Social and Emotional Learning: Research, Practice, and Policy 5 (2025) 100093

Contents lists available at ScienceDirect

Social and Emotional Learning: Research, Practice, and Policy

journal homepage: www.journals.elsevier.com/social-and-emotional-learning-research-practice-and-policy

The development and validation of the Multidimensional Assessment of Teacher Social-Emotional Competence (MATSEC) in East Asian school contexts

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ARTICLE INFO

Keywords:
Social-emotional competence (SEC)
Teacher
Measurement
Factor analysis
East Asia

ABSTRACT

There is a growing consensus that teachers' social-emotional competence (T-SEC) is crucial for their own well-being and students' social and emotional learning (SEL). However, the literature lacks comprehensive, psychometrically sound, and practical measures of T-SEC. Moreover, the existing literature on T-SEC is predominantly grounded in Western countries, leaving this issue largely unexplored elsewhere. This study aims to introduce the Multidimensional Assessment of Teacher Social-Emotional Competence (MATSEC), measuring T-SEC across all five domains of the CASEL framework, with an additional domain focused on social awareness for equity and inclusion. This six-dimensional, self-reported scale was collaboratively developed by a team of East Asian researchers and practitioners through an iterative process of item generation and revisions based on expert reviews, cognitive interviews, and pilot testing. We evaluated various psychometric properties of this scale using data from school teachers in China and Korea ($N = 859$). Exploratory and confirmatory factor analysis suggested a second-order factor structure involving a single overall T-SEC factor indicated by six sub-domain factors: (1) self-awareness, (2) emotion management, (3) social awareness for student well-being, (4) social awareness for equity and inclusion, (5) relationship skills, and (6) responsible decision-making. The overall scale and all subscales showed high internal consistency and concurrent validity, demonstrating significant correlations with teachers' various well-being outcomes, self-efficacy, and perceived school climate. Measurement invariance testing supported cross-country equivalence of the scale. We hope the MATSEC contributes to the emerging literature on T-SEC in East Asia, with the potential to be tested and applied in diverse educational contexts around the world.

1. Background

School-based social and emotional learning (SEL) has been widely tested and accepted as an evidence-based approach to promoting a variety of positive youth outcomes, primarily by fostering social-emotional competence (SEC) in students (Cipriano et al., 2023; Durlak et al., 2022). Over the past decades, SEL has increasingly become a common educational practice in American schools (Skoog-Hoffman

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https://doi.org/10.1016/j.sel.2025.100093
Received 1 August 2024; Received in revised form 11 February 2025; Accepted 18 February 2025
Available online 21 February 2025

et al., 2024), and the outbreak of the COVID-19 pandemic has further fueled the SEL dissemination efforts at a global level. For example, various international organizations have been advocating for the integration of SEL into educational policies and practices across countries (UNESCO, 2024; UNICEF, 2022; WHO, 2022).

While the previous SEL literature has mainly focused on student SEC, there is a growing attention to teacher SEC (T-SEC) as it is acknowledged as an essential factor for successful SEL for students (Gimbert et al., 2023; Schonert-Reichl, 2017). The prosocial classroom model proposed by Jennings and Greenberg (Jennings & Greenberg, 2009) is one of the most comprehensive frameworks that explain why and how teachers may influence student SEC development. According to this model, a socially and emotionally competent teacher may be better able to create a healthy classroom climate and facilitate student SEC development in several ways, through positive student-teacher relationships, effective classroom management, and effective SEL implementation, all while effectively coping with their own stress (Jennings & Greenberg, 2009).

With an increasing interest in T-SEC, studies have examined various correlates of T-SEC, mainly focusing on individual teacher-level outcomes. Multiple studies have found that T-SEC was positively related to job satisfaction (Kinman et al., 2011; Yahyazadeh-Jeloudar & Lotfi-Goodarzi, 2012) and mental well-being (Zhang et al., 2023), while negatively related to burnout (Brackett et al., 2010; Kinman et al., 2011) and mental health challenges (Fitzgerald et al., 2022). T-SEC has also been found to be related to self-efficacy in teaching practices including student engagement and classroom management (Deng et al., 2022; Romero-García et al., 2022). Beyond the individual teacher level, T-SEC has been linked to school-level variables such as having a supportive principal and school climate (Brackett et al., 2010; Morton, 2014), and to student-level variables such as students' increased SEC (Lee et al., 2018) and mental and behavioral well-being outcomes (Braun et al., 2020).

1.1. Measurement of T-SEC

The field has a shared understanding that SEC is also malleable in adulthood and T-SEC can be promoted through effective SEL interventions (Oliveira et al., 2021; Schonert-Reichl, 2017). Just as the assessment of student SEC is essential for guiding and evaluating SEL interventions for students (Assessment Work Group, 2019), the measurement of T-SEC is one of the first steps toward enhancing T-SEC and various subsequent outcomes. To date, however, no unified consensus exists on how to conceptualize and measure the construct of T-SEC. A recent review on T-SEC identified five primary theoretical models of T-SEC and their associated instruments (Lozano-Peña et al., 2021): Gross's (2013) emotion regulation (ER) process model, Mayer et al.'s (2000) emotional intelligence (EI) model, Bar-On's (2006) EI model, the Collaborative for Academic, Social, and Emotional Learning (CASEL) model (CASEL, 2013; 2020), and the prosocial classroom model (Jennings and Greenberg, 2009). Gross's ER model conceptualizes SEC as emotion regulation processes, which focus on efforts to up-regulate positive emotional responses or down-regulate negative emotional states (Gross, 2013). The two EI models treat emotional intelligence as a proxy for SEC, encompassing skills such as emotional awareness, understanding, expression, and regulation (Bar-On, 2006; Mayer et al., 2000). Unlike these three models which mainly focused on emotional competence, the CASEL model views SEC as a more comprehensive, multidimensional construct spanning five domains: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (CASEL, 2013; 2020). Based on the CASEL's conceptualization, the prosocial classroom model specifically emphasizes the importance of T-SEC and its impact on students and classroom outcomes (Jennings & Greenberg, 2009).

Currently, the CASEL model seems to be the most widely used framework in the world that has guided the measurement of student SEC, not only informing the development and validation of various scales, but also influencing how education authorities define the learning standards and benchmarks for SEL outcomes (Frye et al., 2024; Martinez-Yarza et al., 2023). However, the application of the CASEL model to the measurement of T-SEC has been relatively limited. Traditional instruments for T-SEC are largely built on the ER or EI models. These tools aim either to measure an adult's ability to regulate their emotions (e.g., the Emotion Regulation Questionnaire [ERQ]; Gross & John, 2003), or to assess a more general ability to recognize and understand their own or other's emotions as well as effectively regulate their emotions in different social settings, such as the Situational Test of Emotional Understanding (STEU) and the Situational Test of Emotional Management (STEM; MacCann & Roberts, 2008), or the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; Mayer et al., 2012). In line with these well-established tools for adults in general, a new situational test named the Test of Regulation in and Understanding of Social Situations in Teaching (TRUST) was developed specifically to measure teachers' emotional competence especially when confronted with difficult student interactions (Aldrup et al., 2020). Although these instruments have shown good psychometric properties with diverse samples, they have a narrow focus and scope for measuring multiple dimensions of SEC beyond emotional competence. The situational tests have their own strengths, but may be limited in applicability across different educational settings and cultural contexts. Also, these measures are typically lengthy and may require trained administrators, making them less practical and feasible to be used for large-scale assessments in routine school settings. These limitations call for more comprehensive and user-friendly measures of T-SEC.

Until recently, there have been only a few scales or resources available in the literature, which intend to measure a broader set of T-SEC based on the CASEL model. For example, the Social-Emotional Competence Teacher Rating Scale (SECTRS) was originally developed based on the CASEL model, but during the scale validation process, all the items designed for self-awareness and decision-making were removed, leading to a final factor structure covering only three out of the five CASEL competencies (Tom, 2012). The SECTRS was initially published as a dissertation study conducted in the U.S. and later adapted and validated with Mexican and European samples (Grazzani et al., 2024), but the use of this scale and further validation of its factor structure seems generally scant in the literature.

