 0.14$, $p < .001$), and responsible decision-making ($\beta = 0.17$, $p < .001$). Interestingly, feedback from the teacher was negatively associated with self-awareness ($\beta = -0.10$, $p < .05$), relationship skills ($\beta = -0.11$, $p < .05$), and responsible decision-making ($\beta = -0.19$, $p < .01$). The results indicated that teaching and learning environment could explain 12%−17% of the variance in socio-emotional skills after controlling for covariates.

Study 2: person-centered approach

Study 2 was a person-centered study designed to explore the possible existence of distinct socio-emotional skill profiles. Figure 2 depicts the conceptual model.

While Study 1 explored the association between teaching and learning environment and socio-emotional skills across the overall sample, Study 2 offered a more nuanced understanding by identifying distinct subgroups of students who might experience varying levels of socio-emotional skills and examining how teaching and learning environments are associated the likelihood of students belonging to different subgroups.

Methods

Participants and instruments

The participants and instruments in Study 2 were the same as that in Study 1.

Table 1. Descriptive statistics, reliabilities and bivariate correlations.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Gender (1 = male, 0 = female)	–														
2. Year level	0.01	–													
3. Student age	0.00	0.50**	–												
4. Major (1 = science, 0 = humanities)	0.36**	−0.09**	−0.13**	–											
5. Socioeconomic status	0.01	−0.07*	−0.10**	0.06*	–										
6. Active learning	−0.05	−0.06*	−0.07*	−0.15***	−0.05	–									
7. Feedback from teacher	0.01	−0.03	−0.06*	−0.13***	−0.04	0.61**	–								
8. Good teaching	0.00	−0.05	−0.07*	−0.08***	−0.06	0.58**	0.72**	–							
9. Clear goals and standards	0.01	−0.04	−0.07*	−0.08***	−0.02	0.50**	0.58**	0.61**	–						
10. Appropriate assessment	0.01	−0.04	−0.06*	−0.11***	−0.04	0.56**	0.69***	0.68***	0.64**	–					
11. Self-awareness	−0.09***	−0.03	−0.07*	−0.10***	0.04	0.37***	0.25***	0.30***	0.34***	0.28***	–				
12. Self-management	0.02	−0.05	−0.06*	−0.02	0.06	0.34***	0.26***	0.29***	0.34***	0.29***	0.67***	–			
13. Social awareness	−0.05	−0.05	−0.06*	−0.05	0.06*	0.33***	0.24***	0.24***	0.25***	0.23***	0.67***	0.65**	–		
14. Relationship skills	−0.08***	−0.06	−0.06*	−0.10***	0.03	0.37***	0.24***	0.29***	0.29***	0.26***	0.69***	0.63**	0.71**	–	
15. Responsible decision-making	−0.11**	−0.05	−0.09**	−0.07*	0.04	0.35***	0.16***	0.24***	0.27***	0.20***	0.66***	0.64***	0.62**	0.65**	–
McDonalds' Omega	–	–	–	–	–	0.80	0.88	0.71	0.77	0.83	0.64	0.65	0.73	0.67	0.69
Mean	–	–	–	–	–	2.87	2.43	2.72	2.62	2.53	2.09	1.92	2.10	2.20	2.29
SD	–	–	–	–	–	0.62	0.76	0.71	0.68	0.70	0.48	0.48	0.50	0.49	0.49

Note. *$p < 0.05$, **$p < 0.01$. Reliability was measured by McDonalds' Omega.

Table 2. Relationship between the teaching and learning environment and socio-emotional skills.

