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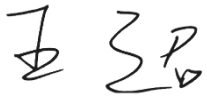

Date: 21 August 2022

A Cultural Perspective on the Structure and Function of Social-Emotional Competencies: A study of the Transition Years into Adolescence in Western China

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21 August 2022

Abstract

Social-emotional competencies have been increasingly recognized as crucial for child development. Extensive evidence in Western countries suggests that social-emotional competencies have positive impacts on students' outcomes. The evidence has influenced the research and educational practices in Eastern countries such as China. However, few studies have examined the universals and particulars of social-emotional development in different cultures. Responding to the need, this study takes a cross-cultural perspective to examine the structure and function of social-emotional competencies during the transition to early adolescence in Western China.

More specially, the study tries to answer: (1) Does the structure of social-emotional competencies as defined by a widely used framework in Western countries replicate in a collectivistic culture? More specifically, is responsible decision-making, as defined in the framework, a valid factor in the construct of social-emotional competencies before adolescence? (2) Is the structure of social-emotional competencies stable during the transition to early adolescence? (3) Did participation in a SEL programme improve students' academic performance on standardised tests in reading, math, and science? (4) Does teacher-student relationship mediate the association between social-emotional competencies and academic performance?

It was found that responsible decision marking did not stand as a separate domain as described in the Western framework. Instead, social harmony that represents the effort and willingness to achieve collective benefits emerged as a separate factor. The structure of social-emotional competencies was stable during the transition to early adolescence. Participation in the investigated SEL programme improved students' academic performance on standardised tests in reading and math, but not in science. Teacher-student relationship mediated the association between social-emotional competencies and reading performance but not math performance. The findings were interpreted based on the existing literature. The implications to future research and educational practices were discussed.

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Chapter 1 Introduction

Social-emotional competencies have been increasingly recognized as crucial for child development. Social-emotional competencies are consistent patterns of thoughts, feelings, and behaviours that impact one's wellbeing and socio-economic outcomes throughout life (De Fruyt et al., 2015). Extensive research, especially in the United States, has shown that developing robust social-emotional competencies in childhood can lead to positive social, academic, and mental health outcomes (e.g., Durlak et al., 2011). The converging evidence has led to a wide variety of social-emotional learning (SEL) programmes in North America with the subsequent global adoption of these programmes (e.g., CASEL, 2013).

Although social-emotional interventions are still rare in China, researchers have started to apply the conceptual framework of social-emotional learning, developed by the Collaborative for Academic, Social, and Emotional Learning (CASEL), to understand the function of social-emotional competencies in Chinese students (e.g., Wang, 2019; Chen et al., 2021). However, cross-cultural researchers have been calling for caution to the practice of unquestioningly incorporating social and emotional concepts that have emerged in a different culture into local contexts without adequate consideration of its value system and the economic structure of the society (e.g., Schneider, 1998; Chen & Frech, 2008; Chung et al, 2020). The assumptions of universals in social-emotional development have inevitably led to none or surface-level adaptation (such as translation and replacing photographs or names) of a SEL programme developed in one culture to another (e.g., Wong et al., 2014; Wu et al., 2016; Kam et al., 2011). These programmes appear to show mixed results in student outcomes.

As Western evidence dominates the field, few studies have examined the universals and particulars of social-emotional development in individualistic and collectivistic cultures, which tend to have distinct value systems (e.g., Wang et al., 2017; Kwong et al., 2018). Responding to the concern, this study takes a cross-cultural perspective to examine the

structure and function of social-emotional competencies. To our knowledge, it is the first study that compares Chinese students' perceptions of their social-emotional competencies with their North American peers as reported in the literature. This study is also the first to evaluate the impact of a large-scale school based SEL programme on students' academic performance in China.

The data used in this study was obtained from Beijing Normal University with written approval from UNICEF China. In 2011, the Ministry of Education, China, together with UNICEF initiated arguably the country's first SEL programme covering 250 schools in five counties in Western China. The universal school-based programme was adopted from the Social Emotional Aspects of Learning (SEAL) in England (Humphrey et al., 2008). Targeting typically developing children in primary school, the programme aimed to improve students' social and emotional competencies. This study utilizes the cross-sequential data from one of the programme counties collected by Beijing Normal University to investigate the structure and function of social-emotional competencies.

Specifically, the study aims to answer four research questions: (1) Does the structure of social-emotional competencies as defined by the CASEL framework replicate in a collectivistic culture? More specifically, is responsible decision-making, as defined in the CASEL framework, a valid factor in the construct of social-emotional competencies in the transition years before adolescence in Western China? (2) Is the structure of social-emotional competencies stable during the transition to early adolescence in Western China? (3) What is the association between social-emotional competencies and academic performance? More specifically, did participation in a SEL programme improve students' academic performance on standardised tests in reading, math, and science? (4) Does teacher-student relationship mediate the association between social-emotional competencies and academic performance?

The following chapters present the entire study step by step. The literature review sets out the theoretical and empirical basis for understanding and examining the cultural differences in social-emotional competencies from the perspectives of attachment, self-

determination, and social-cultural learning. The chapter also unpacks the association between social-emotional competencies and academic performance and the potential internal functioning mechanisms. The methodology chapter outlines the study design. The database and the adapted SEL programme investigated in the study are described first, followed by the nature of the secondary data analysis, sample design, participant characteristics, and measures. The analysis plan is presented at the end of this chapter. Specifically, exploratory and confirmatory analyses are used to investigate the structure of social-emotional competencies (Research question 1). The stability of the structure during the transition to adolescence is confirmed through measurement invariance analyses (Research question 2). A mixed measure ANOVA is employed to examine the impact of the adapted SEL programme on students' academic performance (Research question 3). A half-longitudinal mediation model is hypothesized to explore the indirect path from social-emotional competencies to academic performance through teacher-student relationship (Research question 4). Findings are reported in the results chapter. Finally, the discussion chapter interprets the statistical findings with a cross-culture lens. The strengths and limitations of this study are summarized at the end along with implications for future research and educational practices.

Chapter 2 Literature Review

This chapter reviews existing literature related to children's cognitive and social-emotional development. It starts with the three theoretical perspectives based on attachment theory, self-determination theory, and the ecological model, to set the basis for understanding the structure and function of social-emotional competencies in cultural contexts. The role of culture in forming social-emotional competencies is discussed next by comparing individualistic cultures with collectivistic cultures, followed by empirical evidence on the cross-cultural adaptability of the widely used CASEL framework in Chinese culture. The review ends with the function of social-emotional competencies in promoting academic performance and the potential contribution of the study to the existing literature.

2.1 Understanding Child Development in Social Contexts

Extensive research suggests that social interaction plays a critical role in children's social-emotional and cognitive development. Formal schooling broadens children's worlds to encompass peers, teachers, and activities outside the family, providing enriched social contexts for children to develop. Researchers applied different theoretical perspectives to understand children's social-emotional and cognitive development in school settings, including perspectives related to attachment, motivation, and sociocultural learning. Although these perspectives have led to somewhat different conceptual and developmental models, they all stress the critical role of social interactions in child development, indicating that cultures with different social values and norms may shape developmental outcomes differently.

2.1.1 Attachment-Related Perspectives

Research on attachment has a strong focus on children's social-emotional development and social relationships. It is based on the attachment theory that first emerged to explain mother-child relationships and was later extended to relationships with significant others such as teachers and peers. The central idea of the attachment theory is that the attachment figure or the primary caregiver acts as a "secure base" that frees the child to explore the surrounding environment and provides a "safe haven" that they can return to for comfort and safety (Ainsworth, 1989). Through early attachment relationships with caregivers, children form an internal working model of the self and others. The internal working model then shapes how children interpret and respond to social experiences in later life and impacts their social and emotional functioning throughout life. Extensive literature has demonstrated the influence of early attachment relationships on children's developmental outcomes (Berlin et al., 2008; Sabol and Pianta, 2012; Pallini et al. 2014; Fearon et al. 2010; Groh et al., 2014; Madigan et al., 2013). Children who had sensitive and responsive primary caregivers and therefore formed secure maternal attachments tend to have better relationships with teachers and peers, less externalizing and internalizing behaviours, and better adapting to schools.

Researchers who extended the attachment theory to teacher-student relationships suggested that children may need to rely on teachers to fulfil their attachment needs when they are physically separated from the primary attachment figure during school days. However, there are some debates on whether the teacher-student relationship can be considered an attachment relationship. Verschueren and Koomen (2012) argued that the teacher-student relationship may have an attachment component, but for most children, the relationship with teachers is probably not an attachment bond because it is not as exclusive and durable as a parent-child relationship. In addition, teachers' primary role is to instruct and even though they do engage in caregiving behaviours, and as children grow, the teachers' role as caregivers decreases gradually. Thus, the authors assumed that the centrality of attachment-related behavioural processes in the teacher-child relationship depends on child age. For younger children, the teacher-student relationship tends to function more like an attachment relationship. Aligned with Verschueren and Koomen's view, a synthesis of the literature by Sabol and Pianta (2012) found moderate associations between mother-child and teacher-student relationships in early childhood along with decreased association in middle childhood and adolescence. These authors attributed the decreasing trend to the reducing time spent with an individual teacher and the increasing importance of peer relations.

Echoing Sabol and Pianta (2012)'s view on the increasing importance of peers, research on multiple attachment models suggests that besides general maternal attachment, children may develop domain-specific attachment models when interacting with other significant others, including peers. These multiple models can be activated independently. Verschueren et al. (2012) tested the ideas by examining the unique and joint effects of children's relationships with mothers, teachers, and peers, on three dimensions of self-concept (general, academic, and social) in a sample of 113 first graders. Domain-specific links between social relationships and self-concept dimensions were found. Specifically, teacher-student relationships predicted academic self-concept, peer acceptance predicted social self-concept, and mother-child relationships predicted general self-concept. The

evidence supported the idea of multiple attachment models. However, some researchers argued that in addition to the attachment behavioural system, the school context is also likely to elicit the sociability behavioural system as children develop and accumulate relational experiences (Schuengel, 2012; Davis, 2003; Whipple et al, 2009; Hughes, 2012).

2.1.2 Motivation-Related Perspectives

Embedding in the educational context of schooling, research on motivation has a strong focus on students' academic achievement and teachers' role in motivating students to learn. This field of research is based on the self-determination theory. The central idea of the self-determination theory is that human beings strive to fulfil three basic psychological needs: autonomy, competence, and relatedness (Ryan & Deci, 2000). Satisfying these needs yields enhanced self-motivation and mental health while thwarting the needs leads to diminished motivation and well-being. Autonomy is central to the self-determination theory. Feelings of competence or relatedness do not necessarily enhance intrinsic motivation unless accompanied by a sense of autonomy. People who feel autonomy perceive their own actions as a result of internal reasons instead of external reasons (Turban et al., 2007).

Motivation is conceptualised to be experienced on a continuum from intrinsic to extrinsic, reflecting the degrees to which the value and regulation of the requested behaviour have been internalized and integrated. Integrated regulation refers to integrating a value or regulation into the sense of self (e.g., "I work hard because I value."). Identified regulation refers to acknowledging a value or regulation for personal benefits (e.g., "I work hard because it pays off."). Introjected regulation refers to adopting a value or regulation of others to maintain feelings of worth (e.g., "I work hard because I want to please my mom."). Finally, external regulation refers to acting to a value or regulating behaviours for some separate outcome (e.g., "I work hard because I want a reward or to avoid punishment.").

According to the self-determination theory, people are not intrinsically motivated by activities that do not hold intrinsic interests to them. Linking back to attachment theory, intrinsic motivation is observed early in child development, manifesting for example as exploratory behaviours among infants. However, as children grow up, their freedom to be

intrinsically motivated is seen to be increasingly curtailed by social pressures and responsibilities. Children are required to regulate their behaviours according to social norms and values. As children internalize and assimilate values or regulations, they tend to experience greater autonomy in action, show more interest, and put more effort toward achievement. Extensive evidence shows that more autonomous extrinsic motivation is associated with more school engagement, higher quality learning, and better performance and wellbeing (Grolnick & Ryan, 1987; Vallerand & Bissonnette, 1992; Miserandino, 1996; Ryan & Deci, 2009; Niemiec & Ryan, 2009; Areepattamannil et. al, 2011; Saeed & Zyngier, 2012; Ryan & Deci, 2020). Therefore, teachers' role in promoting students' autonomous extrinsic motivation was emphasized by research in motivational perspectives (e.g., Furrer & Skinner, 2003; Reeve et al., 2004; Finn et al., 2009; Wang et al., 2019).