Another example is a self-reflective tool developed by the American Institutes for Research as a practical resource for SEL-implementing teachers to reflect on how their own SEC influences their SEL practices across five domains of the CASEL model (Yoder, 2014). To our knowledge, however, the psychometric evidence of this practical tool has not been available in the literature. In addition, the target users of this tool are those who are actively implementing SEL instructions to students, which limits its use in educational settings without such intensive or intentional SEL practice occurring.

Recently, there have been a few more research-based scales developed to measure T-SEC based on the CASEL model. For example, a scale named EduSEL was developed and validated with Israeli teachers, which was found to measure three factors: cognitive skills, emotional awareness, and social competencies (Hemi & Kasperski, 2023). Although the items included in this scale were together designed to cover five domains of the CASEL model, the examined factor structure of this scale was not directly aligned with the CASEL model, but rather with Jones and Bouffard's (2012) conceptualization that differentiates cognitive, emotional, and social domains of SEC.

Also, Yang et al. (2024) has recently validated a 22-item version of the Transformative Social and Emotional Learning Competencies Scale (TSELCS-22) with Asian American and Pacific Islanders teachers in the United States. The items included in the TSELCS-22 were originally developed by the CASEL as part of the Personal SEL Reflection tool to help SEL-practicing educators to self-reflect on their own SEC (CASEL, 2021). The TSELCS-22 was found to measure five factors, aligned with the CASEL model, with an additional second-order factor indicated by

all the five SEC factors (Yang et al., 2024). One of the unique characteristics of this scale, compared to previously reviewed tools, is that it included items explicitly focused on race, ethnicity, and culture (e.g., "I can have honest conversations about race and racism with young people, their families, and other community members"), in line with the increasing emphasis on and demand for equity-centered and transformative SEL largely within the U.S. context (Jagers et al., 2019; Cipriano & McCarthy, 2023). Despite promising psychometric evidence, we believe this scale may not be directly transferable to other educational contexts with different SEL practice conditions (e.g., where SEL is not a common practice) or different sociocultural contexts (e.g., where other forms of educational inequities are more salient).

1.2. T-SEC in East Asia

In East Asia, school-based SEL is a relatively new area of research and practice compared to the U.S. and other Western countries. For example, in Cipriano et al.'s (2023) meta-analysis on school-based SEL interventions, only 4.6 % of the 424 reviewed studies were conducted in East Asia. The education systems in East Asian countries are commonly characterized by a strong emphasis on academic achievement, which has led to a lack of interest in and support for students' social and emotional development despite the highly competitive and stressful educational environments (Cha et al., 2012; Hannum et al., 2019). In this context, school-based SEL has been introduced as a promising solution to address students' mental and behavioral health, primarily based on the CASEL framework (Lee & Bong, 2017; Yu & Jiang, 2017). SEL has gained increased attention more recently with the exacerbated difficulties following the COVID-19 pandemic (Fu et al., 2024; Li and Hesketh, 2024).

Despite this growing recognition and need for school-based SEL, little attention has been paid to building frontline teachers' capacities to practice SEL. East Asian teachers are now increasingly expected to address students' social and emotional needs, while still meeting rigorous academic standards and high expectations from parents and the society (Ao et al., 2023; Ministry of Education, 2024). This has led to unintended consequences of lowering teacher well-being, observed in the rising trends of burnout, turnover, and serious mental health issues among Chinese and Korean teachers (Ao et al., 2023; Korean Teachers and Education Workers Union, 2024). In this educational context, T-SEC may hold even greater significance as an essential ingredient for successful school-based SEL, as well as for fostering teachers' own well-being (Collie & Perry, 2019; Jennings & Greenberg, 2009). However, there is a general lack of attention to the critical roles teachers play in school-based SEL and to providing the necessary training or support to develop their SEC.

The scientific literature on T-SEC is also in its nascent stages in East Asia, which is related to a lack of assessment tools for T-SEC that are developed for or validated with East Asian teachers. So far, we have identified a few scales, developed and used to measure T-SEC within local publications in South Korea (Jeon & Choi, 2022; Ko et al., 2015) and mainland China (Li et al., 2021). All of these scales adopted the CASEL model as a guiding conceptual framework, aligned with the way SEL has been introduced and discussed in these countries (Lee & Bong, 2017; Yu & Jiang, 2017). However, the existing studies on T-SEC measures in this region did not report sufficient information about the scale development and validation processes, provided little psychometric evidence beyond Cronbach's alpha, and/or had limited generalizability due to small sample size or specific target sample (e.g., special education teachers). Published in local journals, these scales also have limited cross-national applicability due to the difference in languages. Altogether, these limitations call for more robust research to develop psychometrically sound and more comprehensive measures of T-SEC for East Asian populations.

In addition, there was little attention to equity and inclusion in conceptualizing and measuring T-SEC through these existing scales. Compared to other regions of the world, East Asian countries share similar forms of educational inequities, including those based on meritocratic beliefs, family background and socioeconomic status, and the marginalization of students with disabilities or other disadvantaged statuses (Johansen, 2023; Teng et al., 2019). Cultivating the necessary skills to build positive learning environments for diverse student populations is a crucial aspect of T-SEC in all countries across the globe, enabling more inclusive and equitable teaching practices. However, the currently available T-SEC measures in East Asia are limited in explicitly assessing equity and inclusion, while there is a lack of flexible measures adaptable to capture the diverse forms of inequities specific to each country's educational context.

1.3. Research Objectives

To address the noted gaps in the literature, the research team developed the Multidimensional Assessment of Teacher Social-Emotional Competence (MATSEC), designed to be a comprehensive and practical measure of T-SEC that is also culturally relevant to the East Asian educational contexts. The MATSEC intends to be a comprehensive scale by measuring multiple dimensions of T-SEC based on the CASEL model, and by including competencies closely related to promoting equitable and inclusive learning conditions as relevant to the East Asian educational contexts. This scale is designed to be a practical tool that is time- and cost-efficient to administer in routine school settings. This scale is intended for use with teachers who may or may not implement SEL in a systematic or conscious way, considering the East Asian educational contexts. More detailed information on item and scale development procedures is presented below and in Supplemental Material. The main objective of this study is to evaluate various psychometric properties of the MATSEC to validate this measure with East Asian teacher samples. Specifically, we examined its factor structure and dimensionality, internal consistency reliability, concurrent validity, and cross-country measurement invariance.

2. Methods

2.1. Scale Development and Pilot Testing

More detailed information on the scale development and pilot testing procedure can be found in Supplemental Material. In summary, the MATSEC was originally developed and pilot-tested with a total of 37 items under the five domains of the CASEL model, many of which assumed the roles of school teachers directly interacting with students: (1) self-awareness (7 items measuring self-awareness as an educator and awareness of one's emotions), (2) self-management (8 items measuring emotion management and self-management for task performance), (3) social awareness (12 items measuring awareness of others' well-being and social awareness for equity and inclusion), (4) relationship skills (5 items measuring positive relationships with others), and (5) responsible decision-making (5 items measuring decision-making for school community). The scale was first developed in English, and was subsequently translated and back-translated into Simplified Chinese (the primary written language used in mainland China). The pilot testing was conducted in a county located in Southwestern China in Fall 2023, with a stratified cluster random sample of 606 elementary and middle school teachers (more information on the sample is provided in the following section). A two-stage consecutive factor analysis approach was employed, first conducting exploratory factor analysis (EFA) with half of the pilot sample and then confirmatory factor analysis (CFA) with the other half, to examine the underlying factor structure of the items. The results of the analysis showed 11 items with strong cross-loadings and 3 items with low loadings, which were subsequently removed. Based on the results as well as feedback from teachers and field experts, 23 pilot-tested items were retained or slightly amended, while six items were newly added. Specifically, two items on emotion management were

added to account for experiences of frustration and effective communication of emotions, respectively. Three items on social awareness of students' well-being were added, two of which were previously excluded due to their general nature. These items were revised with a focus on students (not generalized others) and added back, while the third item specifically focused on awareness of underlying causes of student emotions. One item on social awareness for equity and inclusion was split into two, separating students' academic performance from individual characteristics and family backgrounds. The finalized version of the scale to be tested in our main study therefore consisted of 29 items. The English version of the finalized scale was subsequently translated into Simplified Chinese and Korean.

