



International Journal of Knowledge and Learning

ISSN online: 1741-1017 - ISSN print: 1741-1009

<https://www.inderscience.com/ijkl>

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DOI: [10.1504/IJKL.2024.10060777](https://doi.org/10.1504/IJKL.2024.10060777)

Article History:

| | |
|-------------------|------------------|
| Received: | 20 November 2021 |
| Last revised: | 22 November 2021 |
| Accepted: | 05 November 2022 |
| Published online: | 08 December 2023 |

Mediating effects of social and emotional skills on cognitive ability and academic achievement: Suzhou study

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Abstract: Educational planners and researchers believe that social and emotional skills play a crucial role in functioning well in the 21st century. This paper investigates how social and emotional skills mediate the relationships between students' cognitive ability and academic achievement. Recently, the OECD organised a large-scale international project to gather information about social and emotional skills among students in ten cities across nine countries. From the primary dataset released in 2019, information obtained from Suzhou, China ($n = 3,604$) was extracted to analyse the mediating effects. The study found strong linear relationships between cognitive ability and social and emotional skills in the older cohort group participants. The study also found that cognitive abilities mediate the relationship between social and emotional skills and academic achievement.

Keywords: cognitive abilities; academic achievement; social and emotional skills; mediation; China.

Reference to this paper should be made as follows: Khine, M.S., Liu, Y. and Afari, E. (2024) 'Mediating effects of social and emotional skills on cognitive ability and academic achievement: Suzhou study', *Int. J. Knowledge and Learning*, Vol. 17, No. 1, pp.16–27.

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1 Introduction

There is growing recognition that individuals need various skills to function well in the increasingly interconnected world and competitive economic environments. When preparing the young generations for the workforce, educators believe that developing appropriate personality characteristics and non-cognitive skills and factors among adolescence are critically important. Many organisations and employers require applicants to take personality tests and gauge their interpersonal and intrapersonal skills during recruitment to determine whether they have the necessary qualities. Some of these tests are also known as 21st-century skills that focus on one's ability to function well in the workplace and society. The notion of non-cognitive and 21st-century skills encompasses many individual characteristics. Among the personality traits grit, tenacity, curiosity, attitudes, self-concept, self-efficacy, coping strategies, perseverance, and confidence are frequently considered in the literature (Khine, 2016).

As early as in the year 2013, the Ministry of Education, People's Republic of China called for the 'all-round development' of students; with the key indicators being reflected as emotional control, personality quality, interpersonal communication, and curiosity for knowledge (MOE of People's Republic of China, 2013). In 2016, students were advocated to be equipped with 'core competence of Chinese student development' to adapt to lifelong learning and lifelong development. As stipulated in the policy document, non-cognitive ability was introduced into fundamental education pedagogy research and evaluation programs (Core Literacy Research Group, 2016). However, a long-established mindset emphasises students' cognitive abilities throughout their schooling years (Zhang, 2020). In contrast to the stellar performance of Chinese teenagers in cognitive abilities of reading, mathematics, and science in PISA 2019 (International Student Assessment

Project); a rather stern fact emerged, as Chinese teenagers also demonstrated a low sense of belonging to the school, low levels of satisfaction with schools, lack of autonomy and self-consciousness for self-planning (Du, 2019). Suzhou students' participation in the SSES survey is of great empirical value to deepen the educational reforms in this regard.

2 Literature review

Early attempts to measure personality traits include The Big Five Inventory (BFI) developed by John et al. (1991). The 44-item English BFI was constructed to allow efficient and flexible assessment of the five personality dimensions, extraversion, agreeableness, conscientiousness, neuroticism (emotional stability), and openness to experience. The Big Five taxonomy represents a parsimonious and comprehensive way of summarising individual differences in all personality characteristics. In addition, personality characteristics comprising the Big Five are predictive of a wide range of outcomes (John, 2021). Since its introduction, numerous studies have discovered its efficacy and usefulness in schools and workplace settings. The inventory has also been translated into many languages, including Italian (Ubbiali et al., 2013), Dutch (Denissen et al., 2008), Chinese (Zhou, 2015), Spanish (Mezquita et al., 2019), Turkish (Çikrikci et al., 2019), Japanese (Iimura and Tako, 2018), French (Madamet et al., 2018), and Arabic (Alansari, 2016).