2.1.3 Perspectives on Sociocultural Learning

The construct of sociocultural learning contributes to the existing literature on children's social-emotional and cognitive development by providing new angles for researchers to contextualize their research, especially within different cultures. Researchers with a sociocultural perspective are often guided by Bronfenbrenner's ecological model, which provides an overarching framework to understand the influence of external environments on children's development. The ecological model defines five interactive systems, namely microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Bronfenbrenner,1986). First, the microsystem refers to the principal or proximal development settings in which a child actively participates, such as family and school, while the mesosystem represents the interrelations among two or more principal settings. Studies in attachment perspectives and motivation perspectives lie mainly in these two systems. Second, the exosystem represents the distal settings that do not involve a child directly as an active participant but affect him or her indirectly through his or her parents (parents' social networks would be a good example of the exosystem). Third, the macrosystem reflects the social norms, values, and ideologies of a culture, and it is this system that is widely used to guide cross-cultural studies. Lastly, the chronosystem refers to the interaction of

developmental changes within a child alongside environmental changes over time, a process that is usually examined in cohort studies.

An example of cross-cultural studies using the ecological model is the study of school climate. Students in China, for example, were found to perceive higher levels of teacher-student support, peer support, school liking, fairness of school rules, and opportunities for autonomy in the classroom than their peers in the US (Jia et al.., 2009; Yang et al.., 2013; Bear et al., 2014). Guided by the ecological model, researchers attributed the differences to cultural differences in social values. First, education and academic achievement are highly valued by Chinese students and their parents, which arguably leads to strong educational commitments for students as well as high social status and respect for teachers. From students' perspective, the strong commitment to education along with respect for teachers' authority may make Chinese students less critical of teachers and schools. From teachers' perspective, teachers are expected to be fully dedicated to supporting students' learning due to the high social value placed on education and therefore may be more supportive of their students. In addition, social harmony is highly valued in Chinese culture. Positive relationships with teachers and peers are emphasized not only in school but also by parents at home. The cross-cultural findings align closely with the self-determination theory: although the three psychological needs are innate and universal, the fact that needs satisfaction is facilitated by internalizing socially or culturally endorsed values and behaviours suggests that individuals are likely to perceive competence, autonomy, and relatedness differently within cultures that hold different values.

One study on chronosystem is informative to the current study. Chen et al.., (2005) examined Chinese students' social functioning and adjustment in primary school during different phases of the social-economic transition in China after the "open-up policy" in the early 1980s. It was found that with three cohorts in the city of Shanghai, the function of shy-sensitive behaviours in social, emotional, and school adjustment changed over the decade. Shyness was positively associated with social and academic achievement in the 1990 cohort. The association became weaker or nonsignificant in the 1998 cohort while shyness

was associated with peer rejection, school problems, and depression in the 2002 cohort. The authors suggested that the transition towards a market economy since the “open-up” policy led to dramatic changes in economic and social structures in the following decade. In the new competitive environment, behavioural characteristics that facilitated the achievement of personal goals such as social assertiveness and initiative were valued and encouraged highly. These new beliefs, attitudes, or values were likely integrated into the education and childrearing goals and therefore modified educational and parenting practices in China over the decade. However, acknowledging regional differences in the pace and magnitude of the social and economic reforms within China, Chen et al., (2005) called for caution in generalizing the results in Shanghai, the economic centre in China, to other parts of China.

2.2 Cultural Differences in Social-Emotional Development

According to the theoretical perspectives discussed above, cultural values have significant influences on children’s social-emotional development through the ways of perceiving the self and others. The CASEL framework that is arguably based on childrearing within individualistic cultures has been widely used in the literature and practices in Western countries. The framework has also been adapted to Eastern countries such as China, Korea, Japan, and Singapore (Hayashi et.al, 2022; Kim et al., 2022; Frydenberg et al., 2017; Zhou & Ee, 2012). Most of these studies have applied the CASEL framework directly to local students, assuming a universal structure for social-emotional competencies However, cross-cultural studies have also indicated differences in the nature of the distinct self in individualistic and collectivistic cultures—the independent self vs. the interdependent self (explained further in the next section). The available evidence suggests that the CASEL framework may broadly (but not fully) apply to Chinese contexts, since the definition of each domain tends to be different (Zhu, 2016; Wang, 2019; Wang et al., 2017; Shi et al., 2022; Chen et al., 2021). However, there is clearly a need for further research on the structure of social-emotional competencies using a cultural lens.

2.2.1 Cultural Differences in Constructing the Self and Others

Although human beings are likely to develop a universal understanding of

themselves as physically distinct and separable from others, people in different cultures tend to have different perceptions of the self and others. Cross-cultural studies focusing on collectivistic and individualistic societies were often guided by Markus and Kitayama's (1991) theory about two distinct types of self, namely the independent self and the interdependent self. Markus and Kitayama defined the two types of self by the degree to which people see themselves as separate from others or as connected with others. The goal of the independent self is to separate oneself from social context. In contrast, the interdependent self seeks to be connected with the social context. Others serve as a tool or resource for self-evaluation and in forming the independent self while relationships with others in specific contexts actively and continuously define the interdependent self.

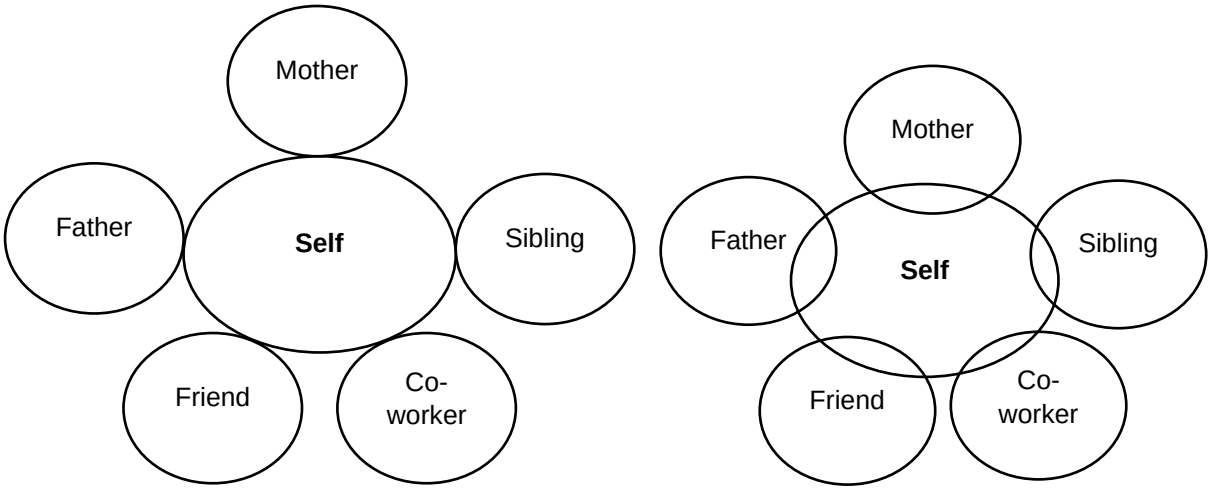
More specially, the *independent self*, as an autonomous, independent person, seeks independence from others and strives to realize one’s uniqueness. People with greater development of an independent self, organize and justify their behaviours primarily by reference to their own internal repertoire of thoughts, feelings, and actions instead of the thoughts, feelings, and actions of others. In contrast, the *interdependent self* sees one's status as a participant in a larger social unit and pursues similarity and connectedness with others. People with greater development of an interdependent self, are arguably motivated to find a way to fit in with relevant others, to fulfil and create obligations, and in general to become part of various interpersonal relationships. However, it is worth noting that people’s perceptions about self are not dichotomous but fall along a continuum from the independent self to the interdependent self. So does culture. Some cultures are more individualistic creating a conductive environment for forming the independent self (e.g., the United States), while others are more collectivistic and nurture the interdependent self (e.g., China).

Distinct perceptions of self also lead to distinct perceptions of others as well as distinct patterns in the self-others relationship and social interactions. Figure 1 presents the conceptual representations of the self that explains these differences further. The circles are representations of the various aspects of the self or the others. People with the independent self view others as independent units as well. In contrast, people with the interdependent self

see others in particular social relations which results in the context-specific self, represented by the intersections between the circle of self and the circle of others. While others are critical for social comparison and self-validation in the independent self, these others become an integral part of the context to which the interdependent self strives to be connected and fitted. Others thus participate actively and continuously in defining the interdependent self. The interdependent self also possesses and expresses a set of internal attributes, such as abilities, opinions, judgments, and personality characteristics. However, these internal attributes are constantly controlled and regulated. Such voluntary control of the inner attributes constitutes the core of the cultural ideal of becoming mature.

Figure 1

The Conceptual Representations of the Self



The Independent Self **The Interdependent Self**

Note. The figure is an adaptation of Markus and Kitayama's conceptual representations

2.2.2 Defining Social-emotional Competencies

De Fruyt et al. (2015) defined social-emotional competencies as:

individual characteristics that (a) originate in the reciprocal interaction between biological predispositions and environmental factors; (b) are manifested in consistent

> patterns of thoughts, feelings, and behaviours; (c) continue to develop through formal and informal learning experiences; and (d) influence important socio-economic outcomes throughout the individual's life. (p. 279)

Although researchers agree on these key characteristics of social-emotional competencies, there are differences in how to measure social-emotional competencies. Existing measurements could be grouped into two approaches: the curative approach and the preventive approach. The curative approach is clinically derived with emphasis on screening for vulnerabilities such as the Child Behaviour Check List (CBCL) and the Strengths and Difficulties Questionnaire (SDQ). The preventive approach is educationally oriented with a focus on promoting positive attitudes, behaviours, and skills (Abrahams et al., 2019).

Even within the preventive approach, there is huge variability in different social-emotional competencies frameworks and no consensus has been reached on the number and nature of the constructs needed to represent social-emotional characteristics. Some frameworks or measurements have a strong focus on social skills (e.g., the CASEL framework) while others have a greater emphasis on emotional (e.g., the Big Five framework) or cognitive skills (e.g., the OECD framework) (Jones et al, 2016). The CASEL framework is based on Goleman's Emotional Intelligence model, which distinguishes between awareness and management as they are applied to the self and others. The CASEL framework includes the four Goleman domains, namely self-awareness, self-management, social skills (or relationship skills), and social awareness, and also the fifth domain of responsible decision-making (Mantz et al., 2018).

More specifically*, self-awareness* refers to skills to identify one's own emotions and thoughts and understand how thoughts and emotions impact one's behaviour while *self-management* reflects the consequent attempt to effectively regulate one's thoughts, emotions, and behaviours. Similarly, *social awareness* is directed at one's perception of others' emotions and thoughts, including the ability to understand others' behaviours, take others' perspectives, and demonstrate empathy. *Relationship skills* refer to the pro-social behaviours such as listening to others, working cooperatively, handling conflict

constructively, and assisting others. *Responsible decision making* emphasizes responsible consideration of the needs of others, as opposed to only oneself, including the ability to make safe, respectful, and moral decisions about one's behaviour and interactions with others.

2.2.3 Cultural Differences in Social-Emotional Competencies

The different ways to perceive oneself and others indicate differences in the structure of social-emotional competencies. Following the CASEL framework, the cultural differences in each of the five domains are discussed in detail. Given the adaptability of the CASEL framework in a collectivistic culture like China is central to this study, the discussion focuses primarily on American and Chinese students although studies in other individualistic and collectivistic societies were referred to as well.