2.2. Sampling and Participants

In Spring 2024, we collected teacher survey data to evaluate the finalized version of the MATSEC from two countries in East Asia: Mainland China and South Korea. The inclusion criteria were teachers employed in regular schools (elementary schools in both countries and middle schools in China only) during the Spring semester in 2024. Those who were (a) principals or vice-principals, (b) working in special schools that primarily serve students with disabilities, or (c) on leave as of Spring 2024 were not eligible to participate.

In China, we invited the same individuals who had participated in our pilot test to participate again in our main study after a gap of eight months. The Chinese teacher sample was recruited using a stratified cluster random sampling method in a county located in southwest China. First, we randomly selected 20 elementary schools (4 urban and 16 rural schools) and 20 middle schools (4 urban and 16 rural schools) based on the urban-rural school ratio in this county. Within each selected school, we aimed to recruit 20 teachers from elementary schools and 10 teachers from middle schools based on the elementary-middle school student ratio in this county. With the support of the local education bureau and with the help of school representative teachers, we created within-school sampling frameworks stratified by grade, homeroom teacher (banzhuren)[1] role, and gender. In each elementary school, we aimed to recruit 12 banzhuren teachers (two for each grade), plus eight non-banzhuren teachers across six grades (at least one for each grade), while aiming to achieve an equal gender distribution (10 women and 10 men). Similarly, in middle schools, we aimed to recruit six banzhuren teachers (two for each grade), plus four non-banzhuren teachers across three grades (at least one for each grade), again trying to maintain an equal gender balance (5 women and 5 men). Each identified teacher was orally informed by a school representative staff member of the study's purpose and procedures, and provided with a link to an online consent form through Qualtrics so that each teacher could voluntarily decide whether to participate in our study. As a result, a sample of 606 elementary and middle school teachers consented to participate in our pilot study in October 2023, and 597 of them consented to participate again in our main study in June 2024, in addition to five new participants. Upon giving their consent, participants were automatically directed to an online survey within the Qualtrics platform.

In Korea, we recruited a sample of elementary school teachers using a convenience sampling method. Since the use of random sampling was not feasible for the Korean sample, we reached out to several nationwide teacher associations, organizations, and online communities that many Korean elementary school teachers are actively engaged in. They advertised our survey to their affiliated members with a link to an online consent form through Qualtrics. To ensure the participants' eligibility as teachers, we requested an active professional email address given by the local education authorities during the consent process. In April 2024, a sample of 257 elementary school teachers voluntarily consented to participate in our study. Upon giving their consent, participants were automatically directed to an online survey within the Qualtrics platform.

With the total sample size of $N = 859$ across countries, 59 % of the participants were self-identified as female, with an average age of 39 (SD = 3.69) and 15 years of teaching experiences (SD = 5.87). More detailed information on the participants' characteristics is presented in Table 1. There were no missing data in all the major variables (i.e., T-SEC and other variables hypothesized to be correlated with T-SEC) and sociodemographic variables, except for 13 cases in the Chinese sample missing sociodemographic variables.

2.2.1. Measurement

T-SEC. After going through the scale development procedures described in Supplemental Material in detail, we used the Simplified Chinese and Korean versions of the finalized scale to measure T-SEC. This scale consists of 29 items, asking respondents to indicate the extent to which they agree or disagree with each statement on a response scale ranging from 0 (strongly disagree) to 5 (strongly agree). The instruction suggests taking some time to reflect on each item and states that there are no right or wrong answers. All the included items and the corresponding domains are presented in English in Table 2 in the Results section. In the survey, the items were randomly ordered to eliminate ordering effects on internal consistency reliability.

Mental health. Teachers' mental health was measured using both positive and negative indicators of mental health. First, the Simplified Chinese and Korean versions of the WHO Well-Being Index (WHO-5)

Table 1
Sample Characteristics Across Countries.

	N (%) or M (SD)		
Variable	**Total sample ($N = 859$)**	**China ($n = 602$)**	**Korea ($n = 257$)**
Personal characteristics			
Gender (Female)	507 (59.02 %)	332 (55.15 %)	175 (68.09 %)
Age in years	39.03 (3.69)	41.13 (7.70)	34.24 (6.50)
Education level			
Associate degree	123 (14.32 %)	123 (20.43 %)	—
Bachelor's degree	610 (71.01 %)	454 (75.42 %)	156 (60.70 %)
Master's degree or above	108 (12.57 %)	7 (1.16 %)	101 (39.30 %)
Parent/guardian status (Yes)	483 (56.23 %)	406 (67.44 %)	77 (29.96 %)
Average number of children (if any)	1.18 (1.91)	1.01 (0.85)	1.57 (0.60)
School/Educator characteristics			
School location (Urban)	296 (34.46 %)	120 (19.93 %)	176 (68.48 %)
School type (Public)	859 (100.00 %)	602 (100.00 %)	257 (100.00 %)
Years of teaching	14.73 (5.87)	16.62 (9.96)	10.35 (5.95)
Homeroom teacher role	542 (63.10 %)	319 (52.99 %)	223 (86.77 %)
Administrative role	190 (22.12 %)	134 (22.26 %)	56 (21.79 %)
Number of grades taught	1.14 (0.10)	1.12 (0.50)	1.21 (0.77)
Grades taught[1]			
1st	86 (10.01 %)	67 (11.13 %)	19 (7.39 %)
2nd	112 (13.04 %)	75 (12.46 %)	37 (14.40 %)
3rd	133 (15.48 %)	77 (12.79 %)	56 (21.79 %)
4th	126 (14.67 %)	75 (12.46 %)	51 (19.84 %)
5th	145 (16.88 %)	80 (13.29 %)	65 (25.29 %)
6th	160 (18.63 %)	76 (12.62 %)	84 (32.68 %)
7th	63 (7.33 %)	63 (10.47 %)	—
8th	69 (8.03 %)	69 (11.46 %)	—
9th	76 (8.85 %)	76 (12.62 %)	—
Average class size	36.36 (21.63)	42.83 (8.56)	21.42 (5.47)

Notes. [1]Participants were asked to check all grade levels they currently teach if there are more than one grade levels.

[1] Homeroom teachers (called "Banzhuren" (班主任) teachers in China and "Damim" (담임) teachers in Korea) refer to educators who are assigned to a specific classroom. Their responsibilities extend beyond teaching academic subjects, tasked with various administrative and caring duties for the assigned classroom such as managing the classroom, maintaining regular check-ins with students and their families, hosting parent meetings, and conducting family visits when needed.

Table 2
Pattern of Final Factor Loadings for EFA.

