



Research Article

The Multiple Roles of Social-Emotional Skills in Student Educational, Psychological, and Social Outcomes: An Empirical Study from China

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Abstract: The aim of the present study was to investigate the multiple roles of social-emotional skills in the educational, psychological, and social outcomes of Chinese primary and secondary students, using an ordinary least squares (OLS) regression method based on the 2019 Survey on Social and Emotional Skills (SSES) data. A two-stage stratified probability sampling design (sampling schools at the first stage and students at the second stage) was administered to gain a representative sample, and the final sample contained 7,141 participants across both 10-year-old and 15-year-old cohorts. The results indicated that task performance, collaboration, and engaging with others are stronger contributors to student educational outcomes than emotional regulation and open-mindedness; that emotional regulation and collaboration are stronger contributors to student psychological outcomes than task performance, open-mindedness, and engaging with others; and that emotional regulation, collaboration, and engaging with others are stronger contributors to student social outcomes than task performance and open-mindedness. Generally, open-mindedness embodied a relatively weaker effect on student educational, psychological, and social outcomes. The findings suggest that social-emotional skills function differently across student educational, psychological, and social outcomes, which may provide some effective guidance to proceed with social-emotional education in Chinese primary and secondary schools.

Keywords: social-emotional skills, educational outcomes, psychological outcomes, social outcomes, OLS regression analysis, SSES 2019

1. Introduction

During the past three decades, research has increasingly focused on social-emotional skills across various domains, such as education, psychology, and sociology (e.g., Durlak et al., 2011; Elias et al., 1997; Miyamoto et al., 2015; Walton et al., 2023; Zins & Elias, 2007). In effect, it was reported that students' success in school is not only dependent on merely cognitive abilities, but also dependent on their capacities to efficiently manage goal- and task-directed behaviors, regulate personal emotions, and establish positive interpersonal relationships, which generally refer to individuals' social-emotional skills (Guo et al., 2023; Osher et al., 2016; Weare & Gray, 2003). Researchers overall suggest that navigating social and emotional situations in school education may exert a multitude of powerful consequences for students' global life outcomes and potential social development (e.g., Frydenberg et al., 2017; Humphrey et al., 2011; Zins & Elias, 2007). From a personal perspective, individuals with better social-emotional skills are more likely to

acquire success and well-being, including fostering holistic personalities, performing well in school, having supportive social relationships, reporting less mental health problems, holding the superiority in labor market, and consequently weathering the storms of life (Albright & Weissberg, 2010; Miyamoto et al., 2015). From a social perspective, social-emotional skills serve as an irreplaceable role for the global social progress, such as cultivating well-rounded citizenship, developing positive community engagement, and conducting favorable social ethos (Durlak et al., 2010; Oberle & Schonert-Reichl, 2017; OECD, 2015). Therefore, It is crucial to foster students' social-emotional skills, which are considered to be more malleable than cognitive skills, through targeted interventions, programs, and policies, with the subsequent potential benefits (Kautz et al., 2014; Weissberg et al., 2015).

Although the value of developing students' social-emotional skills has long been recognized among scholars, and social and emotional learning (SEL) has been conducted internationally for decades in many countries (Oberle & Schonert-Reichl, 2017; Osher et al., 2016; Zins & Elias, 2007), SEL-related programs have merely recently been launched in China over the past few years (Mao, 2018; Yu & Jiang, 2017). Moreover, the Chinese exam-oriented education system has traditionally placed excessive emphasis on students' cognitive training while neglecting their all-round development. This has inevitably led to a situation where "intellectual education is emphasized, but moral education is neglected", and "repetition is emphasized, but innovation is neglected" (Wang et al., 2022). Chinese schools tend to follow the "rational" education pattern that emphasizes knowledge-dominated learning but downplays students' psychological growth and social adjustment, whereby social-emotional-related skills have not been a dominating focus in Chinese contemporary education system (Yu & Jiang, 2017). Nevertheless, researchers argued that the development of social-emotional skills is equally or even more important than the development of cognitive skills (Author & Areepattamannil, 2016; Liu et al., 2023; Yao, 2021). Actually, there still remains a paucity of evidence on the underlying relevance between social-emotional skills and Chinese adolescent academic and life well-being, despite the importance of the developmental trajectories of social-emotional skills across a lifetime (see Liu et al., 2023). Therefore, it is necessary to empirically explore the effects of social-emotional skills on student educational, psychological, and social outcomes to inform educational policy for specifically conducting SEL in Chinese educational context.

2. Literature review

2.1 Social-emotional skills

Social-emotional skills have been variously conceptualized in previous studies. Several related terms, such as social and emotional competence, social and emotional intelligence, noncognitive skills, soft skills, character skills, and life skills, are all substitutions of social-emotional skills and are interchangeably used due to the common conceptual space (Elias et al., 1997; Humphrey et al., 2011; Oberle & Schonert-Reichl, 2017; Wigelsworth et al., 2010). Generally, social-emotional skills represent a large cluster in the 21st century skill domain, which can be best defined as "individual characteristics that (a) originate in the reciprocal interaction between biological predispositions and environmental factors; (b) are manifested in consistent patterns of thoughts, feelings, and behaviors; (c) continue to develop through formal and informal learning experiences; and (d) influence important socioeconomic outcomes throughout the individual's life" (De Fruyt et al., 2015, p. 279). Particularly, among numerous instruments assessing social-emotional skills (e.g., Frydenberg et al., 2017; Humphrey et al., 2011; Wigelsworth et al., 2010), there are two crucial but distinct frameworks - the Collaborative for Academic, Social, and Emotional Learning (CASEL) framework and the Big Five framework.