First, more individualistic cultures consider self-awareness to be focused on a person's emotions, thoughts, and influences. However, self-awareness in more collectivist cultures involves a broader perspective that includes significant others and the social context (Hecht & Shin, 2015). Evidence suggests that Asian students tend to be less consistent in their self-descriptions across contexts than do their American peers (Crystal et al., 1998, English & Chen, 2007). However, Asian students' self-descriptions tend to remain consistent over time within contexts. Moreover, individualistic cultures tend to value and promote personal strengths in self-awareness for independent selves to "stand out" while personal weakness is highlighted more in collectivistic cultures for interdependent selves to "fit in". Wang et al. (2017) found a unique component in self-awareness among Chinese students, called "zi zhi zhi ming" in Chinese. It refers to the awareness of one's own limitations. This aligns with the findings that humbleness toward others was more likely to be socially desirable and acceptable in collectivistic cultures than in individualistic cultures that value self-confidence and assertiveness in relationships (Kim, 2003).

Second, people in more collectivistic cultures tend to take a high degree of agency to effectively regulate their thoughts, emotions, and behaviours in various interpersonal situations (Weisz et al., 1984). Self-management in more individualistic cultures primarily

implies an assertion of one's inner attributes and a consequent attempt to change one's outer behaviours (e.g., know my negative emotions well and then control them). In contrast, self-management in collectivistic cultures implies changing or adjusting one's inner attributes that can disturb social harmony (e.g., I am not supposed to have negative emotions). Wang et al. (2017) identified "shen du" as a component of self-management for Chinese students, which seems unique in Confucian cultures. It refers to how someone behaves well even when alone, reflecting the agentic control of one's behaviours for the interdependent self. The finding aligns closely with the evidence that Chinese children tend to have higher self-regulation skills than their peers in the United Kingdom (Ellefson et al., 2017).

Third, social awareness and relationship skills tend to be more sophisticated in collectivistic cultures. Given the goal of the interdependent self is to be connected with others, it requires the skills to identify and focus on others' needs, desires, and goals (Markus & Kitayama,1991). By doing so, people may internalize the goals of others as their own in some cases. Even though one's own goals are quite different from those of others, meeting another's goals can facilitate the satisfaction of one's own goals by assuming reciprocal contributions from the other for one's own goal fulfilment. The reciprocal interdependence with others stresses an important relationship skill: perspective-taking. In collective cultures, it involves not only the willingness and ability to feel and think what others are feeling and thinking, but also to absorb this information without being told, and then to help others realize their goals. Wang et al. (2017) defined the ability as "cha yan gan se" in Chinese, which loads to the domain of social awareness in their study in Western China. However, in individualistic cultures, it is the individual's responsibility to "say what's on one's mind" if one expects to be understood (Hecht & Shin, 2015).

In addition, Wang et al. (2017) found the ability to provide "hints" that help others to "read" one's minds is also important in collectivistic cultures. It calls "han xu" in Chinese, representing expressing ideas and emotions implicitly. Wang et al. (2017) also found two unique concepts that related to relationship skills, namely "mian zi" and "guan xi". "Mian zi" is defined as the recognition by others of an individual's social standing and position (Lockett

1988), which is given high priority in Chinese social interactions. “Guan xi” refers to personal connections, which is related to what Markus & Kitayama (1991) called “in-group”. People with the same social group tend to form a stronger bond in Chinese culture, which serves as exclusive social resources for the individuals.

Forth, responsible decision making appears to be more meaningful in individualistic cultures as a channel for independent selves to communicate personal interests with social benefits. Evidence suggests that collectivists tend to socialize towards responsibility taking (Triandis, 2018, p.61-68). Collectivist cultures are more likely to see decision making as a shared activity to achieve group interests instead of an individual decision to realize personal interests (Mann et al., 1998). Keller et al. (1998) compared the socio-moral reasoning of children in Iceland and China in a longitudinal sample by presenting a friendship dilemma. In the dilemma, a protagonist has to choose between keeping a promise to the best friend and accepting an interesting invitation from another child who is new in class. Participants were asked to make a practical choice reflecting how a child will behave in this situation and a moral choice indicating the participant's moral evaluation of this psychological attribution. Keller and colleagues found that the Icelandic participants interpreted the situation as a conflict between self-interest and friendship, whereas the Chinese participants interpreted it as a conflict between altruism and friendship. Moreover, Icelandic participants demonstrated moral inconsistency at younger ages, opting for the new child despite a moral conviction that countered this choice. In contrast, Chinese participants established consistency between practical and moral judgment at all ages.

2.2.4 Cross-Cultural Adaptability of the CASEL Framework

Although the discussion of cultural differences follows the CASEL framework, it is worth noting that it does not mean the five-dimension structure applies to all cultures (Hecht & Shin, 2015). Social-emotional competencies have been widely researched in more individualistic cultures, however, less is known in more collectivistic cultures. Only a few studies were found to investigate the structure or function of social-emotional competencies in China (Zhu, 2016; Wang, 2019; Zhao, 2022; Wang et al., 2017; Shi et al., 2022; Chen et

al., 2021). However, most studies are based on the CASEL framework, assuming its cross-cultural adaptability. Although available evidence appears to suggest that the CASEL framework broadly applies to Chinese contexts, more studies are needed to factor in the developmental changes in adolescence and the wide geographic distribution accompanied by economic disparities.

Wang (2019) and Zhao (2022) investigated the function of social-emotional competencies in academic performance using Western social-emotional competencies scales. The confirmatory factor analyses supported the structure of the CASEL framework in both studies, however, the analyses were conducted without consideration of cultural variations. Zhao (2022) investigated the concurrent relationship between social-emotional competencies and students' self-reported academic performance in two primary schools in Chengdu. Students in grades four to six were assessed through the Social Skills Improvement System-Social Emotional Learning (SSIS-SEL), a tool guided by the CASEL framework (Gresham et al., 2020). The measurement model fit was not ideal in the confirmatory analysis ($X2/df = 2.236$, CFI = 0.807, TLI=0.796, RMSEA = 0.057). It may indicate that the CASEL framework does not fit well in Chinese culture. However, the findings on the association between social-emotional competencies and academic performance showed another possibility, that is the potential role of developmental changes on social-emotional competencies in early adolescence. Zhao (2022) found that social-emotional competencies predicted self-reported math and reading performance in grade four and five but not in grade six. It is possible that students' perceptions of their social-emotional competencies changed in early adolescence and the scale might not measure the same things as it does in childhood. Since Zhao (2022) did not examine the factor structure by grades, this is a hypothesis that needs to be tested.

Wang et al. (2019)'s study on the effect of social-emotional competencies on academic performance provided some evidence on the adaptability of the CASEL framework. With the Chinese version of the Delaware Social and Emotional Competency Scale student version (DSECS-S) (Zhu, 2016), the confirmatory analysis demonstrated a

good model fit (χ^2/df = 10.30, CFI = 0.97, TLI = 0.96, RMSEA = 0.04) among 7,106 fourth and fifth graders from 97 primary schools in Western China. Zhu (2016) examined the reliability and validity of the DSECS-S (Mantz et al., 2018), however, among 1,864 secondary school students in Hunan, Henan Gansu, and Shanghai. The scale demonstrated good internal consistency and test-retest reliability (Cronbach's α > 0.70). Through the exploratory analysis with half of the sample, four factors were extracted. It was found that the items loaded to each factor aligned with the original scale. The confirmatory analysis with the other half of the sample demonstrated good model fit (CFI=0.94; TLI=0.92; RFI=0.90; IFI=0.94; NFI=0.93; χ^2/df=3.48; RESEA=0.05). However, mixing samples from different geographic locations that have distinct economic status tends to mask the cultural differences.

Further, Chen et al. (2021) used a sample of 1,141 senior secondary school students from three schools in Western China to conduct a confirmatory factor analysis. The updated version of the same scale (Bear et al., 2019) was used to measure students' social-emotional competencies. The model fit (χ^2/df = 4.20, CFI = 0.94, RMSEA = 0.05) was good. Although Zhu (2016) and Wang et al. (2019) demonstrated the converging evidence on the adaptability of the CASEL framework in Western China, future research is needed to warrant the stability of social-emotional competencies, especially during the transition from childhood to adolescence.

Shi et al. (2022) developed and validated a social-emotional skills scale in China based on the CASEL framework through two rounds of exploratory factor analysis in general upper grades students (Grade 4-6) and rural students separately. The confirmatory factor analysis was followed to confirm the findings with a mixed sample (including both urban and rural students mainly in Grade 5 and 6). Shi et al. (2022) found a five-factor structure with 70 items that aligns closely with the CASEL framework. However, the samples were in several schools (less than 10) located in Eastern China, which are relatively developed areas. Moreover, the items used by Shi and colleagues were mainly selected from Western scales

including the Social Skills Rating System (SSRS), School Social Behaviour Scales (SSBS), Behavioural and Emotional Rating Scale (BERS), Social Emotional Assets and Resilience Scale (SEARS), and Devereux Student Strengths Assessment (DESSA). No culturally specific items were added.

Wang et al. (2017) was the only study found so far that did not assume the cross-cultural adaptability of the CASEL framework. Wang et al. (2017) identified 12 skills through student and expert interviews, open-ended questionnaire investigations, and literature review. While half of the skills were captured by the definition of the CASEL framework, the other half were found to be unique in the Chinese culture, namely “zi zhi zhi ming”, “shen du”, “cha yan guan se”, “han xu”, “mian zi”, and “guan xi”. Wang et al. (2017) extracted five factors that were similar to the CASEL framework through the exploratory factor analysis and confirmatory factor analysis in a sample of 6,638 students in 74 rural primary and secondary schools from 11 provinces in Western China. The five domains are presented in Table 1 with a sample item for each unique skill if applies.

Table 1

The Domains of Social-Emotional Competencies with Sample Items

Domain	Unique skill	Sample item
Self-cognition	zi zhi zhi ming	I clearly understand my limitations in my academic work.
Being cognizant of others	cha yan guan se	Although my friends sometimes said nothing, I can still understand what they want.
Self-management	shen du	I never do anything bad, even if others don’t know.
Self-management	Han xu	I usually implicitly express my feelings facing others’ mistakes.
Social skills	guanxi	I can establish close relationships with my teachers who will give me help.

Social skills	mian zi	I won't expose others to lying when they are boastful about their experience.
Responsible decision-making	_	Family is usually my first consideration when I make a decision.

Note. Information in the table was extracted from Wang et al. (2017).

Self-cognition is similar to self-awareness in the CASEL framework though the focus is quite different (e.g., strengths vs. weakness). Being cognizant of others is close to social awareness in the CASEL framework, however, with a new layer of "cha yan guan se". Similarly, self-management includes two unique skills ("shen du" and "han xu") in Chinese culture. "Guan xi" in the social skills domain is equivalent to relationship skills in the CASEL framework though with an emphasis on instrumental assistance. "Mian zi" is a unique skill in the domain. Responsible decision making seems to align with the definition in the CASEL framework, however, from the perspective of others instead of the self. It is worth noting that Wang et al. (2017) analysed students in primary school and secondary schools together. Moving from primary school to secondary school duplicates with the transition from childhood to adolescence. The transition is accompanied by significant developmental changes due to puberty and increasing cognitive maturity, as well as shifts in social roles and expectations, characterized by the growing sense of oneself as an autonomous individual (Eccles, 1999). Therefore, mixing the samples from these two different development stages may mask these developmental changes in students' perception of social-emotional competencies.

2.3 Social-Emotional Competencies and Academic Performance

Extensive evidence suggests the positive impact of social-emotional competencies on academic performance. However, research falls short on the functioning mechanism. Some studies suggest a direct path, indicating overlaps of abilities that affect general learning performance, such as intellectual ability or emotion regulation, between social-

emotional competencies and academic performance. Some argue that learning content also has a role to play, but mainly on specific subjects that require emotional knowledge, such as humanities subjects. Others support the indirect path through building social relationships. Future research is needed to test these hypotheses.