Item		Factor 1	Factor 2	Factor 3	Factor 4
SELFA1	I know what my strengths are as an educator		0.76		
SELFA2	I know specific ways I can enhance student learning		0.77		
SELFA3	As an educator, I have identified particular areas that require self-improvement		0.70		
SELFA4	I know when my feelings are making it hard for me to focus on work		0.74		
SELFA5	I know when my mood affects how I treat students		0.63		
EMOM1	I am good at managing my stress				0.83
EMOM2	I know how to control my anger				0.86
EMOM3	I know how to handle my frustration				0.82
EMOM4	I can manage my emotions effectively at school				0.83
EMOM5	I can communicate my emotions with others in a proper way				0.67
SAWB1	I can sense how students feel		0.59		
SAWB2	I can recognize the underlying psychological states behind students' words and behaviors		0.63		
SAWB3	I know when there is a student who needs help		0.60		
SAWB4	I generally have a good understanding of the reasons behind students' negative emotions (e.g., disappointment, anxiety, anger).		0.56		
SAEQI1	I try to prevent students from being left out of peer groups	0.89			
SAEQI2	When a student is rejected by peers, I try to help that student	0.90			
SAEQI3	I pay attention to the needs of students with marginalized backgrounds (e.g., [contextually relevant examples])	0.78			
SAEQI4	I treat every student fairly regardless of their individual characteristics and family backgrounds	0.90			
SAEQI5	I treat every student fairly regardless of academic performance	0.71			
SAEQI6	I try to create a classroom/school environment in which every student can feel a sense of belonging	0.60			
SAEQI7	I value and encourage diverse perspectives and opinions from students	0.66			
RELS1	I can make friends easily with other people			0.63	
RELS2	I get along well with my students			0.75	
RELS3	I get along well with the parents or guardians of my students			0.82	
RELS4	I get along well with my colleagues			0.51	
DECM1	When a problem arises in my classroom or school, I think of different ways to solve the problem			0.48	
DECM2	Before making a decision regarding student matters, I think about what might happen to the student(s) as well as the broader school community			0.47	
DECM3	When finding solutions for student-related issues, I communicate with different stakeholders, including students themselves and their parents or guardians	0.50		0.51	
DECM4	I work with my colleagues to come to a best possible decision for our students	0.40		0.47	

Note. $n = 430$; In the actual survey, the items were randomly ordered to eliminate ordering effects.

were utilized to assess the overall mental well-being of teachers (Fung et al., 2022; OECD Korea Policy Centre, 2024). This index consists of five items asking participants to reflect on their positive feelings over the past two weeks (e.g., "cheerful and in good spirit," "calm and relaxed"). Each item asks respondents to choose the option that best aligns with their experiences, with a response scale ranging from 0 (at no time) to 5 (all the time). In previous studies, Cronbach's alpha for the WHO-5 ranged from 0.81 to 0.91 (Fung et al., 2022; OECD Korea Policy Centre, 2024). In the current study, Cronbach's alpha was 0.96 for the Chinese sample and 0.90 for the Korean sample.

Additionally, symptoms of depression and anxiety were assessed as an indicator of negative mental health. In China, we used the depression and anxiety subscales (seven items each) from the validated Simplified Chinese version of the Depression, Anxiety and Stress Scale–21 items (DASS-21; (Gong et al., 2010), with a response scale ranging from 0 (not at all) to 3 (very much or most of the time). Cronbach's alpha of this scale was 0.89 in the previous study (Gong et al., 2010) and 0.95 for the Chinese sample of our study. In Korea, we used the Korean version of the Patient Health Questionnaire–4 (PHQ-4), consisting of two items for depression and two items for anxiety (OECD Korea Policy Centre, 2024), with a response scale ranging from 0 (not at all) to 3 (nearly every day). Cronbach's alpha of this scale was 0.85 in the previous study (OECD Korea Policy Centre, 2024) and 0.83 for the Korean sample of this study.

Teacher burnout. The Chinese (22-item) and Korean (10-item) versions of the revised Maslach Burnout Inventory-Educator Survey (MBI-ES) were utilized to assess the overall level of teacher burnout within each country (Jung & No, 2020; Wu et al., 2016), both covering three domains of burnout: emotional exhaustion, depersonalization, and personal accomplishment. Participants were asked to indicate the frequency of their experiences related to each statement (e.g., "I feel emotionally drained from work," "I feel that I treat some of my students as if they were impersonal objects"), ranging from 0 (never) to 6 (everyday) in the Chinese survey and from 0 (strongly disagree) to 5 (strongly agree) in the Korean survey. The average score of the three subscales was created in each sample, with reverse-coded items for personal accomplishment for higher scores to indicate higher levels of burnout. Cronbach's alpha values reported in previous studies fall within the range of 0.75 to 0.92 (Jung & No, 2020; Wu et al., 2016). In the current study, Cronbach's alpha of this scale was 0.88 for the Chinese sample, and 0.82 for the Korean sample.

Job satisfaction as a teacher. A single item adopted from the OECD Teaching and Learning International Survey (TALIS; (OECD, 2019) was used to understand teachers' overall satisfaction with their profession (i.

e., "How satisfied are you with your job as a teacher?"). Respondents were given a range of options from 0 (very dissatisfied) to 5 (very satisfied).

Life satisfaction. A single item adopted from the OECD Guidelines on Measuring Subjective Well-being (OECD, 2013) was used to understand teachers' overall satisfaction with their life (i.e., "Overall, how satisfied are you with life as a whole these days?"). Respondents were given a range of options from 0 (not at all satisfied) to 10 (completely satisfied).

Teacher self-efficacy. Teacher self-efficacy was measured using two subscales adopted from the OECD TALIS (OECD, 2019): *self-efficacy in classroom management* (4 items; e.g., "can control disruptive behavior in the classroom") and *self-efficacy in student engagement* (4 items; e.g., "can get students to believe they can do well in school work"). The response options range from 1 (not at all) to 4 (a lot). The OECD (OECD, 2019) reported reliability coefficients (omega and stratified Cronbach's alpha) of each country ranging from 0.80 to 0.97. In the current study, Cronbach's alpha was 0.94 for the Chinese sample and 0.88 for the Korean sample.

School climate. Teachers' perceived school climate was assessed using two subscales adopted from the OECD TALIS (OECD, 2019): *school climate regarding relationship quality* (4 items; e.g., "In this school, teachers and students usually get on well with each other") and *school climate regarding participation* (5 items; "This school has a culture of shared responsibility for school issues"). The response options range from 0 (strongly disagree) to 5 (strongly agree). In the TALIS 2018 (OECD, 2019), omega coefficients for the Chinese and Korean sample ranged from 0.80 to 0.97. In the current study, Cronbach's alpha was 0.94 for the Chinese sample and 0.91 for the Korean sample.

2.2.2. Ethics consideration

This study, including the pilot test and the main evaluation, was conducted according to the protocols approved by the Human Research Ethics Committee (HREC) of the University of Hong Kong (HREC reference number: EA230378). Participants were informed that the participation was completely voluntary, they could stop taking the survey at any time, and all the data would be kept confidential. Each participant received a small amount of electronic cash upon completion of the survey.

2.3. Data analysis

The exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted in accordance with the method and criteria used during the pilot-testing stage. The entire sample ($N = 859$; 70.1 % Chinese and 29.9 % Korean) was divided into two equivalent subsamples using the SOLOMON technique (Lorenzo-Seva, 2022), with Subsample One ($n = 430$; 70.7 % Chinese and 29.3 % Korean) designated for EFA and Subsample Two ($n = 429$; 69.5 % Chinese, 30.5 % Korean) for subsequent CFA to validate the factor structure. In the EFA Subsample, the Kaiser-Meyer-Olkin (KMO) statistic and Bartlett's test of sphericity were used to assess the suitability of the data for factor analysis. Parallel analysis (Horn, 1965) was then conducted to determine the appropriate number of factors based on the criterion of retaining factors with eigenvalues greater than those derived from random data. EFA was performed using the principal axis factoring method with Promax rotation according to Watkins (2018). The item reduction procedure followed the guidelines used in the pilot-testing phase, with reference to Acar Güvendir and Özer Özkan (2022).