The CASEL framework is viewed as one of the most widely used tools to evaluate social-emotional skills among existing instruments (e.g., Frydenberg et al., 2017; Humphrey et al., 2011; Miyamoto et al., 2015). Social-emotional skills are closely linked to SEL in the CASEL framework. The CASEL defines SEL as "a process of developing the ability to recognize and manage emotions, develop caring and concern for others, make responsible decisions, establish positive relationships, and handle challenging situations effectively" (CASEL, 2005). In such a context, five core social-emotional skills were proposed, namely self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (CASEL, 2005). Since the CASEL framework has been proved to be universally applicable across many different contexts, it has been broadly referenced in abundant SEL-related studies (e.g., Albright & Weissberg, 2010; Osher et al., 2016; Wigelsworth et al., 2010).

The Big Five model is also a crucially authoritative framework assessing social-emotional skills, which refers to five personality traits, namely conscientiousness, neuroticism, agreeableness, openness, and extraversion (John et al., 2008). Particularly, the Big Five framework was employed in the 2019 Survey on Social and Emotional Skills (SSES 2019) by the Organization for Economic Co-operation and Development (OECD) to evaluate student' social-emotional skills. Its feasibility in organizing and measuring social-emotional skills had been previously validated (Walton et al., 2023). Specifically, social-emotional skills in SSES 2019 were divided into five dimensions, namely task performance (persistence, responsibility, and self-control), emotional regulation (emotional control, optimism, and stress resilience), collaboration (cooperation, empathy, and trust), open-mindedness (creativity, curiosity, and tolerance), and engaging with others (assertiveness, energy, and sociability), individually corresponding conscientiousness, neuroticism, agreeableness, openness, and extraversion within the Big Five model (OECD, 2019).

Critically, the Big Five framework was employed in the large-scale international program to assess students' social-emotional skills because it has many merits in comparison with the CASEL framework, although both of which are considered to be relatively authoritative and well-researched frameworks (OECD, 2019, 2021). The Big Five model serves as a robust empirical foundation, offering a comprehensive and parsimonious summary of individual differences in social-emotional skills. It demonstrates high predictive power for corresponding domains and skills that are both malleable and temporally stable. Empirical validation of correlations between Big Five domains and 21st-century skills further supports its selection as the overarching structure in the SSES 2019 framework for assessing students' social-emotional skills (Borghans et al., 2008; Chernyshenko et al., 2018; Steponavičius et al., 2023). Generally, organizing social-emotional skills into the five overarching categories of the Big Five framework may offer a concise yet comprehensive conceptualization of the different skills and related evidence for their validity (OECD, 2019, 2021). Therefore, the SSES 2019 framework based on the Big Five model was used in the current study to evaluate participants' social-emotional skills.

2.2 Social-emotional skills and student educational outcomes

Student educational outcomes mainly referred to academic performance within the SSES 2019 framework (OECD, 2019). Previous studies indicated that social-emotional skills are critical in determining students' scholastic achievement, such as mathematics learning, reading literacy, and arts achievement (e.g., Aleksić et al., 2019; Dobbs et al., 2006; Lim & Kim, 2011; Liu et al., 2023; McCormick et al., 2021). It was found that participation in an early mathematic intervention mitigates the associations between socio-emotional strengths and math skills, indicating that initiative, self-control, and attachment are less strongly linked to math skills for students who received the intervention (Dobbs et al., 2006). Using a multilevel growth model (MGM), Lim and Kim (2011) reported that students who show more pro-social behaviors or less problem behaviors perform better in reading achievement. Differently, McCormick et al. (2021) examined the effects of SEL programs on math and language skills in the longer-term and revealed a mixed result. The authors argued that although SEL can predict students' English/Language Arts (ELA) test scores in third and fourth grade, no treatment impacts were reported on math skills and even the variation of math achievement by baseline skills. Further, a longitudinal study showed that students' earlier academic, cognitive, and social-emotional skills predict longitudinal trajectories in math, reading, language, and social-emotional skills from kindergarten through third grade (Burchinal et al., 2020). More than that, a structural equation models (SEM) analysis showed that socially skilled behaviors can mediate the relationship between social-emotional comprehension and reading as well as the relationship and between social-emotional comprehension and math (McKown et al., 2016). However, much less has been known regarding the predictive power of social-emotional skills for artistic achievements (see Liu et al., 2023). In fact, arts achievement was more considered to be the cause rather than the effect of social-emotional skills in the existing literature (e.g., Author & Areepattamannil, 2016; Müller et al., 2019).