Both correlation and intervention evidence suggest that social-emotional competencies have a small to moderate positive effect on academic performance, although the internal mechanism is still unclear. MacCann et al. (2020) reviewed 90 studies on the association between social-emotional competencies (referred to as mixed emotional intelligence in the study) and academic performance before November 2016 from primary schools to tertiary education. A small to moderate effect size (ES = 0.19, 95% C.I. = [0.17, 0.22]) was found in MacCann et al (2020). Somaa et al. (2021) replicated these findings by including more recently published studies between January 2011 and July 2020. The effect size was from small to moderate (ES = 0.20, 95% C.I. = [0.16, 0.23]). It should be aware that most of the studies included in MacCann et al. (2020) and Somaa et al. (2021) were cross-sectional studies from Western countries.

MacCann et al. (2020) also investigated the unique contribution of social-emotional competencies on academic performance. After controlling for intellectual intelligence and big five personalities, social-emotional competencies explained an additional 2.30% of the variance. Through moderator analyses, MacCann et al. (2020) proposed three mechanisms that might explain the unique contribution. First, social-emotional competencies contribute to academic performance by regulating negative academic emotions. Emotionally competent students may deal with negative emotions, such as test anxiety, disappointment, and boredom, elicited in academic settings effectively, and therefore may perform well in all subjects. Second, social-emotional competencies overlap with academic content. Most humanities subjects require a good understanding of people’s interactions, emotions, attitudes, and motivations. Therefore, students who have better social-emotional competencies may perform better in humanities subjects but may not in math or science. Third, socially competent students may manage the social world around them well and form

good relationships with peers, teachers, and parents. This can directly influence students' performance by obtaining better marks from teachers or indirectly through more social support.

Two cross-sectional studies in China provided some evidence for MacCann et al. (2020)'s hypotheses, however, with mixed findings on the indirect path through teacher-student relationship. Wang et al. (2019) found that academic emotions (learning anxiety and interest) and positive social relationships (peer relationships and teacher-student relationships) partially mediated the relations from social-emotional competencies, measured by the CASEL framework, to academic performance on standardized tests (reading, math, and science). The findings align with MacCann et al. (2020)'s hypotheses about the paths through academic emotions and social relationships. However, the significant effects on all subjects suggest that there are more overlaps between social-emotional competencies and academic ability than emotional contents, which could be some domain-general ability as controlled by MacCann et al. (2020). In contrast to Wang et al. (2019)'s findings, Zhao (2022) found that positive teacher-student relationship did not mediate the association between social-emotional competencies and students' self-reported reading and math performance, while negative teacher-student relationship did.

Some longitudinal studies in Western countries found that teacher-reported social-emotional competencies appear to be a stronger predictor of students' academic performance, which may indicate the indirect path through social relationships. For example, Malecki and Elliot (2002), studying third graders from two schools in a large urban community in Western Massachusetts, found that teacher-rated social-emotional competencies (cooperation, assertion, and self-control) at the beginning of the school year positively predicted students' academic performance in the standardized test (reading, math, and language) at the end of the school year. However, student-reported social-emotional competencies with the same measure were only predictive of later performance in languages. This aligns with MacCann et al. (2020)'s assumption about overlaps between social-emotional competencies and humanities subjects.

Elias and Haynes (2008) got similar findings with teacher-reported social-emotional competencies in a disadvantaged third-grader sample located in a Northeastern urban community in the United States. It was found that besides social-emotional competencies at the beginning of the school year, improvement in social-emotional competencies throughout the year was predictive of end-year school grades for reading and math after controlling for prior academic performance. The significant effects on both standardized tests and school grades add to MacCann et al. (2020) assumptions that social relationships do not simply influence academic performance by obtaining better marks from teachers.

Oberle et al. (2014) investigated both teacher-reported and student-reported measures of social-emotional competencies in relation to students' standardized test performance in reading, writing, and mathematics with a sample of students located in urban and suburban areas in Western Canada. It was found that teacher-reported social-emotional competencies in Grade 6 significantly predicted higher scores in math and reading on the standardized test in Grade 7 after controlling for students' performance in Grade 4. Aligning with Malecki and Elliot (2002), Oberle et al. (2014) also found that self-reported social-emotional competencies were only significantly related to reading performance. However, it is worth noting that the teacher-reported measure in Oberle et al. (2014) captured broader aspects of social-emotional competencies (assertive social skills, frustration tolerance, peer interactions, and task orientation) than the student-reported measure which only reflected the domain of social responsibility.

Social-emotional intervention studies, again mainly in Western countries, further established the causal link between social-emotional competencies and academic performance based on theoretical frameworks. Durlak et al. (2011) reviewed 213 universal school based SEL programmes from 1955 to the end of 2007, through a meta-analysis. It was found that, compared to the controls, students in the intervention groups demonstrated enhanced social and emotional competencies and academic performance in reading and math. The finding remained the same after ruling out the effect of research methods. The

average effect size on social-emotional competencies was from moderate to strong (ES = 0.57, 95% C.I. = [0.48, 0.65]). Although the overage effect size on academic performance was weaker (ES=0.27, 95% C.I. = 0.15, 0.39), Durlak et al. (2011) argued that social-emotional interventions would lead to an 11-percentile gain in achievement, which is valuable for educational interventions.

Taylor et al. (2017) examined the follow-up effects of SEL programmes by reviewing 82 studies published between 1970 and 2014 through a meta-analysis, following similar procedures to Durlak et al. (2011). The significant effect on academic performance remained at the same level in follow-up after 56 to 195 weeks (EF = 0.33, 95% C.I. = [0.17, 0.49]), although with the deceased effect in social-emotional competence (EF = 0.23, 95% C.I. = [0.15, 0.31]). Corcoran et al. (2018) did a more specific review on the impact of children's academic performance by subjects. The review focused on 40 studies between 1970 and 2016 that met the criteria for high methodological standards. Corcoran et al. (2018) found that social-emotional interventions had a positive effect on reading (ES = 0.25), mathematics (ES = 0.26), and science (ES = 0.19). The effect sizes tend to be smaller for more rigorous randomized studies with large sample sizes. However, it is worth noting that the studies on science (n=5) were much less than those on math (n=33) and reading (n=35).

The social-emotional interventions assumed a route from social-emotional competencies to academic performance through school engagement, however, it was rarely tested in the literature. Panayiotou et al. (2019) was the only study that investigated the internal mechanism with a 3-wave longitudinal sample of 1626 upper elementary students (M=9.17, SD=0.31 at baseline) in 45 schools in England. It was found that students with greater social-emotional competence (measured by the CASEL framework) at Time 1 were reported by teachers to experience fewer mental health difficulties (conduct problems, hyperactivity, emotional symptoms, and peer problems) at Time 2 which in turn predicted higher academic attainment (math, reading, and writing) at Time 3. However, school engagement did not mediate the relationship between social-emotional competencies at Time 1 and academic performance at Time 3, although social-emotional competencies at

Time 1 did increase school engagement at Time 2.

2.4 The Current Study

Guided by the attachment theory, the self-determination theory, and the ecological model, the study argues that social or cultural values may shape children's perceptions of the self and others. Although all significant others likely have a role to play, their importance tends to vary at different developmental stages even within a particular culture. For example, and of specific relevance to this study, is the developmental changes to children's internal working model. In early childhood, children form an internal working model of the self and others through interactions with the primary caregiver. When children leave the primary attachment figure and start schooling, teachers' role becomes salient, especially in middle childhood. Through interactions with teachers, children appear to modify their internal working models. When they step into adolescence, peers tend to be more and more important, as seeking independence from adults. Therefore, the developmental stage is critical for understanding children's social-emotional competencies. However, existing literature has not paid enough attention to the "sensitive" period of transition to early adolescence. Earlier studies have either grouped children in upper primary school (normally Grade 4-6) together or focused on the secondary years. This study examines sixth graders separately to detect developmental changes, if any.

No matter which significant others come into play, cultural values influence children's perceptions of themselves and others throughout. According to Markus and Kitayama's (1991) theory, collectivistic cultures are conducive to forming the interdependent self that aims at maximizing personal uniqueness. In contrast, individualistic cultures nurture the independent self that strives for minimizing personal uniqueness to fit in with others. The distinct selves indicate that people from these two cultures may perceive social-emotional competencies differently. However, the field is dominated by Western definitions, frameworks, measurements, and evidence that are arguably more individualistic. Much less is known from the more collectivistic cultures like in China.

The limited evidence suggests that the CASEL framework may not fully apply to

Chinese contexts, given that the definition of each domain within the framework perhaps be very different. Therefore, a primary aim of this study is to examine the structure of social-emotional competencies in Chinese context. To achieve this aim, the study investigates how Chinese students perceive their social-emotional competencies and whether this is similar to or different from what is reported in the literature about students in the individualistic context of the United States (Research question 1). Since the dataset is based on a scale that is developed and validated in the United States (DSECS-S), it allows the comparison, although indirectly.

After examination of the scale items, it was found that the responsible decision making domain may not capture additional information but reiterate other domains in the Chinese context. Although the four studies with the DSECS-S demonstrated a good model fit of the CASEL framework in Chinese samples (Zhu, 2016; Wang et al., 2019; Chen et al., 2021; Shi et al., 2022), the samples were either at distinct developmental stages (Wang et al., 2019; Chen et al., 2021) or from different geographic locations with distinct economic statuses. This study contributes to the literature by testing these possibilities with a sample in a city in Western China (Research question 2).

The second aim of the study is to examine the function of social-emotional competencies in academic performance. Although there is clear evidence to show the causal link between social-emotional competencies and academic performance, the internal mechanism is not clear. According to the literature, social-emotional competencies may directly impact academic performance through the learning process (manifested by emotion regulation ability or social support) or learning content (such as social-emotional knowledge required in humanity subjects). If the learning process is the driving force, social-emotional competencies will be equally important to all subjects. In contrast, social-emotional competencies will be a stronger predictor for humanities subjects than math and science, if learning content dominates the function. This study contributes to the literature by investigating the causal effect of social-emotional competencies on reading, math, and science scores, utilizing the data from a school based SEL programme in China (Research

question 3).

Previous literature also indicates an indirect path between social-emotional competencies and academic performance through social relationships. However, the findings on positive teacher-student relationship are mixed. The self-determination theory suggests that better relationships with teachers motivate students to engage more in learning, however, it also indicates that emotional support may not function independently without autonomy support. The study is arguably the first to examine the mediating role of positive teacher-student relationship in the relations between social-emotional competencies and academic performance, using longitudinal intervention data (Research 4).

Chapter 3 Methodology

This chapter introduces the database from which the analytic samples were drawn firstly, followed by a brief overview of the SEL programme investigated in this study. The approach to secondary data analysis is justified along with ethical considerations next, before presenting the sample design and participants. The measures of social-emotional competencies, teacher-student relationship, and academic performance are explained following the description of sampling and participants. This chapter ends with the data analysis plan.

3.1 Database

The data used in this study is a part of the Child-Friendly School (CFS) study initiated by UNICEF China in 2016. The study adopted a two-wave cross-sequential design to monitor and assess students' learning outcomes and school quality according to UNICEF's Child-Friendly School standards in four counties in Western China. In addition, an experimental design was applied to one of the four counties, Mile City in Yunnan Province, to assess the impact of the SEL programme. The analytic samples were drawn from the dataset of Mile City.

The study measured students' self-rated social-emotional competencies and academic performance on standardized tests in reading, math, and science. Individual and

classroom factors that related to academic outcomes were also collected from students, including subject-specific learning interests, teaching and learning strategies, and teacher-student relationships. Students also reported basic demographic information such as age, gender, ethnicity, and social-economic status. Additionally, individual characteristics that are specific to the context in Western China, such as left-behind status (students living with grandparents) was collected. Besides academic performance, school quality was another focus of the CFS study. Students were asked to evaluate school quality following the CFS standards. To complement student data, teachers, principals, and parents were also surveyed to have a comprehensive understanding of school quality along with school observations. Given school quality is not the focus of this paper, only student data were analysed.