When Stajkovic et al. (2019) conducted a study with 875 university students, trait, independent and intrapersonal models were used to determine the effects of the Big Five personality traits and self-efficacy on academic achievement. The study found that self-efficacy positively related to academic performance across all models. Acknowledging that personality traits and cognitive ability are well known to predict academic performance, Brandt et al. (2019) explored the interplay of students' personality, cognitive ability, and academic achievement to answer to what extent the associations are generalisable. Their study involves over 12,000 ninth-grade students in Germany. The Big Five test was used to measure personality traits, and the 12-item matrices test (NEPS_MAT) was used to measure the school subject. The results show the differential associations by school subject for cognitive ability and personality traits explained most variation in academic performance among the sample.

In Oshio et al.'s (2018) meta-analysis, the authors examined 30 studies to investigate the relationships between psychological resilience, ego-resiliency, and Big Five personality traits. When comparing the two types of resiliency, they found a negative relationship with neuroticism and positive relationships with openness and agreeableness with ego-resiliency. Sorić et al. (2017) investigated the relationship between personality traits, goal orientation, and academic achievement among 501 high school students in Croatia. The study's objective was to determine whether goal orientation mediates the relationship between Big Five personality traits and academic achievement. The study found that goal orientation, learning approach, performance approach, and work avoidance mediate the relationship only with conscientiousness and academic achievement. When examining a nationwide sample of 135,389 primary and lower secondary students in Denmark public schools from grade 4 to grade 8, Andersen et al. (2020) found that academic performance was equally strongly related to Big Five measures such as conscientiousness at all grade levels, and agreeableness and emotional stability reflected their connections with conscientiousness. In another study, Verbree

et al. (2021) explored whether personality traits predict achievement and the relationship between different personality traits and academic achievement contingent upon the educational field. The results show that students who are more open to experience and less conscientious are inclined to choose arts and humanities subjects.

Mammadov (2022) recently conducted a meta-analysis to assess the strength of relationships between the Big Five personality traits and academic performance by synthesising 228 studies. The results indicate that the combined effect of cognitive ability and personality traits explained 27.8% of the variance in academic performance. Among the five traits, conscientiousness was found to be a strong predictor of performance. The study also found associations between academic performance and openness, extraversion, and agreeableness at the elementary and middle school levels. The effect sizes are large and significant. Above mentioned studies in various contexts and at different schooling levels indicate the positive and significant associations between personality traits and academic performance using the Big Five framework.

A growing number of educators, trainers, and policymakers believe that social and emotional skills are key to a well-rounded education and success after schooling and entering the workforce (Hoerr, 2020). Alzahrani et al. (2019) observed that social and emotional competence affects children’s academic achievement and behavioural development. The authors reviewed several studies on the influence of social and emotional competence on learning outcomes, and better school achievement, including reading, writing, critical thinking, vocabulary, and behavioural skills.

Table 1 Social and emotional skills and alignment to Big Five personality traits factors

| <i>Big Five factor</i> | <i>Dimensions</i> | <i>Skills</i> |
|------------------------|----------------------|--|
| Conscientiousness | Task performance | Responsibility Persistence Self-control |
| Neuroticism | Emotional regulation | Stress resistance Optimism Emotional control |
| Agreeableness | Collaboration | Empathy Trust Cooperation |
| Openness to experience | Open-mindedness | Tolerance Curiosity Creativity |
| Extraversion | Engaging with others | Sociability Assertiveness Energy |

Many frameworks define social and emotional competencies for children and adolescents as well as for adults. Greenberg and Weissberg (2018) describe that social and emotional skills should be situated at the centre of educational curricula and pedagogy. Chernyshenko et al. (2018, p.10) noted that the Big Five structure of the personality characteristics offers a strong empirical foundation, an efficient summary of individual