Based on EFA results and a guiding theoretical framework, we then conducted CFA in Subsample Two ($n = 429$) to confirm the validity of the final factor structure. The robust maximum likelihood estimator (MLR) was used to handle any item nonnormality (Li, 2016). First, we tested and compared various alternative non-hierarchical factor structures to identify the number of latent factors that fit the data best. The robust model fit was assessed using goodness-of-fit indices. The thresholds are the root-mean-square error of approximation (RMSEA) values and Standardized Root Mean Square Residual (SRMR) lower than 0.80, the comparative fit index (CFI) and Tucker-Lewis index (TLI) values above 0.90 (Hu & Bentler, 1999). The Bayesian Information Criterion (BIC; (Schwarz, 1978) and the Akaike Information Criterion (AIC; Akaike, 1974) were used to compare non-nested models. A lower AIC indicates better model fit, while a lower BIC suggests a more parsimonious model (Vrieze, 2012).

After confirming the number of latent factors based on competing non-hierarchical models, we subsequently tested and compared the second-order hierarchical model and the bifactor model using both Subsample Two ($n = 429$) and the entire sample ($N = 859$) to examine if there exists an overarching construct of T-SEC underlying the identified factors. Second-order factor modeling and bifactor modeling are two commonly applied methods to jointly model a broad construct and highly related sub-constructs. In second-order factor models, the relationship between the overall construct and sub-constructs is direct and hierarchical: the overall construct (higher-order factor) is assumed to explain variances in sub-constructs (lower-order factors), which in turn explain variances in observed indicators. Bifactor models assume no direct relationship between the overall construct (general factor) and sub-constructs (specific factors), each uniquely explaining variances in observed indicators (Chen et al., 2006).

In bifactor modeling, model-based dimensionality was estimated to determine whether the multidimensional data are sufficiently unidimensional to measure the overarching T-SEC construct. This was assessed through Explained Common Variance (ECV), Percentage of Uncontaminated Correlations (PUC), and Average Relative Parameter Bias (ARPB) (Rodriguez et al., 2016). A higher ECV value suggests the unidimensional nature of the general factor. ECV is typically used in conjunction with PUC; specifically, PUC > 0.70 and ECV > 0.70 indicate the unidimensional nature of the general factor (Reise et al., 2013; Rodriguez et al., 2016). Additionally, ARPB measures the difference between an item's loading in the unidimensional one-factor model and its loading on the general factor in the bifactor model. An ARPB value less than 10 % - 15 % is considered acceptable, indicating minimal bias (Rodriguez et al., 2016).

The reliability of the overall T-SEC and its subscales was evaluated using McDonald's Omega. For the second-order factor model, McDonald's Omega values were calculated for each first-order latent factor as well as the second-order factor. In the bifactor model, model-based reliability was assessed using Omega Hierarchical (ωH) and Omega Hierarchical Subscale (ωHS). An ωH > 0.80 indicates the reliability of the general factor (Rodriguez et al., 2016). The appropriateness of interpreting the subscores for the subscales in the bifactor model was assessed by considering the number of factors, Omega Hierarchical Subscale, and the coefficient Omega value of the specific factors (ωS) (Dueber & Toland, 2023).

The concurrent validity of the MATSEC was assessed by estimating Pearson *r* correlation coefficients between each of the T-SEC factors and other variables that have previously been found to be associated with T-SEC. The Pearson *r* correlation values were interpreted using Cohen's (1988) benchmark: correlation coefficients > 0.50 indicates a strong correlation, [0.30, 0.50] indicates a moderate correlation, and < 0.30 indicates a weak correlation.

Lastly, we tested cross-national measurement invariance to see if the MATSEC can be used across Chinese and Korean teachers in a comparable way. Using the multigroup CFA framework, cross-group constraints were imposed, from configural (with no constraints as the baseline model), to metric (with equal loadings across groups), to scalar (with equal loadings and intercepts across groups) models in a stepwise approach (Furr, 2021). To ensure the second-factor model was successfully identified, we constrained one item intercept for each first-order factor (i.e., the first item of each first-order factor) to be equal across the two groups. Similar to the main CFA, the MLR estimator was used in measurement invariance testing to produce robust model fit indices. Guided by the acceptable differences in model fit indices

comparisons (Cheung & Rensvold, 2002), a difference of 0.01 or less in CFI and TLI (i.e., ΔCFI and ΔTLI ≤ 0.01) and a difference of 0.015 or less in RMSEA and SRMR (i.e., ΔRMSEA and ΔSRMR ≤ 0.015) indicate that the measurement model is invariant across the two samples at configural, metric, and scalar level. All the aforementioned analyses in this study were conducted using R software (v4.3.1; R Core Team, 2023).

3. Results

3.1. EFA

In the EFA subsample, the KMO measure was 0.96, and Bartlett's Test of Sphericity showed significant results ($\chi 2 = 8593.94$, $p < 0.001$), supporting the feasibility of performing factor analysis. Although parallel analysis recommended retaining five factors, none of the items showed the highest loading on the fifth factor, nor did they show significant cross-loadings with the fifth factor. This finding suggests that the fifth factor may be redundant and should be considered for removal. Therefore, we conducted the EFA, setting the number of factors to four.

The results suggested that Factor 1 was extracted mostly among the items measuring social awareness for equity and inclusion (SAEQI), Factor 2 among the items measuring self-awareness (SELFA) and social awareness for student well-being (SAWB), Factor 3 among the items measuring relationship skills (RELS) and responsible decision-making (DECM), and Factor 4 among the items measuring emotion management (EMOM). Notably, the four items in the responsible decision-making dimension exhibited cross-loadings and/or relatively lower loadings compared to items in other dimensions. Specifically, DECM3 and DECM4 had cross-loadings with differences lower than 0.10. DECM1 and DECM2 showed relatively lower loadings (< 0.50). However, to maintain consistency with the CASEL model and to ensure that the DECM dimension contained three or more items (Raubenheimer, 2004), these four items were retained at the EFA stage. The final factor structure and loadings derived from EFA is presented in Table 2.

3.2. CFA

3.2.1. Non-hierarchical factor models

Based on the factor structure derived from the EFA results and guided by the theoretical considerations of the CASEL model, we initially tested three models to confirm the number of factors: (1) Model 1: a 29-item four-factor correlated model directly derived from the EFA results, with DECM3 and DECM4 allowed to load on both Factor 3 and Factor 4; (2) Model 2: a 29-item five-factor correlated model where the four decision-making items (i.e., DECM1–4) were separated as a standalone factor; (3) Model 3: a 29-item six-factor correlated model where the four decision-making items were treated as a standalone factor, and with five self-awareness items (i.e., SELFA1–5) and four social-awareness items (i.e., SAWB1–4) in Factor 2 split into two separate factors. As shown in Table 3, all three models demonstrated good model fit, with Model 3 showing the best fit: $\chi 2 = 627.24$, $df = 362$, $p < 0.001$; CFI = 0.95, TLI = 0.95, RMSEA = 0.05, SRMR = 0.05.

Upon examining the standardized factor loadings across the three models, we additionally examined another model with 27 items, since SELFA4 and SELFA5 consistently showed factor loadings lower than 0.50. As shown in Table 3, Model 4, a 27-item six-factor model after removing the two items, showed the best model fit to our data: $\chi 2 = 520.79$, $df = 309$, $p < 0.001$; CFI = 0.96, TLI = 0.95, RMSEA = 0.05, SRMR = 0.04. The standardized factor loadings of this model ranged from 0.67 to 0.85, with an average of 0.78. The correlations among factors ranged from 0.62 to 0.87, with an average of 0.76. Across six factors, the average variance extracted (AVE) ranged from 0.58 to 0.68, which were higher than the threshold of 0.5 for an acceptable level of convergent validity as a single factor (Fornell & Larcker, 1981). At the same time, however, six out of all 15 possible pairs of factors showed the shared variance (SV) or squared correlation that was greater than the AVE of associated factor(s). According to a commonly used approach to assessing discriminant validity by comparing AVE and SV (Fornell & Larcker, 1981), the discriminant validity of six factors as examined in Model 4 cannot be fully established. The main estimation results of Model 4 are shown in the Supplemental Table S1.

Table 3
Robust Fit Indices across Non-hierarchical, Second-order Factor, and Bifactor Models.