3.2 The Social-Emotional Learning Programme

The SEL programme was initiated by the Ministry of Education, China, together with UNICEF in 2011 (MOE-UNICEF SEL Programme Team, 2020, p.1). The National Training Centre for Primary School Principles, Ministry of Education was identified as the implementing partner of the SEL programme in 250 schools in Western China, providing trainings and onsite guidance to the schools. The programme adopted a whole school approach that involved a coordinated set of activities across curriculum teaching, school climate and environment, and family and community partnerships. At the school level, teachers were the main implementors. The programme was adapted from the Social Emotional Aspects of Learning (SEAL) in England (Humphrey et al., 2008). UNICEF China contracted the Northampton Centre for Learning Behaviour to provide technical support to the programme implementing partner. Working with the Northampton Centre for Learning Behaviour, the implementing partner translated and adapted the SEAL materials (including the curriculum and training manuals) into Chinese.

The adapted SEL curriculum kept all the themes in the original SEAL curriculum, namely New Start, Argument and Reconciliation, Say No to Bullying, Advance towards the

Goal, Good to be Me, Relationships, and Change (MOE-UNICEF SEL Programme Team, 2020, p.2). However, the lesson plans were adapted according to the local context. One of the major changes, that is of interest of this study, was the conceptual framework of social-emotional competencies. The SEAL programme conceptualized social-emotional competencies into five domains, namely self-awareness, self-regulation (similar to self-management in the CASEL framework), motivation, empathy, social skills (similar to relationship skills in the CASEL framework). The adapted SEL programme added the perspective of the collective in the conceptual framework besides the perspective of the self and others. Within each perspective, there were aspects, awareness and management (e.g., collective awareness and collective management).

This adapted conceptual framework was reflected in the learning objectives of the adapted SEL curriculum. For example, the learning objectives of Going for Goals in the adapted curricula for Grade 4 are (1) identify difficulties that impede my learning (self-awareness); (2) know how my emotions impact my learning (self-awareness); (3) develop strategies to overcome the difficulties (self-management); (4) set goals for myself and monitor my progress (self-management); (5) achieve a goal step by step and be patient for the results (self-management); (6) know how others can help me achieve my goals and how I can help with others as well (awareness of others); (7) help others to change their feelings that affect learning negatively (management of others); (8) know the importance of cooperation (collective awareness); and (9) take the responsibilities when I undertake group work (collective management) (MOE-UNICEF SEL Programme Team, 2020, p.66).

3.3 Secondary Data Analysis

The de-identified dataset of Mile City with no personally identifying information was used in this study with the written approval from UNICEF China. Therefore, no further ethical approval was sought for the current study. Although it is secondary data analysis in nature, the author participated in the CFS study as a staff member of UNICEF China and therefore was familiarised with the data. Compared to the CFS study, the current study takes a

different analytical approach to the data with a different focus on students' social-emotional competencies. At the student level, the CFS study focused mainly on students' academic performance. Descriptive analysis was conducted and presented in the final report, demonstrating the increasing trends in students' academic performance, key factors that affect students' academic performance including social-emotional competencies, and the intervention effects on these key factors in Mile City (Wang & Xin, 2019). This paper applies statistical methods to the data with a focus on social-emotional competencies and their relation to academic performance.

3.4 Sampling

The sampling for Mile City was designed by the American Institute of Research and reported in the internal working papers (Spier et al., 2016; Li et al., 2017). It should be noted that it was not a random sample from the student population of Mile. The sample was drawn from 50 intervention schools across the 12 townships. Propensity Score Matching (PSM) was used to match the selected intervention schools with comparison schools. Participants were randomly selected at the class level following a cross-sequential design. The procedures are outlined below in detail.

3.4.1 Propensity Score Matching

PSM is a quasi-experimental method in which statistical techniques are used to construct an artificial control group by matching each treated unit with a non-treated unit of similar characteristics (Caliendo & Kopeinig, 2008). PSM is a useful method in data analysis for estimating the impact of a project or intervention for which it is not feasible to randomize. For a developmental programme, it is not ethically and logically sound to randomize schools to receive developmental support. To maximize the benefits of the developmental support, 50 CFS schools across all towns in Mile were selected by the local education bureau in consultation with UNICEF China, with a focus on rural schools.

3.4.2 Selection of Intervention Schools

Before selecting the CFS schools for the sample, power calculation was conducted to

determine the sample size. To detect effects as small as 0.20, 30 intervention schools with 30 control schools were aimed for. Of the 50 CFS schools in Mile City, 40 were main campus schools and 10 were satellite campus schools. Main campuses served students from Grade 1 to 6 while satellite campuses (usually small rural schools) served lower grades from one up to five.

First, the 10 CFS schools on satellite campuses were included in the sampling plan considering there was a large pool of potential control schools. Next, 50 percent of the CFS schools on main campuses were selected from each of the 12 townships, ensuring that main campuses across towns had similar chances of being selected. This resulted in 33 CFS schools. The 33 schools were verified to reflect the population in all 50 CFS schools accurately on most of their characteristics, as listed in Table 2. However, due to the inclusion of all satellite campuses, the selected schools were somewhat smaller than the average school size across all 50 CFS schools.

3.4.3 Matching with Comparison Schools

The next step was to match the 33 CFS schools with comparison schools. Ideally, comparison schools would be selected from the same town where the CFS schools were located, to account for all township characteristics. However, the potential comparison schools within some towns were limited, which could result in imbalanced groups and multiple duplicate selections. In addition, the information on the characteristics of the towns in Mile City, and their per capita GDP data for were not available. Therefore, across-town matching was used, however, with one exception. Matching was done with Miyang town given it was the county seat, with a wealthier population that tended to live in urban or semi-urban areas, with non-agricultural occupations, and better living conditions than the rest of the towns. Schools located in the other 11 rural towns were matched across townships.

Mahalanobis Distance Matching (MDM) was used to match schools. It is an effective matching technique when multiple covariates are inter-correlated (King et. al, 2011). The rule for MDM is that there should be no more than 5 or 6 covariates for matching. The best

matching variables are variables that are strongly related to the main outcome which, for the CFS study, is academic performance. However, schools' average academic scores in previous years were not available (Spier et al., 2016). Based on available information, six matching variables were identified, all of which are also highly related to students' social and emotional competencies:

- School size (number of pupils);
- Number of teachers;
- Percentage of teachers with a Bachelor's degree;
- Percentage of left-behind children;
- Percentage of ethnic minority students; and
- Percentage of boarding students.

Five best matches were identified for each selected CFS school. The match with the shortest Mahalanobis distance to the CFS school was taken as the first choice. Due to the small number of main campuses in the comparison pool (the comparison /CFS ratio is 2), matching resulted in many duplicates. Several schools share almost identical match lists. Four similar CFS schools were removed after reviewing the lists. The characteristics of the 29 matched comparison schools with the remaining 29 intervention schools are presented in Table 2 along with the standardized group differences between the CFS and comparison schools. The matching improved the baseline balance on most of the variables. There were no large group differences between the CFS and comparison schools except for school size. The matched schools tended to have more students and teachers than selected CFS schools. This resulted from matching several main campuses with satellite campuses due to the small number of main campuses in the comparison pool.

Table 2

The Results of Matching Selected CFS Schools With Comparison Schools

Matching variables	M_N (N=123)	M_C (N=29)	M_M (N=29)	SD
Enrollment (N of students)	148.89	269.00	373.00	-0.40
Number of teachers	3.78	6.00	9.00	-0.66
% of female students	48.17	48.25	47.96	0.06
% of minority students	62.00	67.29	65.12	0.07
% of students that are left behind	13.30	9.68	10.57	-0.12
% of minority teachers	40.87	46.28	50.36	-0.15
% of teachers with Bachelor's degree or higher	24.01	34.38	33.56	0.03
% of teachers with Associate degree or higher	82.15	83.92	87.81	-0.18
% of students are boarding	51.79	70.25	65.75	0.12

Note. The statistics were provided by the American Institute of Research in the internal working memo (Li et al., 2017). M_N is the mean of all non-CFS schools; M_C is the mean of the selected CFS schools; M_M is the mean of the matched comparison group. SD is the standardized group difference between the selected CFS schools and the matched comparison group.

3.4.4 Selection of Participants and Data Collection

Students in higher grades were the focus of the CFS study. One class was selected randomly in Grade 4 and 5 per school at Time 1. The selected students in Grade 4 were to be followed three years later at Time 2. Additionally, one class in Grade 4 was to be selected randomly per school at Time 2 to compare with the fourth graders at Time 1. Student data were collected by the National Assessment Centre for Education Quality based at Beijing Normal University. Three CFS schools and their comparison schools were removed from the sampling by Beijing Normal University when collecting the data because there was no fourth grade either in the CFS schools or in the comparison schools.

The first wave of data collection was planned for September 2016. However, it was delayed to March 2017 to accommodate the schedule of local schools. The second wave of

data was collected in September 2019 as planned. Written informed consent was obtained from teachers on behalf of students (Wang & Xin, 2019). Teachers were asked to explain the purpose of the study to their class, highlighting voluntary participation. Students who opted for the study were allowed to opt-out at any time throughout the study. The consent forms were archived by the National Assessment Centre for Education Quality along with the data at Beijing Normal University.

3.5 Participants

The cross-sectional data at baseline were used for factor analysis to investigate the structure of social-emotional competencies. The longitudinal data were utilised for analysis of measurement invariance first to examine the stability of social-emotional competencies during the transition to early adolescence, and then, to investigate the association between social-emotional competencies and academic performance. After confirming the causal link, the subsample of the intervention group was analysed to examine the mediation effect of teacher-student relationship. The participants in the baseline and the full longitudinal intervention sample are described below.

3.5.1 The Baseline Sample

The baseline sample consists of 3,400 fourth and fifth graders enrolled in 26 intervention schools and 26 comparison schools in Mile in March 2017. The average age is 11.29 (SD = 0.97). These respondents were removed if the answers to the 12 social-emotional competencies items were the same. After clearing out unqualified cases, 2,952 respondents remained in the analytical sample. Excluding the unqualified respondents did not affect the mean age (mean= 11.29, SD=0.97) as well as the demographic structure of the sample as shown in Table 3. The analytical sample was split into half randomly to conduct exploratory factor analysis and confirmatory factor analysis.

Table 3

Demographic Characteristics of the Baseline Sample

Characteristics	Original sample		Analytical sample	
	N	%	N	%
Grade	3,400	100%	2,952	100%
Grade 4	1,937	57%	1,680	57%
Grade 5	1,463	43%	1,272	43%
Gender	3,371	99%	2,927	99%
Male	1,765	52%	1,544	52%
Female	1,606	47%	1,383	47%
Ethnicity	3,306	97%	2,932	99%
Ethnic minorities	1,997	59%	1,750	59%
Han ethnicity	1,309	39%	1,182	40%
Left behind status	3,291	97%	2,921	99%
Left behind	1,014	30%	920	31%
Non left behind	2,277	67%	2,001	68%

Note. There is a small percentage of missing values in each demographic factor, except grade.

3.5.2 The Longitudinal Sample

The two-wave longitudinal dataset consists of 1,113 students[1] enrolled in 26 intervention schools and 26 comparison schools in Mile City of Yunan Province. The first wave data were collected in March 2017, while the second wave was in September 2019. The SEL programme was implemented during 2017- 2019 in the 26 intervention schools while the 26 comparison schools acted as business as usual. However, 172 students in the six comparison schools that were on satellite campuses were found to move to the intervention schools (main campuses) at the second wave. Grouping them into the control group may narrow the differences between the intervention group and the control group. However, excluding them would result a loss of these rural students and their comparisons. Therefore, both approaches were used in the data analysis to compare the results.

[1]Given the sampling was done at the class level, the large attrition was likely caused by re-assigning students to different classes and schools when they move to higher grades, especially for children in satellite campuses without higher grades.

Regarding data cleaning, no respondent was found to have the same values on the 12 social-emotional competencies items at either time point. The mean age of the 1,113 participants was 10.78 (SD= 0.94) at the first wave. The demographic characteristics of the full sample are presented in Table 4 along with the subsample for the intervention and control group. The control group has a similar demographic structure as the intervention group, although the intervention group has slightly more ethnic minority and left-behind students.