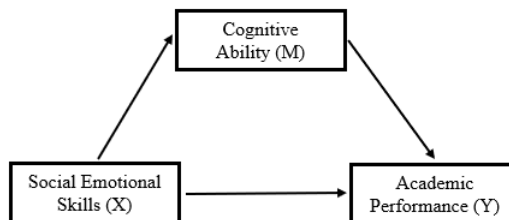
differences in social and emotional skills, and is highly predictive. They also noted that these skills are malleable and stable individual skills. They report that the Big Five framework was the most suitable to measure social and emotional skills and use it as a foundation for the OECD's study on social and emotional skills (SSES) project. Table 1 depicts the alignment between the Big Five factors and social and emotional skills included in the survey.

In his book, *The Heart and Science of Teaching*, Hansen (2019) wrote that according to the latest research, students really could not learn well without social-emotional connections with their learning communities. Cultivating social and emotional skills will ensure students learn these skills across disciplines and link them to academic content. The systemic review and meta-analytic study by Corcoran et al. (2018) synthesised 50 years of research on the effectiveness of school-based social and emotional learning programs for improving academic achievement. They examined 40 studies and found that social and emotional learning positively affected reading, mathematics, and science achievements. From the studies mentioned above, it was evident that cognitive ability and social and emotional skills play a role in educational attainment.

3 Research framework

Figure 1 depicts the conceptual model of mediating effect of social and emotional skills on the relationships between cognitive ability and academic achievement. The conceptual framework consists of social emotional skills as an independent variable (X) and academic achievement as a dependent variable (Y). The intervening variable is social and cognitive ability that will be tested as a mediating variable (M).

Figure 1 Conceptual model



4 Materials and methods

4.1 Context

The Survey of Social and Emotional Skills (SSES) is a large-scale international assessment project organised by the OECD. The survey aims to understand the nature and development level of adolescent students' social and emotional competence and what factors affect the development of these non-cognitive learning competencies. Meanwhile, the survey explores the incremental value of individual social and emotional skills related to a broad set of life outcomes. Its results could shed light on how to improve these emotional skills through educational policies and practices. The survey has been

administered in several cities and countries across the globe. In 2019, the participating countries were Canada, Columbia, China, Finland, Portugal, Russia, South Korea, Turkey, and the USA. The first cycle of SSES started in 2016. After the cognitive interviews were conducted in 2017, followed by the online survey in 2018. The tests were conducted in all participating cities in two age cohorts. 3,647 ten-year-olds and 3,621 15-year-old students from 151 primary and secondary schools in Suzhou participated in the assessment.

Suzhou is a city in Jiangsu Province, Southeast of the People's Republic of China, a region of high socioeconomic status. In Suzhou, schools follow the Ministry of Education's basic curriculum, focusing on developing students' knowledge, skills, emotional attitude, and values. The philosophy of current curricular reforms is to improve students' hands-on problem-solving capabilities, practical communicative skills, and the development of accountability and innovative mindsets to leverage their cognitive capabilities better. Since the cultivation of social and emotional skills is embedded in school subjects such as morality and law, Chinese, science, and English, it was believed that Chinese students' social and emotional status as manifested in different age groups could serve as empirical evidence as to explore the factors affecting the development of diverse skills including curiosity, cooperation, tolerance, sociability, and persistence.

4.2 Data source

The primary data source for this study is the student questionnaire administered by the OECD in the SSES. Educational researchers believe that in the fast-changing world and dynamic economic context, 21st-century skills are necessary to enable countries to operate competitively. The SSES measures social and emotional skills, also known as non-cognitive factors, or soft skills, which every student should have to succeed in their future. This data contains over 60,000 records of students from ten cities across nine countries. The sample for this investigation was extracted from the primary database for an older cohort of students ($n = 3,604$) from Suzhou, China. Among them, 1,756 are females (48.7%), and 1,848 are males (51.3%), aged 15.6 to 16.