	Self-awareness		Self-management		Social awareness		Relationship skills		Responsible decision-making	
	M1	M2	M1	M2	M1	M2	M1	M2	M1	M2
Covariates										
Gender (1 = male, 0 = female)	−0.06(0.04)	−0.07(0.04)*	0.03(0.03)	0.02(0.03)	−0.03(0.04)	−0.04(0.04)	−0.04(0.03)	−0.05(0.03)	−0.09(0.03)**	−0.09(0.03)**
Year level	0.00(0.04)	0.01(0.03)	−0.03(0.04)	−0.02(0.04)	−0.03(0.03)	−0.02(0.03)	−0.04(0.05)	−0.02(0.04)	−0.02(0.04)	0(0.03)
Student age	−0.07(0.05)	−0.04(0.03)	−0.04(0.05)	0.00(0.04)	−0.05(0.04)	−0.02(0.03)	−0.06(0.05)	−0.02(0.04)	−0.08(0.05)	−0.05(0.04)
Major (1 = sciences, 0 = humanities)	−0.09(0.04)*	−0.03(0.03)	−0.04(0.02)*	0.02(0.02)	−0.06(0.03)	0.00(0.03)	−0.09(0.04)*	−0.03(0.03)	−0.06(0.04)	−0.01(0.03)
Highest education level of parents	0.04(0.03)	0.06(0.03)*	0.05(0.03)*	0.07(0.03)**	0.06(0.03)	0.08(0.03)**	0.03(0.03)	0.05(0.02)*	0.04(0.03)	0.06(0.03)
Teaching and learning environment										
Active learning		0.27(0.04)***		0.23(0.04)***		0.27(0.05)***		0.29(0.03)***		0.34(0.04)***
Feedback from teacher		−0.10(0.05)*		−0.06(0.05)		0.00(0.05)		−0.11(0.05)*		−0.19(0.06)**
Good teaching		0.09(0.04)*		0.05(0.04)		0.03(0.06)		0.12(0.04)***		0.10(0.05)*
Clear goals and standards		0.21(0.04)***		0.22(0.04)***		0.09(0.03)**		0.14(0.03)***		0.17(0.04)***
Appropriate assessment		−0.01(0.04)		0.03(0.05)		0.02(0.06)		0.00(0.04)		−0.03(0.05)
R^2	0.02	0.19	0.01	0.17	0.01	0.13	0.02	0.17	0.02	0.17

Note. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$; Standardized coefficients are reported; Estimates in parentheses refer to SE. M1 refers to Model 1 with only the covariates; M2 refers to Model 2 with all the independent variables included.
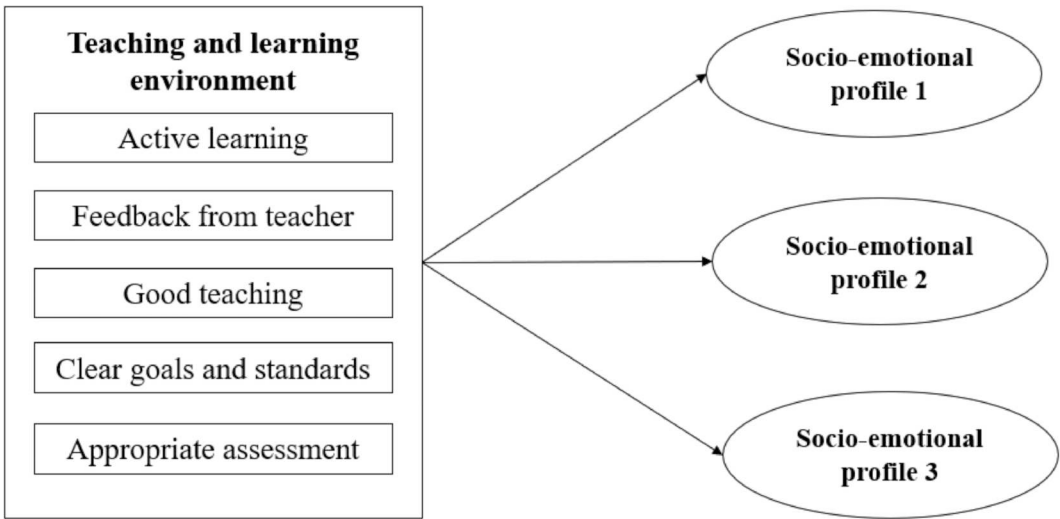
Figure 2. Conceptual model of study 2.

Statistical analyses

In Study 2, we employed the person-centered latent profile analysis (LPA). This approach is designed to identify subgroups of students who demonstrate distinct patterns of variable responses (Lubke and Muthén 2005). Compared with traditional clustering methods (e.g. K-means clustering), LPA is more accurate because it models the measurement errors and provides a combination of goodness-of-fit indices for model comparison and selection (Bray and Dziak 2018). LPA enables researchers to (1) identify subgroups of students characterized by distinct combinations of key variables, and (2) investigate factors that predict one's group or profile membership.