Table 4

Demographic Characteristics of the Longitudinal Sample

Characteristics	**Full sample**		**Intervention**		**Control**	
	N	%	N	%	N	%
Gender	1,113	100%	573	100%	540	100%
Male	573	51%	294	51%	279	52%
Female	540	49%	279	49%	261	48%
Ethnicity	1,092	98%	561	98%	531	98%
Ethnic minorities	653	59%	344	60%	309	57%
Han ethnicity	439	39%	217	38%	222	41%
Left behind status	1,089	98%	557	97%	532	99%
Left behind	380	34%	202	35%	178	33%
Non left behind	709	64%	355	62%	354	66%

Note. There is a small percentage of missing values in the demographic factor, except for gender.

3.6 Measures

The measures involved in the study include (a) social-emotional competencies; (b) teacher-student relationship; and (c) academic performance in reading, math, and science. Social-emotional competencies were operationalized by the Chinese version of DSECS-S (Zhu, 2016). Teacher-student relationship were measured by PISA teacher-student

relationship scale (OECD, 2014). Academic performance was assessed by the standardized tests developed by the National Assessment Centre for Education Quality based on the national curriculum standards (Wang & Xin, 2019). Individual item-level scores for the social-emotional competencies scale and teacher-student relationship scale are available in the dataset, while academic performance is accessible as a composite score.

3.6.1 Social and Emotional Competency

The DSECS-S was published by Mantz and colleagues in 2016 with an American normative sample aged 3-12 in Delaware (Mantz et al., 2018). Working with one of the original developers, Zhu (2016) and the team translated the scale into Chinese (see Table 5). The translation and back-translation were conducted by graduate students who were fluent in English and Chinese and verified by one of the researchers who designed the original scale. The scale contains 12 items with three items assessing each of the four domains in the CASEL framework, namely responsible decision making, relationship skills, self-management, and social awareness (see Table 5). Likert-type items are scored on a scale of 1 = not like me at all, 2 = not much like me, 3 = somewhat like me, and 4 = very much like me. Item 1, “I blame others when I’m in trouble”, requires reverse scoring so that higher scores indicate better social-emotional competencies. Wang et. al (2019) established the reliability and construct validity with a Chinese sample of 7,106 fourth and fifth graders (M =11.25 years, SD = 0.96) in Western China. The Cronbach’s alpha was 0.81. The scale demonstrated good construct validity (χ^2/df = 10.3, CFI = 0.97, TLI = 0.96, RMSEA = 0.04).

Table 5

The Delaware Social and Emotional Competency Scale Student Version

Domain	Items in English	Items in Chinese
Self-management	3. I can control how I behave.	3. 我能控制自己的行为
	7. I think before I act.	7. 在我行动之前我会思考
	11. I am good at waiting for what I want.	11. 对于我想得到的东西，我善于等待
Relationship skills	4. I am good at solving conflicts with others.	4. 我善于处理和他人的冲突
	8. I get along well with others.	8. 我和别人友好相处
	12. I have one or more close friends.	12. 我有一个或者多个好朋友
Social awareness	2. I think about how others feel.	2. 我会考虑别人的感受
	6. I care about how others feel.	6. 我关心别人的感受
	10. What others think is important to me.	10. 别人的想法对我来说是重要的
Responsible decision making	1. I blame others when I am in trouble.	1. 当我遇到麻烦的时候我会指责别人
	5. I feel responsible for how I act.	5. 我对自己的行为负责
	9. I am good at deciding right from wrong	9. 我善于分辨对错

3.6.2 Teacher-Student Relationship

The PISA teacher-student relationship scale is a four-point Likert-type scale with five items, varying from 4 = Strongly agree, 3 = Agree, 2 = Disagree to 1 = Strongly disagree. Higher scores indicate better teacher-student relationships. The reliability and validity were verified with PISA samples (Lee, 2021; Mikk et. al 2016; OECD, 2014). The original scale was used to measure students' general relationships with teachers. The wording of each item was modified by the research team to measure relationships with subject-specific teachers. Table 6 presents the original items along with the modified items, taking math as an example. The scale demonstrated good internal consistency in the whole sample of the CFS study that includes the four counties (Cronbach's α = 0.86 on reading; Cronbach's α = 0.88 on math; Cronbach's α = 0.90 on reading) (Wang & Xin, 2019).

Table 5

The Teacher-Student Relationship Scale

The original version	The modified version
1. I get along well with most of my teachers.	1. I get along well with most of my math teachers.
2. Most of my teachers are interested in my well-being.	2. My math teacher is interested in my well-being.
3. Most of my teachers really listen to what I have to say.	3. My math teacher really listens to what I have to say.
4. If I need extra help, I will receive it from my teachers.	4. If I need extra help, I will receive it from my math teacher.
5. Most of my teachers treat me fairly.	5. My math teacher treats me fairly.

3.6.3 Academic Performance

The reading test consists of 37 questions assessing vocabulary and comprehension at three levels: extraction and retrieval, integration and interpretation, and reflection and evaluation (Wang & Xin, 2019). With 45 questions, the math test measures students' mathematical ability in four areas: number and algebra, space and graphics, statistics and probability, and the compound domain that assesses students' ability to integrate the knowledge and apply it to solve practical math problems. Mathematical ability is assessed at four competency levels: knowing facts, applying rules, mathematical reasoning and solving non-routine problems. Lastly, the science test includes 40 questions covering four content areas: geography, biology, physics and environmental issues. Science ability is measured at five levels: understanding, problem-solving, using tools, and investigating and communicating about the real world.

All test items are multiple choice questions. Students get one point for a correct answer. The composite score was calculated by the percentage of correct answers per subject test. All tests demonstrated good internal reliability with the overall sample in four counties (Cronbach's $\alpha = 0.83$ on the reading test; Cronbach's $\alpha = 0.89$ on the math test; Cronbach's $\alpha = 0.83$ on the science test) (Wang & Xin, 2019).

3.7 Data Analysis

The statistical analyses were conducted using R version 4.1.2. Before any statistical analyses, missing data were examined. Imputation was performed when the data were not missing completely at random. Factor analysis was conducted to examine the structure of social-emotional competencies in the baseline sample drawn from a collectivistic culture. Exploratory analysis was performed first with a random half of the sample to identify the most appropriate structure. Next, confirmatory analysis was conducted with the other half of the sample to compare with the model derived from exploratory factor analysis with the CASEL model. The better fitting model was used with the longitudinal sample for measurement invariance analysis to test the stability of the structure during the transition to adolescence by the intervention and control groups. Finally, a half longitudinal mediation

model was used to examine the function of social-emotional competencies in academic performance. The causal link was established beforehand through ANOVA by comparing the academic growth between the intervention group and the control group. The process is presented in the subsections.

3.7.1 The Structure of Social-Emotional Competencies

Exploratory Factor Analysis. Exploratory factor analysis (EFA) is a multivariate statistical method that attempts to identify the common factors that explain the order and structure among measured variables based on the correlation matrix (Watkins, 2018). EFA assumes multivariate normality and nonsingularity. Before conducting EFA, the assumptions were checked. First, the skewness and kurtosis of the scale items were examined. Then, the outliers were checked with Mahalanobis distance, followed by the energy test of multivariate normality. Second, adequate correlations between the 12 scale items were examined. Bartlett's test of sphericity was performed to ensure that the correlation matrix was significantly different from zero. Given the sample size was large, the Kaiser-Meyer-Olkin (KMO) statistic was required to be above a minimum of 0.5 (Kaiser, 1974).

Common factor analysis (FA) was selected over principal component analysis (PCA) because the aim was to identify a latent factor structure (Fabrigar et al., 1999). Iterated principal axis (PA) extraction was employed since it outperforms Maximum Likelihood (ML) when the relationships between measured variables and factors are relatively weak ($\leqslant$.40), multivariate normality is violated, or when the number of factors underlying the measured variables is misspecified (Briggs & MacCallum, 2003; Curran et al., 1996; MacCallum et al., 2001). Parallel analysis and the visual scree test were used to determine the appropriate number of factors to retain. In addition, oblique rotations (promax and oblimin) were used to obtain the best factor structure that converges with the theoretical frameworks. Finally, factor adequacy was evaluated based on the following criteria: (a) at least two salient items load on a given factor; (b) each variable has a salient loading on one factor and trivial loadings on the remaining factors; and (c) all factors should be theoretically meaningful (Watkins, 2018).

Confirmatory Factor Analysis. Confirmatory factor analysis (CFA) is a special type of structural equation modelling (SEM) that aims to examine the relationship between a set of measured and latent variables based on the covariance matrix (Tabachnick & Fidell, 2014, p.736). As a hypothesis testing by nature, CFA enables researchers to specify competing factor-analytic models, to test their relative abilities to fit the data, and to compare the models according to their goodness of fit. Although CFA is a confirmatory technique in contrast to EFA, the procedures for planning EFA are also applicable to CFA. After multivariate normality and nonsingularity examinations, the baseline sample was fitted with the model derived from the EFA, and, theoretically of interest, the CASEL model.

In terms of estimation method, the Satorra–Bentler scaled test statistic (MLM) was employed since it tends to outperform other methods, such as ML, Generalized Least Squares (GLS), Elliptical Distribution Theory (EDT) and Asymptotically Distribution Free (ADF) in medium to large samples when multivariate normality is violated (Hu et. al, 1992). Like the notion of comparing the observed and reproduced correlation matrices in EFA, CFA estimates parameters to minimize the difference between the observed and estimated population covariance matrices. Several model fit indexes were examined, including the Satorra–Bentler scaled χ^2, the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR) (Hu & Bentler, 1999). These model fit indexes were compared following the criteria below to determine the structure of social-emotional competencies.

A nonsignificant χ^2 normally indicates a good model fit. However, with large samples, trivial differences between sample and estimated population covariance matrices can be significant. A rough rule of thumb is that the ratio of the x^2 to the degrees of freedom is less than two or three (Schreiber et al., 2006). CFI assesses fit relative to other models as the name implies. It adjusts for the issues of sample size inherent in the x^2 test and performs well in terms of estimating model fit even in small samples (Bentler, 1990). CFI ranges from zero to one. A value greater than 0.95 often indicates a good model fit (Hu & Bentler, 1999).

Like CFI, RMSEA is also a comparative fit index, however, with a different approach (Browne & Cudeck, 1992). RMSEA estimates the lack of fit in a model compared to a perfect (saturated) model. A value of 0.06 or less indicates a good-fitting model (Hu & Bentler, 1999). Values greater than 0.10 are indicative of poor model fitting (Browne & Cudeck,1992). Finally, SRMR is a residual-based fit index that estimates the average differences in variances and covariances between the sample and the estimated population. Again, small values indicate a good model fit. SRMR has a range from zero to one with values of 0.08 or less desirable (Hu & Bentler, 1999).

Measurement Invariance Analysis. Measurement invariance analysis is a type of confirmatory factor analysis that assesses the psychometric equivalence of a construct across groups or time (Putnick & Bornstein, 2016). There are four main steps: (a) configural invariance to test the same pattern of factor loadings; (b) metric invariance to test the equivalence of factor loadings; (c) scalar invariance to test the equivalence of item intercepts; and (d) residual invariance to test the equivalence of items' residuals or unique variances (Widaman & Reise,1997).

In this study, configural invariance was required at least to test whether the structure of social-emotional competencies is stable during the transition to early adolescence and whether the interventions changed students' perceptions of their social-emotional competencies. Metric invariance was also required to examine the path model from early social-emotional competencies to later academic performance. Although the study does not compare means, scalar invariance is also tested to provide additional information for further studies in the field. Measurement invariance was evaluated by the changes of model fitting indexes for two nested models. Although there are debates on the cut-off values, the traditional $\chi 2$ difference test and criterion of 0.01 change in CFI was used, complementing by 0.015 change in RMSEA and 0.03 change in SRMR for metric invariance and a stricter criterion of 0.01 change for scalar invariance (Chen, 2007).