When collecting large-scale data, it is necessary to ensure that the sample is as inclusive as possible within the target populations. For this reason, stratified sampling techniques are used to gather equal numbers of students. Stratification is a process that improves the efficiency of the sample design (OECD, 2021).

4.3 Study instruments

The social and emotional skill survey consisted of contextual questions, an SES instrument, cognitive performance measures, and academic achievement in mathematics, language, and arts subjects. Students are asked to complete the questionnaire online.

The cognitive performance measures consisted of seven multiple-choice items that determined the students' cognitive ability. Example items include, 'How many legs do three cows, and four chickens have in total', and 'X and Y went fishing and caught a total of 32 fish. Y caught three times as many fish as X. How many fish did X catch?'. Academic achievement is the sum of students' standardised grades in mathematics, language, and arts subjects provided by the respective schools.

The 130-item SES survey assesses social and emotional skills. The survey covers six domains and 15 dimensions. These domains are collaboration, emotional regulation, engagement with others, open-mindedness, task performance, and compound skills. Students read each statement and select one of the five answers, from Likert-scale strongly disagree to strongly agree.

4.4 *Statistical analysis*

After extracting the Suzhou data from the primary database, SPSS version 27 was used to perform a series of statistical analyses. This includes descriptive statistics, including, frequency, measurement of central tendency, and measure of variability. Inferential statistics were performed to determine the relationships between independent, dependent, and mediating variables. The Pearson product-moment correlations were also computed to examine the bivariate correlations, directions, and strength of relationships between the variables of interest. The mediating role of social and emotional skills on the relationships between cognitive abilities and academic achievement was analysed using PROCESS Macro 4.1 (Hayes, 2021). This procedure examines the direct, total, and indirect effects of social and emotional skills as a mediator in the relationships between independent variable cognitive abilities and dependent variable academic achievement.

As suggested by Baron and Kenny (1986), the following steps are undertaken.

- 1 Make sure that X has a significant relationship with Y.
- 2 X has a significant relationship with M.
- 3 X has a significant influence on M, and M has a significant relationship with Y.
- 4 Simultaneous direct and indirect relationships.

The PROCESS Macro uses bootstrap techniques to determine the significance. In the analysis, a bootstrap sample is set to 5,000. This technique treats the data like a pseudo-population. It takes a random sampling with replacement to determine whether the indirect effect falls within a confidence interval. Collier (2020) indicates that this number is sufficiently large for such an analysis.

5 **Results**

The relationships between social and emotional skills, academic performance, and cognitive ability were analysed using bivariate correlations. Preparatory analyses found that there were no violations of the assumptions of normality, linearity, and homoscedasticity. The associations are presented in Table 2. The social and emotional skills had a small, positive correlation with academic performance, $r(3,602) = 0.04$, $p < 0.01$, and social and emotional skills had a small, positive correlation with cognitive ability, $r(3,602) = 0.13$, $p < 0.001$. Also, there was a small, positive correlation between cognitive ability and academic performance, $r(3,602) = 0.09$, $p < 0.001$.

Multiple linear regressions were used to test if social emotional skills and cognitive ability significantly predicted academic performance. The overall regression was statistically significant ($R^2 = 0.009$, $F(2, 2585) = 11.84$, $p < 0.001$). It was found that cognitive ability significantly academic performance ($\beta = 0.087$, $p < 0.001$). However,

social and emotional skills did not significantly predict academic performance ($\beta = 0.030$, $p = 0.124$). Table 3 reports the results of the multiple linear regressions.

Table 2 Correlations between social and emotional skills, cognitive ability, and academic performance

| Variables | Social and emotional performance | Academic performance | Cognitive ability |
|-----------------------------|----------------------------------|----------------------|-------------------|
| Social and emotional skills | - | | |
| Academic performance | 0.04* | - | |
| Cognitive ability | 0.13** | 0.09** | - |

Note: ** $p < 0.001$; * $p < 0.01$.