To test H2, LPA was used to identify the socio-emotional profiles regarding self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. A combination of goodness-of-fit indices was used to determine the optimal number of profiles (Nylund, Asparouhov, and Muthén 2007). Specifically, a lower value of Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), and sample size adjusted BIC (aBIC) indicate better model fit. A value of entropy higher than 0.8 demonstrates an accurate class separation. A significant p-value of Lo-Mendel-Rubin's Likelihood ratio test (LMR) and Bootstrap Likelihood ratio test (BLRT) suggested that the K class model fits better than the K-1 class model.

To test H3, teaching and learning environment variables were used as independent variables to explore their relationship with socio-emotional profile membership. The *Mplus* automated three-step procedures were used (R3STEP; Asparouhov and Muthén 2014). The odds ratio (OR) value could show to what degree the teaching and learning environment could predict the students' socio-emotional profile. OR values greater than 1 indicate an increased likelihood of membership in a specific profile compared with the reference profile.

Results

H2: Identification of Socio-Emotional Profiles

Table 3 summarizes the goodness-of-fit indices for the models with one through five profiles. The AIC, BIC, and aBIC values decreased as the number of profiles increased. An elbow plot in the Supplementary Material (see Figure S1) suggests a plateau at the three-profile solution, indicating a trivial improvement in the model fit of the four-profile solution. The value of entropy reached a peak of 0.88 in the model with four profiles. The p-values of LMR and BLRT were also significant

for the three-profile solution, showing that the three-profile solution was more accurate than the two-profile solution. Hence, the three-profile solution was considered optimal in classifying students regarding their socio-emotional skills.

Figure 3 and Table 4 display the means and standard errors of the profile indicator variables for the three profiles, in addition to the profile name and profile sizes. The first profile was labeled *low socio-emotional profile* (6% of participants, $N = 66$) due to relatively low levels of socio-emotional skills in self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. The second profile was labeled *medium socio-emotional profile* (55% of participants, $N = 627$) with moderate values in the five socio-emotional skills. The third profile was labeled *high socio-emotional profile* (39% of participants, $N = 443$) due to having the highest levels of socio-emotional skills.

H3: The Role of Teaching and Learning Environment in Predicting Profile Membership

Table 5 summarizes the relationship between teaching and learning environment and profile membership. Compared with the medium and low socio-emotional profiles, students whose teaching and learning environments were characterized by higher levels of active learning (OR = 7.54, $p < .01$; OR = 3.18, $p < .01$) and clear goals and standards (OR = 2.85, $p < .05$; OR = 2.04, $p < .01$) were more likely to be members of the high socio-emotional profile than the low and medium profiles. Students who received more frequent feedback from their teachers (OR = 0.60, $p < .05$; OR = 0.67, $p < .01$) were less likely to be classified into the high socio-emotional profile compared to the low and medium profiles. Compared with the low socio-emotional profile, students who experienced teaching and learning environments characterized by higher levels of active learning were more likely to be classified into the medium socio-emotional profile (OR = 2.38, $p < .05$).

Discussion

This study advances our understanding of the interplay between the teaching and learning environment and socio-emotional skills in higher education. First, our findings provided evidence that students who experienced a better teaching and learning environment would demonstrate higher levels of socio-emotional skills, corroborating H1. Second, we identified distinct socio-emotional skills profiles among university students, categorized into low, medium, and high levels, aligning with H2. Third, students with more favorable perceptions of their teaching and learning environment were more likely to be associated with a high socio-emotional skills profile, lending support to H3. These insights underscore the pivotal role of the teaching and learning environment in fostering university students' socio-emotional skills.

Variable-centered method

Our study enriches existing research by shedding light on how the teaching and learning environment is associated with university students' socio-emotional skills. Consistent with the previous studies (Prince 2004; Yin and Wang 2015), our findings especially highlighted the role of active

Table 3. Model fit indices for the models with varying numbers of latent profiles.