2.3 Social-emotional skills and student psychological outcomes

Student psychological outcomes mainly contained life satisfaction, mental well-being, and test anxiety within the SSES 2019 framework (OECD, 2019). Previous studies indicated that social-emotional skills exert powerful impacts on student psychological health levels (e.g., Chernyshenko et al., 2018; Elias et al., 1997; Macaskill & Denovan, 2014; Niu et al., 2023; Scheier et al., 2001). Skills under the social interaction domain, such as being assertive, energetic,

and extraverted and sociable, are generally associated with greater positive affect, life satisfaction, happiness, self-esteem, and mental well-being but lower depression (Golshiri et al., 2023; Margolis et al., 2020; Schimmack et al., 2004; Vella et al., 2019). While skills under the emotional regulation domain, such as stress resistance, optimism, and emotional control, are expected to show more prominent effects on psychological health, which is primarily correlated to individuals' emotional states and experiences (Guo et al., 2023; Kotov et al., 2010; Scheier et al., 2001; Steel et al., 2008). Particularly, optimism is supposed to be considerably beneficial for subjective well-being and life satisfaction with the potential to maintain positive psychological experiences (Anglim et al., 2020; Scheier et al., 2001). In fact, optimism is also closely related to depressive symptomatology prevention serving as resources for coping with hopelessness with its increased positive emotions (Martínez-García, 2022). Inversely, stress resistance may be most effective to avoid negative emotions such as anxiety, due to its power on handling stress or other affective problems (Anglim et al., 2020; Guo et al., 2023; Kotov et al., 2010). Additionally, responsibility, persistence, self-control, attachment, self-compassion, empathy, creativity, curiosity, gratitude, hope all exert a protective impact on individuals' mental health, including promoting mental relaxation, facilitating self-expression, boosting the immune system, and reducing blood pressure and psychological stress (Appel et al., 2023; Clarke et al., 2021; Gokalp, 2023; Hao et al., 2022; Lakeman, 2016; Leckey, 2011; Macaskill & Denovan, 2014).

2.4 Social-emotional skills and student social outcomes

Student social outcomes mainly covered relations with teachers/peers/parents, sense of belonging, bullying victimization, and global mindedness within the SSES 2019 framework (OECD, 2019). Generally, social outcomes include human relationships, interpersonal conflicts, and global connections and interactions (Chernyshenko et al., 2018). Guo et al. (2023) showed that social-emotional skills are generally linked to individuals' interpersonal relationships with teachers, peers, and parents. Additionally, it was reported that emotional awareness and expression, emotional regulation, cooperation, empathy, trust, and sociability are viewed as fundamental pre-requisite to shape individuals' social connectedness, such as positive relations with others, increased sense of belonging, and decreased bullying victimization (Allen et al., 2017; Anglim et al., 2020; Chernyshenko et al., 2018; Mitsopoulou & Giovazolias, 2015; Riley et al., 2019). Particularly, Kokkinos and Kipritsi (2012) suggest that trait emotional intelligence and cognitive empathy have a significant effect on bullying, while trait emotional intelligence and affective empathy exert a significant impact on victimization. Using a hierarchical linear modeling (HLM), Yang et al. (2020) also argued that the relationship between SEL competencies and bullying victimization differs resting with students' gender and grade levels, and social awareness, relationship skills, and self-management have significant associations with students' bullying victimization experiences. Especially, global mindedness is supposed to be mostly related to individuals' tolerance as it represents the embrace of diverse knowledge and cultures (Chernyshenko et al., 2018; Guo et al., 2023).

2.5 The present study

In the existing literature, the measurement of social-emotional skills was rarely based on the Big Five model as in the SSES 2019 framework, which is considered to be more comprehensive and systematic than many other frameworks to assess individuals' social-emotional skills (Frydenberg et al., 2017; OECD, 2019, 2021; Walton et al., 2023). The measurement of students' educational, psychological, and social outcomes was also not extensive in previous research, thus more variables should be employed to evaluate these outcomes in subsequent studies. Moreover, there still remains a paucity of evidence on the underlying relevance between students' social-emotional skills and their educational, psychological, and social outcomes in China (Liu et al., 2023). Therefore, it would appear to be worthwhile to empirically explore the multiple roles of social-emotional skills in Chinese students' educational, psychological, and social outcomes based on the SSES 2019 framework to effectively proceed with SEL in Chinese educational context.

Based on existent evidence in the literature, this study was conducted to answer the following three research questions.

RQ1: How do social-emotional skills influence student educational outcomes in China?

RQ2: How do social-emotional skills influence student psychological outcomes in China?

RQ3: How do social-emotional skills influence student social outcomes in China?

3. Methodology

3.1 Participants

The data in the current study were obtained from SSES 2019, a large-scale program conducted by the OECD organization. Involving more than 60,000 students from 10 cities across nine countries, SSES 2019 aimed at exploring potential family, school, and community characteristics that shape adolescent social-emotional skills, as well as analyzing the impacts of social-emotional skills on adolescent academic performance, psychological health, behavioral adjustment, and social growth (OECD, 2019). A two-stage stratified probability sampling design (sampling schools at the first stage and students at the second stage) was administered to gain a representative sample for each participating country, assessing two cohorts: 10-year-old and 15-year-old students (OECD, 2021). Particularly, the present study aims to investigate the effects of social-emotional skills on student educational, psychological, and social outcomes by analyzing the Chinese sample, and student questionnaires administered in Suzhou (China) were adopted. After data sorting, matching, and cleaning, the final sample contained 7,141 participants across both 10-year-old and 15-year-old cohorts (male = 3,769, female = 3,372; younger = 3,569, older = 3,572).