Table 3 Multiple regression analyses for associations between social emotions skills and cognitive ability on academic performance

| Variables | Unstandardised coefficient B | Standardised error | Standardised coefficient Beta | t | Sig. |
|-----------------------------|------------------------------|--------------------|-------------------------------|-------|-------|
| Constant | 88.529 | 4.557 | | 19.42 | 0.000 |
| Social and emotional skills | 0.012 | 0.007 | 0.030 | 1.539 | 0.124 |
| Cognitive ability | 1.611 | 0.365 | 0.087 | 4.410 | 0.000 |

Hence, the mediating role of cognitive ability in relation to social and emotional skills and academic performance was investigated in the mediation analysis (Figure 2).

Figure 2 The mediation role of cognitive ability in relation to social and emotional skills and academic performance

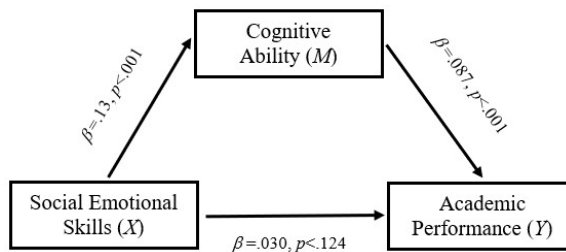


Table 4 Test for mediation using a Bootstrap analysis with a 95% confidence interval

| Relationships | Direct effect | Indirect effect | Confidence interval | | p-value | Conclusion |
|--|---------------|-----------------|---------------------|-------|---------|----------------|
| | | | Low | High | | |
| Social and emotional skills → Cognitive ability → Academic performance | 0.012 (1.54) | 0.004 | 0.002 | 0.006 | < 0.001 | Full mediation |

Table 4 reports the results of the mediating effect of the relationship between social and emotional skills and academic performance. Hayes (2021) suggested that the indirect effect is significant if a zero value falls outside the lower bound and upper bound of the bias-corrected 95% confidence interval. Table 3 reveals that the bias-corrected 95% percentile of CI ($\beta = 0.004$, $CI = 0.002, 0.006$) for social and emotional skills does not

include a zero value. This result indicated the indirect effect of social and emotional skills on academic performance through cognitive ability was statistically significant. Therefore, cognitive ability might be a mediator between social and emotional skills and academic achievement. This indicates that full mediation is occurring (Baron and Kenny, 1986).

Indirect effect is significant if zero value falls outside the lower bound and upper bound of BC percentile 95% CI. Unstandardised coefficient reported. Value in parentheses is t-values.

6 Discussion

The most prominent finding to emerge from this study is probably identifying the mediating effect of cognitive factors coordinating students' social and emotional skills and academic achievement. Due to the malleable nature of social and emotional abilities, adolescents are sensitive to external interventions from peers, teachers, family members, etc. Recognising the need to develop social and emotional skills starting from childhood to adolescence, educators and researchers established frameworks, curricula, pedagogy, and assessment methods implemented in schools in different countries. It has been strongly suggested that effective interventions could promote their social and emotional abilities and lifelong well-being during this period. An earlier study found that educational intervention could improve social and emotional skills to a great extent (Schweinhart et al., 2016). The Ministry of Education of China collaborated with UNICEF on a 'Social and Emotional Learning and School Management Improvement Project' in 2012, aiming to improve students' social and emotional abilities in western China provinces. Particular intervention measures include lectures, instructional reforms, an adjustment in the school environment, and home-school interaction. The project outcomes were found to be able to exert a positive impact on the social and emotional development of Chinese students (Mao et al., 2018). Research on Chinese adolescents' non-cognitive abilities continued: communication and teamwork cooperation have been elaborated as one of the five core literacy components (Xu et al., 2021; Kang et al., 2020). This study detected evidence showing the association between Chinese adolescents' non-cognitive factors and learning achievement through the mediating effect of cognitive factors.