$N_{profile}$	AIC	BIC	aBIC	Entropy	L–M–R LRT (p)	Bootstrap LRT (p)	Class size per profile
1	7995.62	8045.98	8014.22	n/a	n/a	n/a	1136
2	6344.79	6425.36	6374.54	0.76	0.22	<.001	440, 696
3	5042.18	5152.95	5083.07	0.88	<.05	<.001	66, 627, 443
4	4692.44	4833.43	4744.49	0.84	<.05	<.001	45, 182, 579, 330
5	4519.17	4690.37	4582.38	0.81	<.05	<.001	42, 465, 371, 91, 167

Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; aBIC = sample-size adjusted BIC; L–M–R LRT = Lo–Mendell–Rubin Likelihood Ratio Test; LRT = likelihood ratio test; n/a = not applicable.
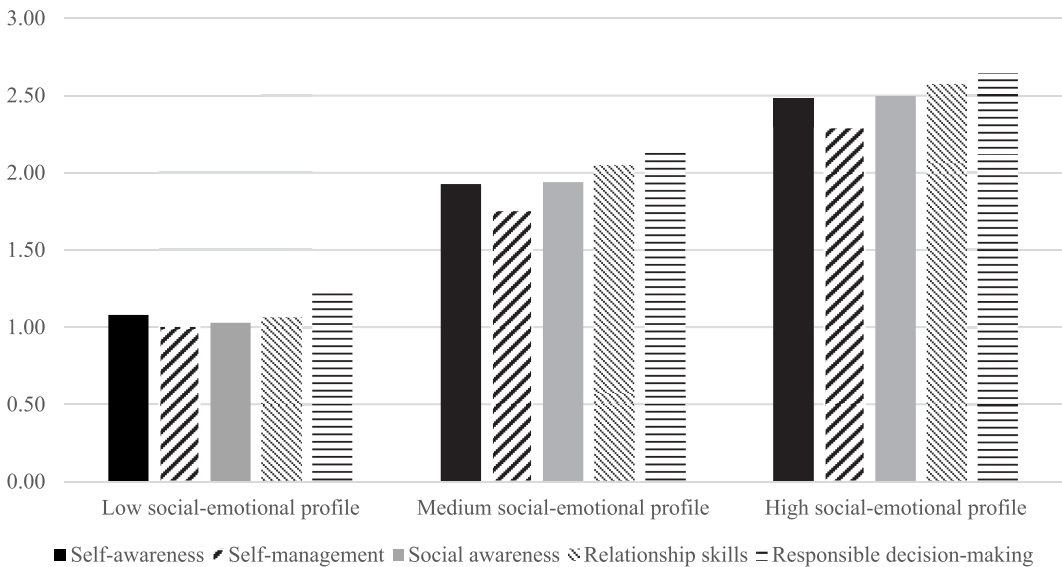
Figure 3. Low, medium and high socio-emotional profiles.

learning, good teaching, as well as clear goals and standards in facilitating students' socio-emotional skills. These factors play a crucial role in establishing a supportive learning environment to encourage students' proactive engagement in their academic learning, thereby fostering their socio-emotional skills (Jagers, Rivas-Drake, and Williams 2019; Jones, McGarrah, and Kahn 2019).

We observed a negative effect of teacher feedback, along with a nonsignificant influence of appropriate assessment on socio-emotional skills, which is consistent with studies conducted in the Chinese context (e.g. Yin, Wang, and Han 2016, 2022). This finding may be attributed to the fact that assessments in China are mostly used for monitoring and evaluation, which can amplify the pressure experienced by students (Yin, Wang, and Han 2016). Formative assessments are less common in the Chinese context. Consequently, students may exhibit negative emotional responses to their teachers' feedback.

Regarding the demographic variables, socioeconomic status emerged as the most important demographic factor influencing students' socio-emotional skills. The critical role of socioeconomic status in university students' development is consistent with the previous research (Alam and Forhad 2022; Gui, Alam, and Hassan 2023). Compared to their economically disadvantaged peers, affluent students typically have greater financial, intellectual, and professional resources that facilitate access to high-quality university learning experiences. These economic advantages could contribute to the development of their socio-emotional skills (Gruijters, Raabe, and Hübner 2024; van Poortvliet 2021).

Table 4. Comparisons of mean differences in socio-emotional skills across the three profiles.

	Low socio-emotional skills ($N = 66$)	Medium socio-emotional skills ($N = 627$)	High socio-emotional skills ($N = 443$)	ANOVA	
	M (SE)	M (SE)	M (SE)	F(2,1133)	η²
Self-awareness	1.08(0.14)	1.93(0.03)	2.48(0.03)	837.93***	0.60
Self-management	1.01(0.12)	1.76(0.03)	2.29(0.03)	649.93***	0.53
Social awareness	1.03(0.16)	1.94(0.04)	2.50(0.03)	795.39***	0.58
Relationship skills	1.07(0.17)	2.05(0.04)	2.57(0.02)	858.59***	0.60
Responsible decision-making	1.23(0.19)	2.16(0.04)	2.64(0.02)	622.96***	0.52

Note. *** $p < 0.001$. We recoded the 4-point scale from 1–4 to 0–3 in order to have a more straightforward understanding of the starting point. Therefore, the highest possible value was 3.