3.7.2 The Function of Social-Emotional Competencies

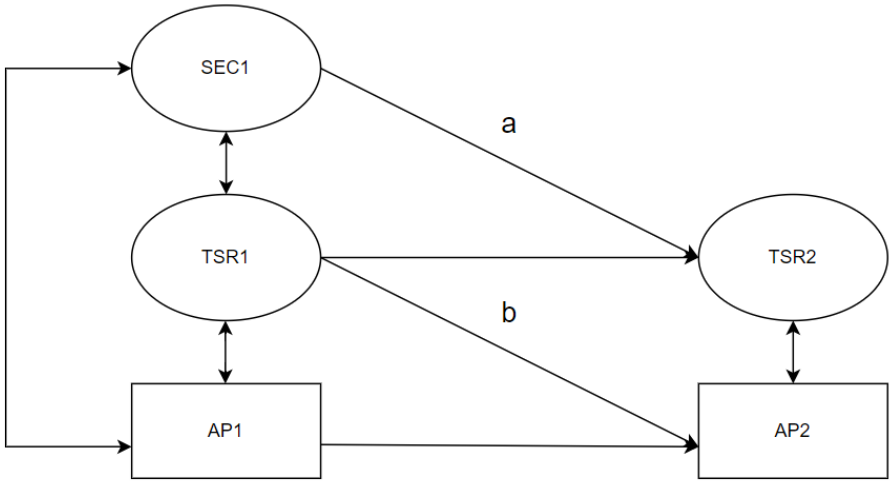
Mediation in general is a causal model that explains the process of ‘‘why’’ and ‘‘how’’ a causal effect happens. Mediation analysis requires at least longitudinal data to establish causal effects (Little, 2013, p. 286-307). Ideally, a mediator should follow the independent variable and precede the dependent variable. Cole and Maxwell (2003) describe a mediation model with just two-time points as a half-longitudinal design. Following this design, the hypothesized model is depicted in Figure 2: a and b are the mediation paths. In Figure 2, a path is the strength of the association between social-emotional competencies at Time 1 and teacher-student relationship at Time 2, controlling for teacher-student relationships at Time 1. Meanwhile, b path is the strength of the association between the teacher-student relationship at Time 1 and academic performance at Time 2 when the prior level of academic performance is controlled. The mediation effect is supported if a, b, and the product of ab is significant. SEM was used to test the mediation model with the longitudinal data of the intervention group. Bootstrap estimation was used to account for the non-normal distribution of the product term.

There are many assumptions to meet before claiming any mediation effect. First, a causal effect is a precondition for any mediation model. In this study, a 2 (Time) × 2 (Condition) mixed repeated-measures ANOVA was used to establish the causal link between social-emotional competencies to academic performance beforehand. It was also hypothesized that the SEL programme would increase students’ academic performance. Specifically, the students who received the programme would have more academic growth than the students in the control group. Further, the half-longitudinal design assumes that the effect of the predictor (social-emotional competencies in this study) on the mediator (teacher-student relationship) from Time 1 to Time 2 would be followed by the effect of the mediator on the change of outcome variable (academic performance) from Time 2 to Time 3 (Little, 2013, p.296). Stationarity and equilibrium are also assumed for any mediation model. Stationarity refers that the causal effects observed between the two measurement occasions

would emerge again if a third wave of data were collected. Equilibrium occurs when the variances and covariances among the measured constructs are unchanging over time. However, these assumptions do not influence the statistical process but the interpretation of the results (Little, 2013, p.295). The mediation may not be stable if the assumptions do not hold. That is, other unmeasured variables may be affecting the function and these impacts may be confounding the mediation effect that are being examined.

Figure 2

The Hypothesized Half-Longitudinal Mediation Model



Note. SEC = social-emotional competencies at Time 1. TSR1 = teacher-student relationships at Time 1; TSR2 = teacher-student relationships at Time 2. AP1 = academic performance at Time 1; AP2 = academic performance at Time 2. a and b are the mediation paths.

Chapter 4 Results

This chapter presents the results of the statistical analyses described in the previous chapter in two sections, aligning with the two study aims, which are the structure and function of social-emotional competencies. Each section has two to three subsections that

present the findings of the statistical analyses in sequence. The first research question is answered in the subsections on exploratory factor analysis and confirmatory factor analysis (Is responsible decision-making, as defined in the CASEL framework, a valid factor in the construct of social-emotional competencies in the transition years before adolescence in Western China?). Findings for the second research question are reported in the subsection on measurement invariance analysis (Is the structure of social-emotional competencies stable during the transition to early adolescence in Western China?). The third research question is answered in the subsection on the causal link between social-emotional competencies and academic performance (Did participation in a SEL programme improve students' academic performance on standardised tests in reading, math, and science?). Finally, the answers to the last research question can be found in the subsection on teacher-student relationship as a mediator (Does teacher-student relationship mediate the association between social-emotional competencies and academic performance?). Each subsection starts with missing patterns of the analytical sample, followed by ways to deal with missing data and examining of assumptions for the statistical analyses. The findings are presented at the end of each subsection.

4.1 The Structure of Social-Emotional competencies

4.1.1 Exploratory Factor Analysis

Twelve percent of the cases have missing data on the 12 scale items, among which 18 cases were with more than 50% missing values. Of the 18 cases, 55% were boys, 50% were left-behind children, and 72% were ethnic minority students. After deletion of these 18 cases, 2,934 cases remained. Little's missing completely at random (MCAR) test suggested that the data were not missing completely at random. Given the missing data only accounted for around 1% of the data, mean imputation was performed (Watkins, 2018). Table 7 presents the descriptive statistics of the imputed data. Univariate skewness and kurtosis were within the safe threshold of normality (skewness is $\geqslant 2$; kurtosis is $\geqslant 7$) (Curran et al., 1996). With Mahalanobis distance, 44 outliers were identified from the sample. Of the 44

outliers, 75% were boys, 50% were left behind students, and 45% were ethnic minority students). Examining the outliers further, it was found that many items were negatively correlated with each other (see Table 1 in Appendix B). The outliers were removed from further analyses. The energy test of multivariate normality indicated that the data did not follow a multivariate distribution among the remaining 2,890 cases. Therefore, the polychoric correlation matrix was deemed to be appropriate input for the EFA (Watkins, 2018).

Table 6

Descriptive Statistics of the Imputed Data for the Baseline Sample

Item	Mean	SD	Median	Skewness	Kurtosis
1	3.31	0.93	4	-1.19	0.35
2	2.94	0.88	3	-0.58	-0.32
3	2.98	0.91	3	-0.61	-0.41
4	2.41	0.98	2	0.09	-0.98
5	2.95	0.89	3	-0.61	-0.29
6	2.99	0.89	3	-0.62	-0.31
7	3.02	0.9	3	-0.66	-0.32
8	3.32	0.83	4	-1.16	0.72
9	2.82	0.91	3	-0.34	-0.7
10	2.79	0.96	3	-0.32	-0.86
11	2.93	0.95	3	-0.54	-0.65
12	3.45	0.85	4	-1.51	1.37

Note. N = 2,890. The content of each item can be found in Table 5.

Although the correlations between the scale items were below 0.3 (see Table 2 in Appendix B), the results of Bartlett's test of sphericity indicated that the correlation matrix

was not random (χ^2[66] = 5,840; p = .00). This was further confirmed with half of the total sample (n = 1,445) that was generated randomly from the sample used for the EFA analysis in this study (χ^2[66] = 2,914; p = .00). Kaiser-Meyer-Olkin (KMO) index was also consulted. The Measure of Sampling Adequacy (MSA) was 0.88, well above the minimum standard for conducting factor analysis (Field, 2012, p.769). After confirming that the correlation matrix was factorable, the subsample with 1,445 participants was submitted for EFA. The parallel analysis suggested a four-factor solution since the eigenvalues of the four factors extracted from the sample were higher than those extracted from random data with both the polychoric and Pearson correlation matrices (see Figure 1 in Appendix A). The scree plot of the factor analysis suggested four factors as well (see Figure 2 in Appendix A).

The four factors explained 35% of the total variance. Before rotations, the first factor explained 25% of the total variance while each of the other three explained an additional 4%, 3% and 2% respectively. Both promax and oblimin rotations were performed. Promax rotation worked better in terms of theoretical convergence. Therefore, the results with promax rotation are reported and examined below. Following the rotation, the four factors explained 12%, 8%, 8% and 7% of the total variance respectively, and 34%, 23%, 24%, and 19% of the common variance. The eigenvalues for the four factors were 1.44, 0.96, 1.00, and 0.79. Table 8 provides the pattern coefficients and communality of each factor. Given the sample size was above 1,000, a loading above 0.29 was considered salient in this analysis (Stevens, 2002, p.393).

The four-factor model deviated from the structure of the original scale, that is the CASEL framework (see Table 8). As theoretically proposed (see the current study in the Chapter 2), the domain of ‘responsible decision making’ disappeared: the three items (1, 5 and 9) loaded onto other domains. Item 1 “I blame others when I am in trouble” loaded together with two ‘relationship skills’ items (“I get along well with others” and “I have one or more close friends”). Item 5 “I feel responsible for how I act” and item 9 “I am good at deciding right from wrong” clustered with two ‘self-management’ items (“I can control how I

behave" and "I think before I act"). Two of the three 'social awareness' items ("I think about how others feel" and "I care about how others feel") loaded on one factor. The one item left in each of the three domains clustered together, forming a new factor that reflects 'social harmony'. The correlations between the four factors ranged from 0.36 to 0.67 (see Figure 3). Similar to the findings of the original scale developers (Mantz et al., 2018), the reliability of the factors was low. The Cronbach's alpha for each factor ranged from 0.39 for social harmony to 0.62 for self-management. The Cronbach's alpha would increase from 0.46 to 0.48 if the item "I blame others when I am in trouble" was dropped. The item also explained the least common variance as indicated in Table 8. The model was also found to be robust with the Pearson correlation matrix.

Table 7

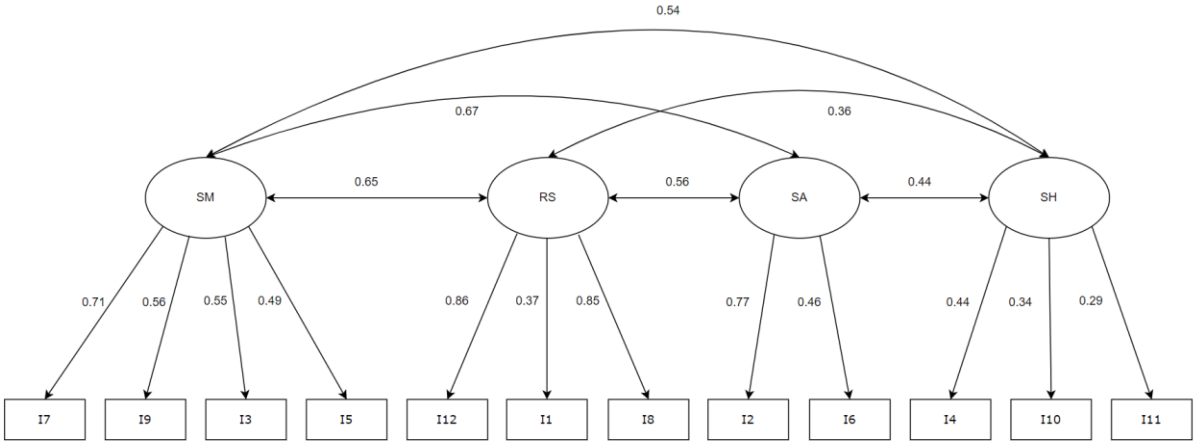
Pattern Coefficients and Communality of Each Item for the EFA

Item	F1	F2	F3	F4	h^2
1. I blame others when I am in trouble.	0.05	**0.37**	0.11	-0.20	0.19
2. I think about how others feel.	-0.06	-0.07	**0.77**	0.15	0.59
3. I can control how I behave.	**0.55**	0.05	0.05	-0.06	0.35
4. I am good at solving conflicts with others.	-0.04	-0.04	0.10	**0.45**	0.21
5. I feel responsible for how I act.	**0.49**	0.02	0.11	-0.06	0.30
6. I care about how others feel.	0.09	0.01	**0.46**	0.14	0.37
7. I think before I act.	**0.71**	-0.02	-0.08	0.02	0.44
8. I get along well with others.	0.08	**0.35**	0.16	0.14	0.35
9. I am good at deciding right from wrong	**0.56**	-0.10	-0.05	0.18	0.34
10. What others think is important to me.	0.01	0.02	0.21	**0.34**	0.24
11. I am good at waiting for what I want.	0.18	0.09	-0.06	**0.29**	0.19
12. I have one or more close friends.	-0.12	**0.86**	-0.22	0.25	0.62

*Note***.** N= 1445**.** Extraction = PA**;** estimator = ML; rotation = promax; h2 = communality. Salient pattern coefficients ⩾0.29 are in bold.