The results of this study also showed a strong correlation between non-cognitive abilities and academic performance, which is in agreement with earlier findings that non-cognitive factors as variations in academic performance. It is noteworthy that cultivating students' social and emotional competence needs joint efforts from all relevant parties. The OECD evaluation results showed that schools, teachers, and families all play a part in cultivating social and emotional skills such as optimising family, school, and community environments. It has also been suggested that the SSES instrument could evolve into a more global survey with more diverse and localised assessing indicators. Since the test was introduced in many different countries, its effectiveness was questioned due to the different educational and cultural contexts. Zhao et al. (2021) argued that traditional approaches to measuring cognitive skills, like pencil and paper tests, may not be best suited to assess non-cognitive skills, and observer reporting could be preferable. Meanwhile, those Chinese researchers also stressed the necessity of eliminating the subjectivity of a single evaluation perspective. Another notable project is

learning to be (L2B), as reported by Aguilar et al. (2019). The authors described the development of a toolkit to create activities and materials for teachers to develop social and emotional competencies among the students in Spain and its potential to use in other countries.

The findings have important implications for the need to integrate social and emotional skills into the school curriculum. The development of social and emotional abilities needs synergy that comes from family, school, and community environments. Educators and curricular reformers need to be aware of the mediating effect of non-cognitive factors on students' academic achievement.

The study focuses on the Suzhou data. Since Suzhou data consisted of both younger and older cohorts, only the older cohort data has been analysed in the study. Thus, the findings of this study could hardly be generalised to the junior cohorts as well as the overall Suzhou students. Meanwhile, although Suzhou was chosen as the sampling city for the SSES survey, a single city can be barely adequate to manifest the entire country's social and emotional skills status. Due to the constraints on data collection, this study does not engage qualitative data from all relevant parties, including teachers, parents, and school principals. A combination of quantitative and qualitative approaches could definitely contribute to the reliability of the findings. Lastly, another potential problem is that the SSES test may not be specifically applicable to the cultural environment in China.

7 Conclusions

Previous studies have shown that the Big Five taxonomy addresses comprehensive but parsimonious physiological indicators summarising individual differences. Empirical findings suggested the mediating effects of social and emotional skills occur as 'partial mediation effects' (Stajkovic et al., 2019) or the 'differential associations' (Brandt et al., 2019) been identified in colligating cognitive ability and academic attainments. This study examined the mediation effects of cognitive skills on the relationships between social and emotional skills and academic performance among the older cohort of students in Suzhou, China. The findings revealed that teenagers' cognitive abilities could mediate the direct effects of social and emotional skills on academic achievement. The results of this study strengthened the notion that non-cognitive skills play an important role in student's academic success. Further studies may consider including the younger group of participants' social and emotional factors, examine the different features in contrast to their elder peers, or trace the chronicle changes of these non-cognitive skills during their schooling years.

References

- Aguilar, P., Lopez-Cobo, I., Cuadrado, F. and Benítez, I. (2019) 'Social and emotional competencies in Spain: a comparative evaluation between Spanish needs and an international framework based on the experiences of researchers, teachers, and policymakers', *Frontiers in Psychology*, Vol. 10, p.2127.
- Alansari, B. (2016) 'The Big Five inventory (BFI): reliability and validity of its Arabic translation in non clinical sample', *European Psychiatry*, Vol. 33, No. S1, pp.S209–S210.