Table 5. Relationship between the teaching and learning environment and profile membership.

Predictors	High vs. low OR (SE)	High vs. medium OR (SE)	Medium vs. low OR (SE)
Gender (1 = male, 0 = female)	0.72(0.32)	0.84(0.20)	0.86(0.35)
Year level	0.77(0.13)	1.06(0.10)	0.73(0.11)*
Student age	0.81(0.08)*	0.91(0.06)	0.89(0.08)
Major (1 = sciences, 0 = humanities)	0.83(0.31)	0.85(0.18)	0.98(0.35)
Highest education level of parents	1.01(0.01)	1.01(0.01)*	1.00(0.01)
Active learning	7.54(2.49)**	3.18(0.65)**	2.38(0.67)*
Feedback from teacher	0.60(0.20)*	0.67(0.12)**	0.89(0.28)
Good teaching	2.07(0.69)	1.46(0.27)	1.42(0.42)
Clear goals and standards	2.85(0.75)*	2.04(0.32)**	1.40(0.33)
Appropriate assessment	0.63(0.20)	0.90(0.17)	0.70(0.2)

Note. $*p < 0.05$, $**p < 0.01$; odds ratio = OR.

Person-centered method

Our study expanded upon Study 1 by delving into individual differences in socio-emotional skills, and we identified three distinct subgroups of students. Consistent with existing research that revealed distinct groups of students with varying levels of socio-emotional skills (Thomas and Heath 2022), we categorized university students into low, medium, and high socio-emotional skill groups.

Notably, most students fell into the medium socio-emotional profile (55%). However, our study also alerted us to a distinct subgroup of at-risk students (6%) who exhibited low levels of socio-emotional skills, indicating a need for more support and attention. The relatively large proportion of students in low and medium profiles may be related to the teaching tradition in China, where cognitive skills are emphasized over socio-emotional skills due to high-stakes examinations and the intensely competitive nature of the educational system (Li 2012). Our finding indicates ample room for Chinese higher education institutions to design programs that could improve students' socio-emotional skills.

Consistent with the findings of Study 1, the person-centered method revealed that students exhibiting high levels of active learning and clear goals and standards were more likely to be classified into the high socio-emotional profile. On the other hand, students who perceived more frequent feedback from their teachers were more likely to be classified as belonging to the low socio-emotional profile.

Theoretical and practical implications

This study presents significant theoretical and practical implications, particularly in the context of Chinese higher education. Theoretically, this study stands as one of the first few to explore students' socio-emotional skills in the Chinese higher education context. The comprehensive application of variable – and person-centered approaches provides a holistic understanding of the association between teaching and learning environment and socio-emotional skills at both population and individual levels. Our study suggests that initiatives to enhance teaching and learning quality in higher education may also have positive downstream consequences on students' socio-emotional skills.

Practically, both studies 1 and 2 highlight that active learning and clear goals and standards are crucial for socio-emotional skills. The critical role of active learning sheds light on the importance of teachers' roles in shaping social and emotional skills in Chinese universities. This may be attributed to teacher-directed teaching and learning traditions prevalent in Confucian culture, where teachers dominate most of the class time and learning activities (Li 2012). This finding implies that Chinese educators may want to enable students' more active roles in teaching by adopting student-centered teaching strategies.

Contrary to expectations, students who received more frequent teacher feedback had lower socio-emotional skills. It is possible that many students took their teachers' feedback in a negative light and lacked the necessary skills to process such feedback in a constructive manner. This underscores the need to inform teachers on how to deliver feedback in an emotionally safe manner. This is an inherently difficult process, and studies have shown that many teachers do not have adequate levels of feedback literacy (Carless and Winstone 2023). Students may also need to be equipped with the skills to receive, interpret, and learn from teacher feedback (e.g. Little et al. 2024). Incorporating these changes into teacher professional development programs is vital to meet the evolving educational needs of university students.