Models	$\chi 2$	*df*	*p*	CFI	TLI	RMSEA	SRMR
CCFA Subsample (n = 429)							
Model 1: Four factors based on EFA with two cross-loaded items	796.55	369	0	0.921	0.913	0.064	0.050
Model 2: Five factors with DECM items as a standalone factor	719.55	367	0	0.935	0.928	0.058	0.048
Model 3: Six factors with SELFA and SAWB split into two factors	627.24	362	0	0.951	0.945	0.050	0.045
Model 4: Six factors with two SELFA items removed	520.79	309	0	0.958	0.952	0.050	0.044
Model 5: Second-order factor model	583.48	318	0	0.947	0.942	0.055	0.052
Model 6: Bi-factor model	526.39	297	0	0.955	0.947	0.053	0.045
Entire sample (N = 859)							
Model 5: Second-order factor model	751.04	318	0	0.953	0.948	0.052	0.044
Model 6: Bi-factor model	688.97	297	0	0.958	0.951	0.051	0.039

3.2.2. Second-order factor and bifactor models

We further tested a second-order model and a bifactor model to examine if we could assume an overarching factor underlying the MATSEC. We explored these two hierarchical models, first based on the empirical findings from Model 4 that demonstrated sufficient convergent validity of each factor but insufficient discriminant validity among six factors, and also based on the literature that suggests the existence of an overarching SEC encompassing multiple dimensions through second-order factor analysis (e.g., (Mantz et al., 2018; Yang et al., 2024) or bifactor analysis (e.g., Collie, 2022). The second-order factor model (Model 5) consists of 27 items, with one second-order factor representing the overall T-SEC and six previously identified first-order factors. In this model, all items loaded on their respective first-order factors, and the first-order factors loaded on the second-order factor. The bifactor model (Model 6) consists of 27 items, each loaded directly on both a general factor and one of the six specific factors. As shown in Table 3, both the second-order factor model (Model 5) and the bifactor model (Model 6) demonstrated a good fit with the data, either from the CFA subsample or the entire sample. Between the two models, for the CFA subsample ($n = 429$), ΔAIC (Model 5 - Model 6) = 63.61, while ΔBIC (Model 5 - Model 6) = -21.68. For the entire sample ($N = 859$), ΔAIC (Model 5 - Model 6) = 89.26, while ΔBIC (Model 5 - Model 6) = -10.61. These mixed results indicate that Model 6 has a lower AIC, suggesting better model fit, whereas Model 5 has a lower BIC, indicating a more parsimonious model. To provide a more comprehensive evaluation of the hierarchical structure of our measure, both Model 5 and Model 6 have been retained for subsequent dimensionality and reliability analyses.

3.3. Dimensionality and reliability

The second-order model (Model 5) fit well with the entire sample: $\chi 2 = 751.04$, $df = 318$, $p < 0.001$; CFI = 0.95; TLI = 0.95; RMSEA = 0.05; SRMR = 0.04. As shown in Table 4, the standardized factor loadings for the first-order factors ranged from 0.67 to 0.86. The six first-order factors demonstrated strong loadings on the second-order factor, ranging from 0.79 to 0.92. All factor loadings were statistically significant. In addition, the McDonald's Omega values for the first-order factors ranged from 0.82 to 0.91, while the McDonald's Omega value for the second-order factor was 0.94. These results supported a multidimensional and hierarchical factor structure of the MATSEC with an overall T-SEC factor and six sub-factors, all of which showed high internal consistency.

The bifactor model (Model 6) also demonstrated a good fit with the entire sample: $\chi 2 = 688.97$, $df = 297$, $p < 0.001$; CFI = 0.96; TLI = 0.95; RMSEA = 0.05; SRMR = 0.04. As shown in Table 4, the standardized factor loadings ranged from 0.13 to 0.60 for the specific factors and from 0.60 to 0.75 for the general factor. All factor loadings were statistically significant except for the factor loading of DECM1 on the decision-making factor (factor loading = 0.13, SE = 0.07, $p = 0.09$). In bi-factor modeling, we additionally examined model-based dimensionality indices (ECV = 0.75, PUC = 0.85, ARPB = 3 %), which indicated that the multidimensional data were unidimensional enough to measure the overarching T-SEC construct. Regarding model-based reliability, strong reliability was exhibited for both the general (ω = 0.97) and six specific factors (ω ranged from 0.82 to 0.92). Omega Hierarchical (ωH) was 0.92, supporting the strong reliability of the overarching T-SEC factor in the bifactor modeling context. After accounting for the general factor, the Omega Hierarchical Subscale (ωHS) values ranged from 0.12 to 0.35. These findings suggest that the majority of the reliable variance in the specific factors can be attributed to the general T-SEC factor rather than to independent constructs representing the specific factors beyond the influence of the general factor. Therefore, the interpretation of the specific factors should be contextualized within the framework of the general factor.

Taken together, the results of the two hierarchical models suggest that (1) we can reasonably assume the existence of the overarching T-SEC construct underlying the MATSEC items, and (2) the six factors may be better understood as a set of sub-domains of T-SEC, which altogether reliably measure the overall higher-order construct of T-SEC (as in the second-order factor model), rather than a set of constructs that are different from and independent of the overall T-SEC construct (as in the bifactor model).

3.4. Concurrent validity

Based on these findings, we calculated six subscale scores by averaging corresponding items, and the overall T-SEC score by averaging the six subscale scores. Extracting factor scores directly from the factor model might be the most accurate way to obtain the scale scores, but we chose to use the averaging method to reflect the way such scales are commonly used in practice settings, and also given relatively high and balanced factor loadings.

As shown in Table 5, the means of the MATSEC subscale and total

Table 4
Standardized Factor Loadings and McDonald's Omega (ω) Estimates of Second-order factor and Bifactor models.

				Bifactor model (Model 6)					
		Second-order factor model (Model 5)		Specific factors			General factor		
Items	Factors	Loadings	ω	Loadings	ωS	ωHS	Loadings	ω	ωH
SELFA1		0.78 * **		0.58 * **	0.82	0.28	0.60 * **	0.97	0.92
SELFA2		0.81 * **		0.45 * **			0.66 * **		
SELFA3	Self-awareness as an educator (SELFA)	0.74 * **	0.82	0.34 * **			0.63 * **		
EMOM1		0.81 * **	0.91	0.55 * **	0.92	0.35	0.61 * **		
EMOM2		0.84 * **		0.60 * **			0.62 * **		
EMOM3		0.84 * **		0.52 * **			0.65 * **		
EMOM4		0.86 * **		0.50 * **			0.68 * **		
EMOM5	Emotion management (EMOM)	0.78 * **		0.36 * **			0.69 * **		
SAWB1		0.82 * **	0.87	0.32 * **	0.87	0.17	0.75 * **		
SAWB2		0.81 * **		0.45 * **			0.70 * **		
SAWB3		0.79 * **		0.32 * **			0.71 * **		
SAWB4	Social awareness for student well-being (SAWB)	0.74 * **		0.31 * **			0.67 * **		
SAEQI1		0.75 * **	0.91	0.39 * **	0.91	0.22	0.65 * **		
SAEQI2		0.82 * **		0.41 * **			0.71 * **		
SAEQI3		0.78 * **		0.35 * **			0.69 * **		
SAEQI4		0.74 * **		0.45 * **			0.61 * **		
SAEQI5		0.74 * **		0.38 * **			0.64 * **		
SAEQI6		0.79 * **		0.31 * **			0.72 * **		
SAEQI7	Social awareness for equity and inclusion (SAEQI)	0.74 * **		0.32 * **			0.67 * **		
RELS1		0.67 * **	0.83	0.24 *	0.83	0.13	0.62 * **		
RELS2		0.78 * **		0.31 * **			0.72 * **		
RELS3		0.77 * **		0.36 * **			0.70 * **		
RELS4	Relationship skills (RELS)	0.76 * **		0.25 * *			0.71 * **		
DECM1		0.77 * **	0.88	0.13	0.88	0.12	0.75 * **		
DECM2		0.82 * **		0.35 * **			0.74 * **		
DECM3		0.78 * **		0.36 * **			0.72 * **		
DECM4	Responsible decision- making (DECM)	0.82 * **		0.36 * **			0.75 * **		
First-order factor	Second-order factor	Loadings	ωho						
SELFA		0.81 * **	0.94	—			—		
EMOM		0.79 * **		—			—		
SAWB		0.90 * **		—			—		
SAEQI		0.87 * **		—			—		
RELS		0.92 * **		—			—		
DECM	Overall T-SEC	0.92 * **							

Note. $N = 859$. * ** $p < 0.001$. * * $p < 0.01$, * $p < 0.05$. ωS: Coefficient Omega of the specific factors
ωho: Coefficient Omega of the second-order factor. ωHS: Coefficient Omega Hierarchical Subscale. ωH: Coefficient Omega Hierarchical.