3.2 Variable description

3.2.1 Dependent variables

Student educational, psychological, and social outcomes were employed as dependent variables. Student educational outcomes mainly covered academic performance within the SSES 2019 framework (OECD, 2019). The school grades (i.e., GPA) in math, reading, and arts obtained from students' school registry, were standardized on a consecutive scale from 1 to 50. Higher scores indicated better math, reading, and arts achievements. Student psychological outcomes mainly involved life satisfaction, mental well-being, and test anxiety within the SSES 2019 framework (OECD, 2019). Life satisfaction was assessed by a single item ("Overall, how satisfied are you with your life as a whole these days?") on a consecutive scale from 0 (not at all satisfied) to 10 (completely satisfied). Mental well-being and test anxiety were assessed on a 5-point Likert-type scale. Higher scores showed greater life satisfaction, mental well-being, and test anxiety. Student social outcomes referred to their perceptions of relationships with teachers/peers/parents, sense of belonging, bullying victimization, and global mindedness within the SSES 2019 framework (OECD, 2019), which were all assessed on a 4-point Likert-type scale. Higher scores demonstrated better teacher-student relations and peer relations, more parent-child conflict and bullying victimization, and greater sense of belonging and global mindedness. It should be noted that corresponding linear transformation was used to process raw scores of students' educational, psychological, and social outcomes according to SSES 2019, which were all standardized to a metric for potential comparison across different participating countries (OECD, 2021). Consequently, the standardized scores, rather than the raw scores, were used in the present study.

3.2.2 Independent variables

Social-emotional skills formed the core independent variables, which were constructed based on a well-researched framework - the Big Five model in SSES 2019. Particularly, SSES 2019 assessed students' social-emotional skills along five dimensions and 15 sub-skills, namely task performance (persistence, responsibility, and self-control), emotional regulation (emotional control, optimism, and stress resilience), collaboration (cooperation, empathy, and trust), open-mindedness (creativity, curiosity, and tolerance), and engaging with others (assertiveness, energy, and sociability). The measurement of 15 social-emotional skills totally involved 97 items in the student assessment final scales. All items were assessed with a Likert-type format ranging from 1-5, namely "strongly disagree", "disagree", "neither agree nor disagree", "agree" and "strongly agree". Higher scores indicated better social-emotional skills. It should be noted that a series of calibration procedures were used to process raw scores according to SSES 2019, which were transformed (standardized) to a metric where the scale averages of 500 for equally weighted data and the standard deviation for the combined dataset is set to 100 (OECD, 2021). Consequently, the standardized scores, rather than the raw scores, were used in the present study. According to the classification in SSES 2019 (OECD, 2019), the current study used the mean value of persistence, responsibility, and self-control as the score of task performance; the mean value of emotional control, optimism, and stress resilience as the score of emotional regulation; the mean value of cooperation,

empathy, and trust as the score of collaboration; the mean value of creativity, curiosity, and tolerance as the score of open-mindedness; and the mean value of assertiveness, energy, and sociability as the score of engaging with others. Corresponding examples of items for social-emotional skills were displayed in Table 1.

Table 1. Examples of items for social-emotional skills

	Variables	Item wording	Item examples
TAS	Persistence	PER08	Finish things despite difficulties in the way.
	Responsibility	RES05	Keep promises.
	Self-control	SEL03	Think carefully before doing something.
EMO	Emotional control	EMO07	Stay calm even in tense situations.
	Optimism	OPT06	Look at the bright side of life.
	Stress resilience	STR01	Relaxed and handle stress well.
COL	Cooperation	COO03	Work well with other people.
	Empathy	EMP03	Can sense how others feel.
	Trust	TRU02	Believe that my friends can keep my secrets.
OPE	Creativity	CRE02	Original, come up with new ideas.
	Curiosity	CUR07	Love learning new things in school.
	Tolerance	TOL04	Want to travel to other countries.
ENG	Assertiveness	ASS03	Know how to convince others to do what I want.
	Energy	ENE02	Show a lot of enthusiasm.
	Sociability	SOC05	Like talking to a lot of different people.

Note: TAS = task performance, EMO = emotional regulation, COL = collaboration, OPE = open-mindedness, ENG = engaging with others

Gender, age, immigration, and socio-economic status (SES) were incorporated as covariates in the current model. On the one hand, they have been widely used in this way to ensure the unbiasedness of the results within social sciences research (Bernerth & Aguinis, 2016). On the other hand, they are theoretically and empirically relevant to student educational, psychological, and social outcomes according to previous studies (e.g., Aleksić et al., 2019; Armstrong et al., 2014; Haller & Hadler, 2006; Mitsopoulou & Giovazolias, 2015; Scheier et al., 2001; Yang et al., 2020). In terms of the gender variable, it was coded as 0 for male and 1 for female. With regard to the age variable, it was coded as 0 for 10-year-old group and 1 for 15-year-old group. As for the immigration variable, it was coded as 0 for native and 1 for immigrant background. Regarding the SES variable, the standardized index administered by the OECD official organization in SSES 2019 was employed, being composed of parental education, parental occupation, and a range of household possessions.