Limitations and future directions

Several limitations warrant consideration. First, the data were based on self-report surveys. Although self-reports have been widely used in quality assurance exercises and have shown satisfactory reliability and validity (OECD 2018), we encourage future studies to triangulate using other methods such as qualitative approaches.

Second, our study focused on the five types of socio-emotional skills outlined in the CASEL framework. However, it is important to note that other socio-emotional skills, such as meta-emotional skills (i.e. emotional attention, clarity, and repair), might also play an important role (Huang et al. 2023).[6] We encourage future studies to focus on a wider spectrum of socio-emotional skills, especially those related to meta-emotions.

Third, although gender and year level were found to have limited relevance to socio-emotional skills, researchers should be cautious about the generalizability of these findings due to the imbalanced distribution of gender and year level within our sample. Although the imbalanced demographic distributions are common in online data collection (Porter and Umbach 2006; Yin, Lu, and Meng 2022), we recommend that researchers cross-validate our findings with a more balanced dataset.

Fourth, we measured students' teaching and learning environment using the SLEQ. Although this instrument has been widely used across the globe, there might be other dimensions of the teaching and learning environment that are not included in this instrument. New pedagogical innovations in higher education, such as undergraduate research, students-as-partners, collaborative online international learning, internships, and service learning, may also help develop students' socio-emotional skills (e.g. Hackett et al. 2023; Mantai et al. 2024; Mercer-Mapstone and Bovill 2020). Furthermore, the level of regulation/non-regulation/dysregulation of the teaching process might also influence student development (de la Fuente et al. 2020). Future studies that use more comprehensive measures of the university's teaching and learning environment might be needed.

Fifth, our study indicated that the variance (i.e. R-squared) in the socio-emotional skills that can be accounted for by the teaching and learning environment was relatively modest. This amount of explained variance is consistent with other studies on socio-emotional skills (e.g. Kuo et al. 2020). Past studies have demonstrated that socio-emotional skills are shaped by various factors, including family, classroom, school, and community (Jagers, Rivas-Drake, and Williams 2019; Wang, King, and Zeng 2024). Given this complexity, future studies could investigate the influence of other potential factors, such as demographics (e.g. socioeconomic status, gender, and ethnicity), family, and community-related processes.

Sixth, this study drew on the quantitative paradigm, which was deductive in nature. This paradigm limited our ability to explore other factors affecting socio-emotional skills. Therefore, we encourage future studies to deepen our understanding of the factors influencing socio-emotional skills by adopting bottom-up exploratory methods, such as qualitative or mixed-methods designs.

Conclusion

Socio-emotional skills are critical for students' future readiness. This study demonstrated the important role of the teaching and learning environment in fostering university students' socio-emotional skills. Among the different dimensions of the teaching and learning environment, active learning as well as clear goals and standards were highlighted as the most strongly associated with socio-emotional skills. The role of feedback was somewhat ambiguous, and we speculate that there might be a need to further enhance teachers' and students' feedback literacy. These insights might help educators design effective teaching and learning strategies to enhance students' socio-emotional skills in the higher education context.

Notes

1. 'Socio-emotional skills' and 'socio-emotional competence' are often used interchangeably in socio-emotional research. The term 'socio-emotional skills' is used in this paper to align it with the CASEL (2020) terminology.
2. Though we posit teaching and learning environment as a precursor of socio-emotional skills based on previous research (OECD 2021) and the theoretical framework of CASEL, it should be noted that students with higher levels of socio-emotional skills may contribute to a more positive teaching and learning environment (de la Fuente-Arias 2017). Hence, enhanced socio-emotional skills could also foster a positive teaching and learning environment. Future studies may need to adopt longitudinal or experimental designs to explore the causal relationship between the teaching and learning process and socio-emotional skills.
3. The teaching and learning environment is measured by asking students' perceptions about their learning experience.
4. The '985' Project is a key program initiated by the Chinese government in May 1998 to create world-class universities and high-level research institutions. A total of 39 universities were selected to be part of this program.
5. The '211' Project is a higher education development and sponsorship scheme initiated in November 1995 to prepare approximately 100 universities for the twenty-first century. A total of 115 universities were selected to be part of this program.
6. We thank the anonymous reviewer for alerting us to the importance of meta-emotional skills in the teaching and learning context.

Ethical approval

Procedures in this study were approved by the Human Research Ethics Committee of The University of Hong Kong (Approval number EA210512).

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