Table 5
Descriptive Statistics and Correlations with Other Variables.

				Correlations with Other Variables								
	Cronbach's alpha	M	SD	WB	DA	BO	JS	LS	SE1	SE2	SC1	SC2
SELFA	0.82	3.79	0.79	0.36	−0.33	−0.42	0.3	0.35	0.44	0.42	0.47	0.4
EMOM	0.91	3.61	0.81	0.48	−0.44	−0.53	0.39	0.49	0.46	0.44	0.49	0.47
SAWB	0.87	3.74	0.69	0.40	−0.33	−0.46	0.36	0.34	0.54	0.5	0.54	0.46
SAEQI	0.91	4.11	0.64	0.30	−0.32	−0.46	0.31	0.28	0.47	0.51	0.59	0.47
RELS	0.83	3.89	0.69	0.43	−0.38	−0.5	0.41	0.43	0.54	0.51	0.56	0.50
DECM	0.87	3.98	0.67	0.36	−0.33	−0.48	0.36	0.36	0.53	0.53	0.62	0.53
Overall T-SEC	0.96	3.88	0.60	0.45	−0.42	−0.56	0.42	0.44	0.58	0.57	0.65	0.56

Note. All the concurrent correlations were significant at $p < 0.001$ level.
WB = Mental well-being; DA = Depression and anxiety; BO = Burnout; JS = Job satisfaction; LS = Life satisfaction; SE1 = Self-efficacy in student engagement; SE2 = Self-efficacy in classroom management; SC1 = School climate regarding relationship quality; SC2 = School climate regarding participation

scores ranged from 3.61 to 4.11 on a Likert scale of 3 indicating "slightly agree" and 4 indicating "agree." To check concurrent validity of this scale, we examined correlations between the MATSEC scale scores and other variables hypothesized to be associated with T-SEC. As shown in Table 5, both the overall T-SEC and each subscale scores showed moderate correlations with most of these variables (r ranging from 0.42 to 0.65 for the overall T-SEC score and from 0.28 to 0.62 across six subscale scores). The overall T-SEC and subscale scores had relatively stronger correlations with perceived school climate (mean $r = 0.61$ and $r = 0.51$, respectively), teacher self-efficacy (mean $r = 0.58$ and $r = 0.49$, respectively), and burnout (mean r = -0.56 and r = -0.48, respectively), compared to mental well-being (mean $r = 0.45$ and $r = 0.39$, respectively), depression and anxiety (mean r = -0.42 and r = -0.36, respectively), life satisfaction (mean $r = 0.44$ and $r = 0.38$, respectively), and job satisfaction (mean $r = 0.42$ and $r = 0.36$, respectively).

3.5. Cross-country measurement invariance

To examine the cross-country validity of the MATSEC, the measurement invariance testing was conducted based on the second-order factor model with sequential constraints. As shown in Table 6, the results suggested strong measurement invariance (i.e., configural, metric, and scalar invariance) across the samples from two countries, based on the negligible robust model fit differences (i.e., ΔCFI < 0.01, ΔTLI < 0.01, ΔRMSEA < 0.01, and ΔSRMR < 0.015).

4. Discussion

The aim of this study was to develop a new self-report measure of T-SEC and evaluate its psychometric properties. The validated MATSEC assesses T-SEC across five domains based on the CASEL model, while also including another domain specifically focused on promoting equitable and inclusive learning conditions relevant to East Asian educational contexts. Based on our work, T-SEC, as measured in the MATSEC, is defined as a set of cognitive, affective, and behavioral abilities that enable teachers to recognize their strengths and weaknesses as educators; manage their own emotions; understand and support students with a focus on their well-being; create learning environments that promote equity and inclusion; build and maintain good relationships with others; and make responsible decisions that benefit students and the entire school community. We developed the MATSEC through a multi-stage scale development process, including initial item generation, pilot-testing, scale finalization, and rigorous tests of psychometric properties, not only based on the theoretical and empirical literature on T-SEC but also incorporating insights and feedback from teachers on the ground and field experts.

Consistent with previous research suggesting a multidimensional and hierarchical measurement model of T-SEC (e.g., Mantz et al., 2018; Yang et al., 2024), our findings support an overarching, higher-order construct of T-SEC comprising six sub-factors: self-awareness as an educator (3 items), emotion management (5 items), social awareness for student well-being (4 items), social awareness for equity and inclusion (7 items), relationship skills (4 items), and decision-making (4 items). Our results demonstrated that the overall T-SEC factor and its six sub-factors showed good psychometric properties, including high internal consistency reliability (i.e., omega estimates all above 0.80), good concurrent validity (i.e., moderate-to-strong correlations with teachers' mental health, job satisfaction, job burnout, life satisfaction, self-efficacy, and school climate), and strong cross-country measurement invariance between Chinese and Korean teacher samples.

Based on the model-based reliability estimates, we primarily recommend using the six subscales of the MATSEC as a set of variables measuring the higher-order construct of overall T-SEC. However, the relatively lower Omega values of the specific factors in bifactor modeling do not preclude the utility of these subscales as specific factors that are independent of the overall T-SEC construct. According to Dueber and Toland's (2023) recommended cutoffs for Omega of specific factors ($\omega S > 0.80$) and Omega Hierarchical Subscale ($\omega HS > 0.14$) for a bifactor model with six specific factors, four subscales (SELEA, EMOM, SAWB, SAEQI) met the cutoffs for reliable specific factors. In addition, the other two subscales (RELS and DECM) may still retain values as a specific factor where item parceling based on sub-domains is recommended for psychometric and modeling-related benefits (Matsunaga, 2008; Rodriguez et al., 2016). In general, we call for more research on the MATSEC to further validate the hierarchical factor structure suggested in the present study and to provide evidence-based recommendations for the practical use of both the overall T-SEC score and the subscale scores.

Table 6
Measurement Invariance Testing Results Across Chinese and Korean Samples.

Robust fit indices	$\chi 2$	*df*	*p*	CFI	TLI	RMSEA	SRMR
Configural invariance model	1448.69	636	< 0.001	0.931	0.924	0.066	0.053
Metric invariance model	1508.76	662	< 0.001	0.929	0.924	0.065	0.067
Scalar invariance model	1647.45	682	< 0.001	0.919	0.917	0.069	0.070
Model fit comparisons	$\Delta\chi 2$	Δdf	*p*	ΔCFI	ΔTLI	ΔRMSEA	ΔSRMR
Metric vs. Configural	60.07	26	< 0.001	0.002	0.000	0.001	0.014
Scalar vs. Metric	138.69	20	< 0.001	0.010	0.007	0.004	0.003

4.1. Contributions and implications for research and practice

The MATSEC has strengths as a multidimensional measure of T-SEC that went through a rigorous scale development and validation process in the East Asian educational contexts. By adopting the widely accepted CASEL model, this scale captures a more comprehensive construct of T-SEC, compared to the traditional measures based on the ER or EI models. The literature has conceptualized SEC as a multidimensional construct involving a set of affective, cognitive, and behavioral competencies related to intrapersonal and interpersonal functioning, which goes beyond just emotional competence (Domitrovich et al., 2017). While the CASEL model has served as a key conceptual framework for many multidimensional measures of student SEC around the world (Martinez-Yarza et al., 2023), there has been a lack of measurement tools that assess T-SEC across all five domains of the CASEL model. Particularly in East Asia, although a few existing measures of T-SEC defined the construct based on the CASEL model (Jeon and Choi, 2022; Ko et al., 2015; Li et al., 2021), no empirical evidence was available on whether the observed factor structure was indeed aligned with the CASEL model. One might question the validity of the CASEL model in collectivist societies, often characterized as prioritizing other-related competencies (e.g., social awareness, relationship skills) over self-related competencies (e.g., self-awareness and self-management; (Hecht & Shin, 2015). But the rigorous factor analysis results of our study suggest that the CASEL model can be a relevant and useful framework to measure a multidimensional construct of T-SEC in China and South Korea.