3.3 Analytical procedures

Stata 17.0 was adopted as the software in the analytical process. To examine the impacts of social-emotional skills on student educational, psychological, and social outcomes, the current study employed an ordinary least squares (OLS) regression analysis. The model composed of both dependent and independent variables, was displayed below.

$$Y_i = \beta_0 + \beta_1 \text{task performance} + \beta_2 \text{emotional regulation} + \beta_3 \text{collaboration} + \beta_4 \text{open-mindedness} + \beta_5 \text{engaging with others} + \beta_i X_i + \varepsilon_i$$

Where Y_i refers to the scores of students' educational (math, reading, and arts achievements), psychological (life satisfaction, mental well-being, and test anxiety), and social outcomes (teacher-student relations, peer relations, parent-child conflict, sense of belonging, bullying victimization, and global mindedness). β_0 embodies the constant term, and β_1 to β_5 involve the regression coefficients of students' social-emotional skills across various dimensions, individually. β_i denotes the regression coefficients of the covariates, and X_i represents students' scores on the covariates. ε_i is the random error term.

Table 2. Descriptive statistics

Variables	M	SD	Min	Max
Math	36.25	12.21	1.00	50.00
Reading	35.40	11.53	1.00	50.00
Arts	37.44	11.19	1.00	50.00
Life satisfaction	7.63	2.11	0	10
Mental well-being	45.87	12.76	10.52	77.73
Text anxiety	50.61	13.44	22.14	80.14
Teacher-student relations	50.97	13.53	8.53	64.70
Peer relations	48.42	12.85	10.54	67.27
Parent-child conflict	52.89	13.47	35.82	93.45
Sense of belonging	48.43	12.88	13.94	80.38
Bullying victimization	47.59	12.40	36.68	95.04
Global mindedness	54.36	11.93	12.01	83.58
TAS	605.15	88.40	289.46	884.30
REG	551.87	91.21	217.00	931.82
COL	630.81	94.50	258.74	912.78
OPE	613.79	87.05	353.54	911.84
ENG	563.17	73.96	217.28	888.33
Gender	0.47	0.50	0	1
Age	0.50	0.50	0	1
Immigration	0.39	0.50	0	1
SES	0.30	0.84	-2.19	3.34

Note: SES = socio-economic status. The values of the study variables were standardized scores based on corresponding linear transformation and calibration procedures, rather than raw scores, according to SSES 2019 (OECD, 2021)

4. Results

4.1 Descriptive statistics

The first step of the analytical process was data screening. Data distribution test demonstrated that the coefficients of kurtosis and skewness of the study variables were smaller than $|\pm 2|$, indicating that the data in the present study were in line with the normal distribution and subsequent analyses were appropriate with a relatively robust estimate (Curran et al., 1996; Lei & Lomax, 2005). Additionally, Table 2 shows the results of descriptive statistics, including mean (M), standard deviations (SD), minimum value (Min), and maximum value (Max).

Table 3. OLS regression analysis for student educational outcomes

Variables	Math	Reading	Arts
Gender	0.485 (0.283)	3.304*** (0.264)	4.022*** (0.255)
Age	-2.678*** (0.310)	-2.606*** (0.289)	-2.652*** (0.279)
Immigration	0.616* (0.295)	0.726** (0.275)	0.289 (0.265)
SES	1.652*** (0.175)	1.282*** (0.163)	1.551*** (0.157)
TAS	0.014*** (0.003)	0.013*** (0.003)	0.015*** (0.002)
EMO	-0.003 (0.003)	-0.005* (0.002)	-0.005* (0.002)
COL	-0.012*** (0.003)	-0.010*** (0.003)	-0.005* (0.002)
OPE	0.011*** (0.003)	0.013*** (0.003)	0.001 (0.003)
ENG	0.010** (0.003)	0.011*** (0.003)	0.013*** (0.003)
Cons.	25.081*** (1.341)	21.523*** (1.250)	24.725*** (1.205)
R ²	0.060	0.084	0.096
Adj.R ²	0.059	0.082	0.095
F	50.75***	72.27***	84.48***

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Standard errors are in parentheses

4.2 The effects of social-emotional skills on student educational outcomes

In terms of the effects of social-emotional skills on student educational outcomes, it displayed the following results in Table 3. For gender variable, female students had significantly higher scores on reading and arts achievements than male students, whereas no significant gender differences were found on math achievement. For age variable, the younger (10-year-old) students gained higher scores on math, reading, and arts grades than the older (15-year-old) students. For

immigration variable, students with immigrant background performed better on math and reading achievements, while no significant differences were found on arts achievement. For SES variable, students from higher SES families had generally greater scores on math, reading, and arts achievements. Task performance significantly and positively affected students' math, reading, and arts grades. Emotional regulation significantly and negatively affected students' reading and arts achievements, but had no significant effect on math achievement. Collaboration significantly and negatively affected students' math, reading, and arts grades. Open-mindedness significantly and positively affected students' math and reading scores, but had no significant effect on arts achievement. Engaging with others significantly and positively affected students' math, reading, and arts achievements.