- Alzahrani, M., Alharbi, M. and Alodwani, A. (2019) 'The effect of social-emotional competence on children academic achievement and behavioral development', *International Education Studies*, Vol. 12, No. 12, pp.141–149.
- Andersen, S.C., Gensowski, M., Ludeke, S.G. and John, O.P. (2020) 'A stable relationship between personality and academic performance from childhood through adolescence. An original study and replication in hundred-thousand-person samples', *Journal of Personality*, Vol. 88, No. 5, pp.925–939.
- Baron, R.M. and Kenny, D.A. (1986) 'The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations', *Journal of Personality and Social Psychology*, Vol. 51, No. 6, pp.1173–1182.
- Brandt, N.D., Lechner, C.M., Tetzner, J. and Rammstedt, B. (2019) 'Personality, cognitive ability, and academic performance: differential associations across school subjects and school tracks', *Journal of Personality*, Vol. 88, No. 2, pp.249–265.
- Chernyshenko, O.S., Kankaraš, M. and Drasgow, F. (2018) *Social and Emotional Skills for Student Success and Well-Being: Conceptual Framework for the OECD Study on Social and Emotional Skills*, OECD Education Working Papers, No. 173, OECD Publishing, Paris.
- Çikrikci, Ö., Griffiths, M.D. and Erzen, E. (2019) 'Testing the mediating role of phubbing in the relationship between the big five personality traits and satisfaction with life', *International Journal of Mental Health and Addiction*, Vol. 20, pp.44–56.
- Collier, J.E. (2020) *Applied Structural Equation Modeling using AMOS: Basic to Advanced Techniques*, Routledge, London.
- Corcoran, R.P., Cheung, A.C., Kim, E. and Xie, C. (2018) 'Effective universal school-based social and emotional learning programs for improving academic achievement: a systematic review and meta-analysis of 50 years of research', *Educational Research Review*, Vol. 25, pp.56–72.
- Core Literacy Research Group (2016) 'Chinese students develop core literacy', *Journal of the Chinese Society of Education* [Chinese], Vol. 37, No. 10, pp.1–3.
- Denissen, J.J., Geenen, R., Van Aken, M.A., Gosling, S.D. and Potter, J. (2008) 'Development and validation of a Dutch translation of the Big Five inventory (BFI)', *Journal of personality Assessment*, Vol. 90, No. 2, pp.152–157.
- Du, W. (2019) 'What educational enlightenment does the PISA test bring to educational evaluation?', *Modern Education Daily* [Chinese], pp.12–18.
- Greenberg, M. and Weissberg, R. (2018) *Social and Emotional Development Matters: Taking Action Now for Future Generations*, Robert Wood Johnson Foundation, New Jersey.
- Hansen, C. (2019) *The Heart and Science of Teaching: Transformative Applications that Integrate Academic and Social-Emotional Learning*, Teachers College Press, New York.
- Hayes, A.F. (2021) *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*, 3rd ed., Guildford Publications, New York.
- Hoerr, T.R. (2020) *Taking Social-Emotional Learning Schoolwide: The Formative Five Success Skills for Students and Staff*, ASCD.
- Iimura, S. and Taku, K. (2018) 'Gender differences in relationship between resilience and Big Five personality traits in Japanese adolescents', *Psychological Reports*, Vol. 121, No. 5, pp.920–931.
- John, O. (2021) 'History, measurement, and conceptual elaboration of the Big-Five trait taxonomy', in John, O. and Robins, R. (Eds.): *Handbook of Personality: Theory and Research* (4E), Guildford Press, pp.35–82.
- John, O., Donahue, E. and Kentle, R. (1991) *The 'Big Five' Inventory: Versions 4a and 5a*, University of California, Berkeley, Institute of Personality and Social Research, Berkeley.
- Kang, C., Xu, G., Wei, R., Liu, J., Zheng, Y. and Liu, Y., Gan, Q. and Ma, L. (2020) 'Open-mindedness: report on the study on social and emotional skills of Chinese adolescence (IV)', *Journal of East China Normal University (Educational Sciences)* [Chinese], Vol. 39, No. 9, pp.77–82.