Along with the five conventional domains based on the CASEL model, the MATSEC includes an additional domain specifically focused on equity and inclusion. Despite the increasing interest in equity-enhancing and inclusive SEL (Cipriano & McCarthy, 2023; Jagers et al., 2019), there has been a lack of T-SEC measures that explicitly assess teachers' competencies related to promoting equitable and inclusive learning conditions. Notably, the understanding of educational inequities and related practices can be highly culturally sensitive (Johansen, 2023). For instance, while race and ethnicity are key to understanding diversity, equity, and inclusion in education in the U.S., educational inequities in East Asia have been more often related to factors such as family backgrounds, socioeconomic status, disabilities, and academic performance (Jagers et al., 2019; Sanger, 2020; Teng et al., 2019). These differences require the development of culturally and contextually relevant indicators of T-SEC contributing to equity and inclusion. During the scale development process, we generated items and examples that can capture culturally and contextually relevant competencies related to equity and inclusion, which was positively appraised by school teachers on the ground. The analysis results also supported the inclusion of these items as a separate factor of social awareness for equity and inclusion (SAEQI), comprising a sub-domain of the broader T-SEC.

Another feature of the MATSEC is its acceptability in routine practice settings, where SEL might not be intensively or intentionally practiced. This scale was designed to be an efficient and user-friendly tool, with a reasonable number of items that can be easily self-administered by schoolteachers. Also, adopting a strength-based approach, we intentionally included positively-worded items only, aiming to recognize teachers' strengths rather than identify their problems. These characteristics of the MATSEC were, in fact, well-received and valued by the teachers who participated in our cognitive interviews and school district leaders in China who provided permission and support for our study. With this initial feedback obtained during our scale development process, we call for more systematic examinations on the acceptability of this scale across different contexts.

The MATSEC, as a rigorously tested, culturally relevant, and user-friendly measure of T-SEC, could contribute to the emerging literature on T-SEC in East Asia, and potentially in other parts of the world. The assessment of SEC in both students and teachers is necessary to ensure successful school-based SEL by providing valuable data for decision-making at different levels (Lozano-Peña et al., 2021). As is the case for students (Assessment Work Group, 2019), the MATSEC can also be used to inform, guide, and evaluate professional development programs aimed to enhance T-SEC. For example, this tool can be used for needs assessment to identify specific areas requiring further improvement or individuals that can benefit from additional support; for formative assessment to monitor progress during interventions and to support continuous improvement for practice; and for summative assessment to evaluate the effectiveness of interventions. However, we advise caution against using the MATSEC for high-stakes decisions (e.g., certification or performance review), as it requires further evidence and acceptance supporting this use.

The MATSEC is freely available to anyone interested in using it for non-commercial purposes (e.g., research and practice). Researchers, practitioners, and any other interested users can access the multi-language versions of the MATSEC at no cost. This scale can be used in diverse cultural contexts, and is open to new translations and adaptations (e.g., by revising items and examples in the SAEQI factor to be culturally and contextually relevant), as well as further testing and refinement. For more detailed information about the use of the MATSEC, please refer to https://www.selasia.org/resources-matsec. We hope this free access to the MATSEC facilitates more investigations of T-SEC across different cultures and supports the development of culturally sensitive SEL practices in diverse contexts.

4.2. Limitations and concluding remarks

A few limitations in our study design are worth noting. First, the Korean sample was recruited through convenience sampling, and thus may not be representative of all Korean teachers. The Chinese sample was recruited through a more rigorous process through random sampling with the cooperation of the local education bureau and school administrators. However, the Chinese sample was only recruited from one county, and may not be representative of teachers from other parts of the country. Future validation studies should adopt sampling methods that increase representativeness of the sample. Second, our measure is based on self-reporting, limiting its ability to objectively assess T-SEC. Although self-reports are a good source for measuring respondents' subjective perceptions and experiences, more research is needed to validate this scale with external measures such as third-party observations or peer ratings. Third, the present study adopted a cross-sectional design, calling for longitudinal studies to examine the extent to which T-SEC is stable or changes over time, and how T-SEC predicts related outcomes for both teachers and students longitudinally. Finally, the current study calls for future studies that use a multilevel modeling method to account for school-level nestedness and explore teacher-level and school-level predictors and correlates of T-SEC.

Despite these limitations, we believe that the MATSEC has the potential to be applicable to teachers in various educational contexts, both within and beyond East Asia. Measuring T-SEC can be one of the first steps to successful school-based SEL for both teachers and students. As suggested by the literature (e.g., Jennings & Greenberg, 2009), and also indicated by the findings of our follow-up studies (Choi et al., 2024; Fu et al., 2025), promoting T-SEC could lead to increased well-being of teachers and their SEL-conducive practices, which will ultimately bring benefits to student SEL. By including indicators focused on equity and inclusion, the MATSEC also recognizes the potential of SEL in mitigating educational inequities and creating more inclusive schools where all students can thrive (Schlund et al., 2020).

To conclude, the present study provides the initial validation results of the MATSEC, designed to be a multidimensional, practical, and culturally relevant measure of T-SEC and tested to be psychometrically sound with East Asian teacher samples. It is our intention and hope to make the MATSEC publicly available for further validation, refinement, and utilization across diverse educational contexts, particularly ones

where T-SEC is similarly becoming a growing area of research, to enhance our global understanding of T-SEC.

Funding Statements

This study was supported by the Start-up Fund of the Department of Social Work and Social Administration and the Seed Fund for Basic Research from the University of Hong Kong awarded to J. Lee.

CRediT authorship contribution statement

Juyeon Lee: Writing – review & editing, Writing – original draft, Methodology, Funding acquisition, Data curation, Conceptualization. **Linyun Fu:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Data curation. **Hui Hu:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation. **Chenxiao Wang:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation. **Eunkyung Chung:** Writing – review & editing, Project administration, Methodology, Data curation. **Se-na Choi:** Writing – review & editing, Methodology, Data curation. **Changyong Choi:** Writing – review & editing, Methodology, Data curation. **Seungmin Lee:** Writing – review & editing, Methodology, Data curation. **Ingrid D. Lui:** Writing – review & editing, Methodology, Data curation. **Min Sang Yoo:** Writing – review & editing, Methodology.

Declaration of Competing Interest

The authors have no competing interests to declare.

Acknowledgements

The authors wish to acknowledge all the teachers who participated in our study, including the scale development process and the main evaluation study. The authors wish to thank the local education bureau, school district leaders, and school administrators in China as well as the teacher associations, organizations, and online communities in Korea that provided valuable support for participant recruitment and survey administration. The authors also appreciate the consultation from the CalHOPE Student Support research team at University of California, Berkeley, especially Dr. Valerie B. Shapiro, Dr. Kamryn Morris, and Dr. Addison Duane.

Appendix A. Supporting information

Supplementary information associated with this article can be found in the online version at doi:10.1016/j.sel.2025.100093.

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