Table 4. OLS regression analysis for student psychological outcomes

Variables	Life satisfaction	Mental well-being	Test anxiety
Gender	-0.045 (0.043)	-0.659** (0.227)	0.657* (0.288)
Age	-0.412*** (0.047)	-2.221*** (0.248)	0.816* (0.315)
Immigration	-0.087 (0.045)	-0.139 (0.236)	-0.200 (0.300)
SES	0.095*** (0.027)	0.512*** (0.140)	-0.108 (0.178)
TAS	0.0004 (0.0004)	0.003 (0.002)	0.0008 (0.003)
EMO	0.008*** (0.0004)	0.046*** (0.002)	-0.073*** (0.003)
COL	0.003*** (0.0004)	0.015*** (0.002)	0.026*** (0.003)
OPE	-0.001* (0.0004)	0.004 (0.002)	-0.008** (0.003)
ENG	0.002*** (0.0005)	0.035*** (0.003)	-0.006 (0.003)
Cons.	0.155*** (0.204)	-11.832*** (1.073)	81.807*** (1.363)
R ²	0.271	0.449	0.199
Adj.R ²	0.270	0.448	0.198
F	293.79***	644.44***	197.20***

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Standard errors are in parentheses

4.3 The effects of social-emotional skills on student psychological outcomes

With regard to the effects of social-emotional skills on student psychological outcomes, it indicated the following results in Table 4. For gender variable, female students had significantly lower scores on mental well-being but significantly higher scores on test anxiety than male students, whereas no significant gender differences were found on life satisfaction. For age variable, the younger (10-year-old) students gained significantly higher scores on life

satisfaction and mental well-being, but significantly lower scores on test anxiety than the older (15-year-old) students. For immigration variable, no significant differences were found on life satisfaction, mental well-being, and test anxiety. For SES variable, students from higher SES families had generally greater scores on life satisfaction and mental well-being, whereas no significant differences were found on test anxiety. Task performance had no significant effect on students' life satisfaction, mental well-being, and test anxiety. Emotional regulation significantly and positively affected students' life satisfaction and mental well-being, but significantly and negatively affected their test anxiety. Collaboration significantly and positively affected students' life satisfaction, mental well-being, and test anxiety. Open-mindedness significantly and negatively affected students' life satisfaction and test anxiety, but had no significant effect on their mental well-being. Engaging with others significantly and positively affected students' life satisfaction and mental well-being, but had no significant effect on their test anxiety.

Table 5. OLS regression analysis for student social outcomes

Variables	Teacher-student relations	Peer relations	Parent-child conflict	Sense of belonging	Bullying victimization	Global mindedness
Gender	1.629*** (0.299)	0.638* (0.255)	-1.050*** (0.279)	0.442* (0.215)	-3.740*** (0.276)	-0.932*** (0.251)
Age	6.539*** (0.328)	1.286*** (0.280)	6.643*** (0.306)	0.108 (0.235)	-6.290*** (0.303)	4.141*** (0.275)
Immigration	-0.015 (0.311)	-1.079*** (0.266)	-0.113 (0.291)	-0.064 (0.224)	0.124 (0.287)	-0.356 (0.261)
SES	1.947*** (0.185)	1.151*** (0.158)	-0.263 (0.172)	0.472*** (0.132)	-0.126 (0.171)	1.955*** (0.155)
TAS	0.008** (0.003)	-0.003 (0.002)	-0.016*** (0.003)	0.001 (0.002)	-0.010*** (0.003)	0.015*** (0.002)
EMO	0.006* (0.003)	0.007** (0.002)	-0.035*** (0.002)	0.022*** (0.002)	-0.033*** (0.002)	-0.001 (0.002)
COL	0.020*** (0.003)	0.062*** (0.002)	-0.010*** (0.003)	0.040*** (0.002)	-0.017*** (0.003)	-0.002 (0.002)
OPE	0.014*** (0.003)	0.001 (0.003)	-0.0002 (0.003)	0.004 (0.002)	0.014*** (0.003)	0.043*** (0.003)
ENG	0.013*** (0.003)	0.015*** (0.003)	0.007* (0.003)	0.054*** (0.002)	0.0004 (0.003)	0.013*** (0.003)
Cons.	9.671*** (1.416)	-3.146** (1.209)	81.789*** (1.321)	-22.702*** (1.017)	78.718*** (1.307)	11.129*** (1.189)
R ²	0.147	0.310	0.250	0.515	0.135	0.226
Adj.R ²	0.146	0.309	0.249	0.514	0.134	0.225
F	136.06***	355.69***	264.45***	839.54***	123.60***	231.66***

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Standard errors are in parentheses