- Khine, M.S. (2016) 'Non-cognitive skills and factors in educational attainment', in Khine, M.S. and Arepattamannil, S. (Eds.): *Non-Cognitive Skills and Factors in Educational Attainment*, pp.3–9, Brill, Rotterdam.
- Madamet, A., Potard, C., Huart, I., El-Hage, W. and Courtois, R. (2018) 'Relationship between the big five personality traits and PTSD among French police officers', *European Journal of Trauma & Dissociation*, Vol. 2, No. 2, pp.83–89.
- Mammadov, S. (2022) 'Big five personality traits and academic performance: a meta-analysis', *Journal of Personality*, Vol. 90, No. 2, pp.222–255.
- Mao, Y., Du, Y., Yi, K. and Wen, S. (2018) 'School improvement based on the cultivation of students' social and emotional abilities – the exploration and practice of the Ministry of Education-UNICEF 'Social Emotional Learning' project', *Primary and Secondary School Management* [Chinese], Vol. 32, No. 11, pp.31–33.
- Mezquita, L., Bravo, A.J., Morizot, J., Pilatti, A., Pearson, M.R., Ibáñez, M.I., Ortet, G. and Cross-Cultural Addictions Study Team (2019) 'Cross-cultural examination of the Big Five personality trait short questionnaire: measurement invariance testing and associations with mental health', *PLoS One*, Vol. 14, No. 12, p.e0226223.
- Ministry of Education (MOE) of the People's Republic of China (2013) *Opinions of the Ministry of Education on Promoting the Reform of Comprehensive Evaluation of Educational Quality in Primary and Secondary Schools* [Chinese] [online] http://www.moe.gov.cn/srcsite/A06/s3321/201306/t20130608_153185.html (accessed 29 October 2021).
- OECD (2021) *Survey on Social and Emotional Skills: Technical Report*, OECD Publishing, Paris.
- Oshio, A., Taku, K., Hirano, M. and Saeed, G. (2018) 'Resilience and Big Five personality traits: a meta-analysis', *Personality and Individual Differences*, Vol. 127, pp.54–60.
- Schweinhart, L.J., Berrueta-Clement, J.R. et al. (2016) 'Effects of the perry preschool program on youths through age 19', *Topics in Early Childhood Special Education*, Vol. 5, No. 2, pp.26–35.
- Sorić, I., Penezić, Z. and Burić, I. (2017) 'The Big Five personality traits, goal orientations, and academic achievement', *Learning and Individual Differences*, Vol. 54, pp.126–134.
- Stajkovic, A.D., Bandura, A., Locke, E.A., Lee, D. and Sergeant, K. (2018) 'Test of three conceptual models of influence of the big five personality traits and self-efficacy on academic performance: a meta-analytic path-analysis', *Personality and Individual Differences*, Vol. 120, pp.238–245.
- Ubbiali, A., Chiorri, C. and Hampton, P. (2013) 'Italian big five inventory. Psychometric properties of the Italian adaptation of the big five inventory (BFI)', *BPA-Applied Psychology Bulletin (Bollettino di Psicologia Applicata)*, Vol. 59, No. 266, pp.37–48.
- Verbree, A., Mass, L., Hornstra, L. and Meig, L. (2021) 'Personality predicts academic achievement in higher education: differences by academic field of study?', *Learning and Individual Differences*, Vol. 92, Article No. 102081.
- Xu, G., Wei, R., Liu, J., Li, J., Kang, C., Ma, L., Gan, Q. and Liu, Y., Huang, Z., Wang, Q., Chen, H. and Gao, X. (2021) 'Engaging with others: The report on the study on social and emotional skills of Chinese adolescents (V)', *Journal of East China Normal University (Educational Sciences)* [Chinese], Vol. 39, No. 9, pp.83–96.
- Zhang, X. (2020) 'Non-cognitive abilities stimulate positive growth', *China Education Daily*, 07-03.
- Zhao, F., Meng, W., Li, F. and Zhou, L. (2021) 'Overview and insight from the China research report on the global youth survey of social and emotional skills by the Organization for Economic Cooperation and Development', *Best Evidence in Chinese Education*, Vol. 9, No. 1, pp.1169–1195.
- Zhou, M. (2015) 'Moderating effect of self-determination in the relationship between Big Five personality and academic performance', *Personality and Individual Differences*, Vol. 86, pp.385–389.