4.4 The effects of social-emotional skills on student social outcomes

As for the effects of social-emotional skills on student social outcomes, it demonstrated the following results

in Table 5. For gender variable, female students had significantly higher scores on teacher-student relations, peer relations, and sense of belonging, whereas male students had significantly higher scores on parent-child conflict, bullying victimization, and global mindedness. For age variable, the older (15-year-old) students gained higher scores on teacher-student relations, peer relations, parent-child conflict, and global mindedness, but lower scores on bullying victimization than the younger (10-year-old) students. For immigration variable, students with immigrant background had worse peer relations. For SES variable, students from higher SES families had greater scores on teacher-student relations, peer relations, sense of belonging, and global mindedness. Task performance had a positively significant effect on teacher-student relations and global mindedness, but a negatively significant impact on parent-child conflict and bullying victimization. Emotional regulation significantly and positively affected students' teacher-student relations, peer relations, and sense of belonging, but significantly and negatively affected their parent-child conflict and bullying victimization. Collaboration exerted a positively significant impact on students' teacher-student relations, peer relations, and sense of belonging, but a negatively significant effect on parent-child conflict and bullying victimization. Open-mindedness significantly and negatively affected students' teacher-student relations, bullying victimization, and global mindedness. Engaging with others exerted a positively significant effect on students' teacher-student relations, peer relations, parent-child conflict, sense of belonging, and global mindedness.

5. Discussion

Using an OLS regression analysis, the present study investigated the multiple roles of social-emotional skills in student educational, psychological, and social outcomes in China based on SSES 2019 data, addressing the three research questions. The results showed that social-emotional skills have different effects on student educational, psychological, and social outcomes. Generally, task performance, emotional regulation, collaboration, and engaging with others were stronger contributors to student educational, psychological, and social outcomes; whereas open-mindedness exerted a relatively weaker impact on student educational, psychological, and social outcomes. The findings were discussed from the following three aspects.

5.1 *Social-emotional skills and student educational outcomes*

Task performance, collaboration, and engaging with others were the three strongest contributors to student educational outcomes in the present study, which had a significant impact on their math, reading, and arts grades. Generally, the finding is consistent with some previous studies (e.g., Burchinal et al., 2020; Liu et al., 2023; McKown et al., 2016), but inconsistent with others (e.g., Dobbs et al., 2006; McCormick et al., 2021). Such a contradiction may be due to the uniqueness of the samples. For example, the participants were students who had received the discipline intervention in the study conducted by Dobbs et al. (2006). Also, Wilson and Narayan (2016) argued that learners active in task performance such as having higher task self-efficacy and more learning strategies tend to gain higher scores on academic outcomes, and high performance was also related to high self-efficacy on subsequent subtasks. Nuutila et al. (2018) clearly revealed that task performance affects students' self-concept and achievement. Further, Kiuru et al. (2020) showed that high task value, expectancy of success, and positive emotions before a task are beneficial for higher levels of effort during the task, which is associated with better task performance. Consequently, high task performance contributes to better subsequent academic achievement for students. Additionally, Lee (2014) clarified that behavioral and emotional engagement may exert a positively significant effect on students' achievement, supporting the present findings. Webb et al. (2014) showed that the level of engagement with others is positively related to learners' achievement. Particularly, the results revealed that collaboration can negatively affect students' math, reading, and arts achievements. Such a finding is probably due to the insufficient guidance during the cooperative process in Chinese schools, thus cooperative learning may be inefficient and waste a lot of time, whereby going against students' grades. Given that the present findings, teachers should support effective and targeted guidance in students' task performance, collaboration, and engaging with others, in order to enhance learners' achievement. For example, research showed that teachers play a crucial role in fostering students' engagement with others with a variety of instructional practices, meaning that how teachers follow up on their initial moves is considerably pivotal for the degree of students' engagement with others (Webb et al., 2014).

5.2 Social-emotional skills and student psychological outcomes

Emotional regulation and collaboration were the two strongest contributors to student psychological outcomes in the current study, which had a significant impact on their life satisfaction, mental well-being, and test anxiety, with a negative effect of emotional regulation on test anxiety. Whereas task performance is not the contributor to student psychological outcomes, which had no significant effect on life satisfaction, mental well-being, and test anxiety. Previous studies demonstrated that emotional regulation-related skills, such as emotional control, optimism, and stress resistance, are the most several significant skills for life satisfaction and mental well-being (Anglim et al., 2020; Kotov et al., 2010; Scheier et al., 2001; Steel et al., 2008). Also, collaboration-related skills (e.g., empathy, cooperation, and trust) can affect life satisfaction and mental well-being by shaping positive interpersonal relationships and supportive social capital (Clarke et al., 2021; Niu et al., 2023; Wei et al., 2011). Mathews et al. (2014) noted that social anxiety symptoms are uniquely related to emotional understanding, acceptance, evaluation, and reactivity. Liu et al. (2021) confirmed that emotional regulation conduces to the improvement of psychological resilience, thereby decreasing students' test anxiety. Particularly, corresponding resilience-training intervention and the mindfulnessbased stress reduction therapy can enhance emotional regulation and mitigate test anxiety of students (Liu et al., 2021; Shahidi et al., 2017). The positive association between collaboration and test anxiety probably revealed that cooperation to solve academic problems usually rests with the strength of groups; however, students have to solve problems independently when taking part in an exam, thus relying on partners in daily cooperative learning may lead to their test anxiety. In fact, regulative skills, such as emotional control and stress resistance, can reduce anxiety and depression by implementing adaptive coping strategies (Garnefski et al., 2002; Guo et al., 2023; Stöber, 2004).

5.3 Social-emotional skills and student social outcomes

Emotional regulation, collaboration, and engaging with others were relatively stronger contributors to student social outcomes than task performance and open-mindedness according to the present results. Particularly, both emotional regulation and collaboration exerted a significant impact on teacher-student relations, peer relations, parent-child conflict, sense of belonging, and bullying victimization, with the effect on parent-child conflict and bullying victimization being negative. The finding is reflected by the studies of Kokkinos and Kipritsi (2012) and Guo et al. (2023), but different from the studies of Chernyshenko et al. (2018) and Yang et al. (2020). Such an inconformity may be due to different measurement frameworks of social-emotional skills. Actually, research showed that emotional regulation has a positive effect on interpersonal-related variables such as teacher-student relations (Hernández et al., 2016). Gülay Ogelman and Fetihi (2021) also suggest that emotional regulation strategies can predict students' peer relations, with the significant effects on the levels of coping with peer pressure, aggressiveness, and social preference. Guo et al. (2023) indicated that emotional regulation skills play a salient role in gaining and maintaining high-quality parent-child relationships. Also, Blair and Perry (2019) noted that cooperation is theoretically conceptualized as the foundation of friendship, which is beneficial for students' social relationships. Thompson (2020) argued that cooperation may facilitate parent-child relationships, which may also provide a foundation for fostering the understanding of mutual obligations of close relationships that contribute to growing collaborative skills, fairness expectations, and fidelity to social norms. Research also revealed that emotional regulation may enhance belongingness, whereby reducing suicide ideation (Swee et al., 2020). Emotional regulation and collaboration also play protective roles in refraining from bullying victimization (Garner & Hinton, 2010; Jenkins et al., 2016). Additionally, given that the extensive effects of engaging with others on student social outcomes, such as teacher-student relations, peer relations, parent-child conflict, sense of belonging, and global mindedness, stakeholders - including school administrators, teachers, students, and parents - should comprehensively propose targeted solutions to promote student engagement.

6. Implications

Traditionally, Chinese primary and secondary students' social-emotional skills have not been given sufficient concerns by school administrators. Although social-emotional education has been conducted in Chinese primary and secondary schools over the past few years, a one-size-fits-all approach was more likely to be adopted in cultivating

students' social-emotional skills. This has caused some undesirable consequences, such as the generally low level of students' social-emotional skills, thereby leading to the potentially insufficient development of their academic performance, psychological growth, and social adjustment (Wang et al., 2022; Yu & Jiang, 2017). Therefore, it is necessary to cultivate students' social-emotional skills in a targeted way in Chinese primary and secondary schools. Potentially, this study may provide some practical implications for pertinently promoting students' social-emotional education, whereby improving their educational, psychological, and social outcomes. Specifically, for students who have low levels of academic performance, school administrators should focus on cultivating their skills of task performance, collaboration, and engaging with others; for students who have low levels of life satisfaction and mental well-being but high levels of test anxiety, school managers should focus on developing their skills of emotional regulation and collaboration; and for students who have low levels of teacher-student relations, peer relations, sense of belonging, and global mindedness but high levels of parent-child conflict and bullying victimization, school administrators should focus on fostering their skills of emotional regulation, collaboration, and engaging with others.

7. Conclusions

The present study investigated the effects of social-emotional skills on the educational, psychological, and social outcomes of Chinese primary and secondary students, using an OLS regression method based on SSES 2019 data. The findings revealed that social-emotional skills function differently across student educational, psychological, and social outcomes. Specifically, task performance, collaboration, and engaging with others were the three strongest contributors to student educational outcomes; emotional regulation and collaboration were the two strongest contributors to student psychological outcomes; emotional regulation, collaboration, and engaging with others were the three strongest contributors to student social outcomes; and open-mindedness exerted a relatively weaker effect on student educational, psychological, and social outcomes. Critically, although some social-emotional skills may be effective in conducting to positive outcomes in a particular domain, they may not be as serviceable in another (Chernyshenko et al., 2018; Miyamoto et al., 2015). Therefore, in order to effectively promote student educational, psychological, and social outcomes in China, conducting social-emotional education in a targeted way is required in primary and secondary schools.

Data availability statement

The datasets generated during and/or analyzed during the current study are available in the 2019 Survey on Social and Emotional Skills (SSES) repository, <https://www.oecd.org/education/cei/social-emotional-skills-study/>.

Informed consent

Informed consent for all individual participants in the study has been officially completed by the international organization OECD.

Ethical statement

The international organization OECD has completed the ethical norm for all participating countries/economies in the 2019 Survey on Social and Emotional Skills (SSES).

Conflict of interest

The author declares no competing interests.

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