Figure 3

The Factor Loadings with Standardised Parameter Estimates in the EFA



Note. N = 1,445; Estimator = MLM; SEC = social-emotional competencies; SM = self-management; RS = relationship skills; SA = social awareness; SH = social harmony. I1-I12 = the 12 scale item (see Table 8 for the content of each item).

4.1.2 Confirmatory Factor Analysis

CFA was employed to assess the construct validity of the model identified in EFA with the cross-sectional data of fourth and fifth graders and compare the model fit with the CASEL model. Given the reliability of each factor was not good, the second-order model was performed without item 1 (“I blame others when I am in trouble”). Although the scale is ordinal in nature, estimating asymptotic covariance matrix (ACM) of polychoric correlations requires a large sample size (Tabachnick & Fidell, 2014, p.784). Given the exploratory factor

analysis showed the same structure with polychoric and Pearson correlation matrices, Pearson correlation matrix (see Table 3 in Appendix B) was deemed appropriate for the confirmatory analyses with the Satorra–Bentler scaled estimator.

The model demonstrated excellent model fit (see Table 9). Table 10 presents the parameter estimates. Item 4 has the lowest contribution to the corresponding latent construct (social harmony), explaining 14% of the variance, while item 8 explained 44% of the variance in relationship skills. Among the latent constructs, self-management explained the most variance in social-emotional competencies (92%) while relationship skills account for the least (46%). The residual analysis did not indicate any problems (see Figure 3 in Appendix A). No post-hoc modifications were conducted. The factor loadings of the second-order model are depicted in Figure 4 with standardized parameter estimates. The CASEL model also demonstrated good model fit, however, the model derived from EFA fit better across all fit indexes (see Table 9).

Table 8

Goodness of Fit Indexes of the CASEL Model and the EFA Model

Model	x^2	df	p	RMSEA [90% C.I.]	CFI	SRMR
1	44.81	40	.00	0.01 [0.00, 0.02]	1.00[a]	0.02
2	92.32	40	.00	0.03 [0.02, 0.04]	0.97	0.03

Note. N=1445; Estimator = MLM; Model 1 = the model derived from EFA; Model 2 = the CASEL model.

[a] CFI is 0.997 before rounding.

Table 9

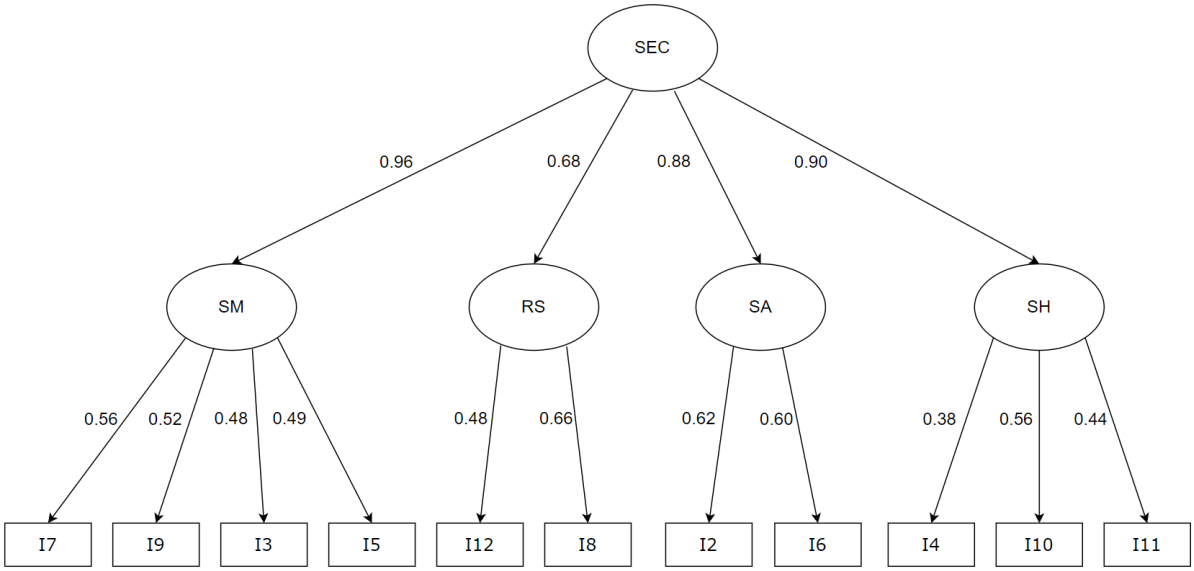
Parameter Estimates of the Model Derived from the EFA

	b	B	SE	r^2
Self-Management	0.96	1.00	-	0.92
Item 7. I think before I act.	0.56	1.00	-	0.32
Item 9. I am good at deciding right from wrong.	0.52	0.94	0.07	0.27
Item 3. I can control how I behave.	0.48	0.85	0.06	0.23
Item 5. I feel responsible for how I act.	0.49	0.87	0.07	0.24
Relationship Skills	0.68	0.56	0.07	0.46
Item 12. I have one or more close friends.	0.48	1.00	-	0.23
Item 8. I get along well with others.	0.66	1.36	0.14	0.44
Social Awareness	0.88	1.00	0.08	0.77
Item 2. I think about how others feel.	0.62	1.00	-	0.39
Item 6. I care about how others feel.	0.60	0.96	0.07	0.36
Social Harmony	0.90	0.69	0.07	0.81
Item 4. I am good at solving conflicts with others.	0.38	1.00	-	0.14
Item 10. What others think is important.	0.56	1.46	0.15	0.31
Item 11. I am good at waiting for what I want.	0.44	1.13	0.12	0.20

Note. N = 1,445; Estimator = MLM; b = standardised factor loading; B = unstandardised factor loading; SE = standardised error; r^2 = the percentage of explained variance. The estimates of the first factor and the first item within each factor were fixed at 1.

Figure 4

The Factor Loadings with Standardised Parameter Estimates in the CFA



Note. N = 1,445. Estimator = MLM. SEC = social-emotional competencies. SM = self-management. RS = relationship skills.SA = social awareness. SH = social harmony. The estimates of the first factor and the first item within each factor were fixed at 1. I1 - I12 = the 12 scale item (see Table 10 for the content of each item).

4.1.3 Measurement Invariance Analysis

The model derived from the EFA was fitted with the longitudinal sample by experimental condition to examine the stability of the model during the transition to adolescence. Before that, the missing data were examined. Twenty-first percent of the cases with missing data on the social-emotional scale at two time points. Given the sample size (1,113 participants) was much smaller than the baseline of 3,400 participants, 60% of missing data were set as the cut-off for case deletion. No cases were found to have missing data over 60%. The full sample was kept for further analysis. Little's missing completely at random (MCAR) test suggested that the data were not missing completely at random. Given the missing data only account for less than 5% of the data, mean imputation was performed. The descriptive statistics of the imputed data are presented in Table 4 in Appendix B. As expected, univariate skewness and kurtosis were within the safe threshold of normality (skewness is $\geqslant$2; kurtosis is $\geqslant$7).

With Mahalanobis distance, 25 outliers were found in the intervention group (of these, 21 boys were boys, 13 were left-behind children, and 19 were ethnic minority students) and 22 outliers were identified in the control group (of these, 14 were boys, 9 were left-behind students, and 12 were ethnic minority students). For the outliers, the correlations of the items between Time 1 and Time 2 are presented in Table 5 (for the intervention group) and Table 6 (for the control group) in Appendix B. Most items at Time 1 were negatively correlated with Time 2. These cases were kept for further analyses, considering the participants were at the development stage of transiting to adolescence. The energy test of multivariate normality indicated that the data did not follow a multivariate distribution in both the intervention and control group. The Yuan-Bentler scaled test statistic (MLR) was used for estimation to account for the non-normal distribution and the relatively small sample size (Tabchnick & Fidell, 2014, p.769).

The covariance matrix was checked by groups (see Table 7 and Table 8 in Appendix B). The covariances of the intervention group were smaller than the covariance of the control group. With the 573 participants in the intervention group, it was found that the measurement model did not fit. The parameter estimates that were most consistent with the data required negative variance. The CASEL model was fitted next with the intervention sample, considering it demonstrated a good model fit. Again, a negative variance was estimated. Likely, there were not enough covariances between the scale items to provide enough variances for the latent variables due to the interventions. Therefore, the one-factor model was tested. The one factor model demonstrated an acceptable model fit (χ^2[44] = 107.23; CFI = 0.93; RSMEA = 0.59 [0.45, 0.73]; SRMR = 0.41).

With the 540 participants in the control group, the model demonstrated an excellent good fit across the three types of invariance analysis (see Table 11). No post-hoc modifications were conducted. The residual analyses did not indicate any problems as well (see Figure 4 in Appendix A). According to the evaluation criteria, metric invariance was fully supported, given that all the indexes were much less than the cut-off values except the χ^2

difference test (χ^2 difference test is known to be sensitive to sample size). Scalar invariance was supported roughly since ΔCFI was above the cut-off of 0.01 while the other indexes were below the cut-offs. The parameter estimates in metric invariance are provided in Table 12. While item 4 has the lowest contribution (17%) to the corresponding latent construct at Time 1, item 12 becomes the lowest at Time 2 (22%). Item 8 explained the most variance of the corresponding latent construct across both time points (56% at Time 1 and 60% at Time 2). Among the latent constructs, self-management explained the most variance in social-emotional competencies (90%) at Time 1, while social harmony contributed the most at Time 2 (93%).

Table 10

The Goodness of Fit Indexes of Measurement Invariance Analysis

Model	χ^2	df	p	RMSEA	CFI	SRMR	$\Delta\chi^{2a}$	Δdf	p	$\Delta RMSEA$	ΔCFI	$\Delta SRMR$
Configural	240.920	200	0.025	0.021	0.980	0.037						
Metric	254.585	207	0.013	0.022	0.976	0.042	14.154	7	.049	0.001	0.004	0.005
Scalar	325.303	218	0.000	0.030	0.947	0.050	81.945	11	< .000	0.008	0.029	0.008

Note. N= 540. Estimator = MLR. Cut-off for $\Delta\chi^2$ p>0.05, ΔRMSEA ≤ 0.015, ΔCFI ≤0.01, ΔSRMR ≤ 0.03 for metric invariance and ΔSRMR ≤ 0.01 for scalar invariance. The estimates of the first factor and the first item within each factor were fixed at 1. Three decimal points are kept in this table to capture the differences in the change of model fit indexes.

[a] $\Delta\chi^2$= Yuan-Bentler scaled χ^2difference test.

Table 11

Parameter Estimates of Metric Measurement Invariance

	Time 1				Time 2			
	B	SE	b	r^2	B	SE	b	r^2
Self-Management	**1.00**	**0.00**	**0.95**	**0.90**	**1.00**	**0.00**	**0.91**	**0.83**
Item 7. I think before I act.	1.00	0.00	0.63	0.39	1.00	0.00	0.62	0.38
Item 9. I am good at deciding right from wrong.	0.95	0.06	0.57	0.33	0.95	0.06	0.60	0.37
Item 3. I can control how I behave.	0.89	0.06	0.55	0.31	0.89	0.06	0.60	0.36
Item 5. I feel responsible for how I act.	0.88	0.07	0.52	0.27	0.88	0.07	0.58	0.34
Relationship Skills	**0.57**	**0.08**	**0.76**	**0.57**	**0.59**	**0.08**	**0.74**	**0.55**
Item 12. I have one or more close friends.	1.00	0.00	0.48	0.23	1.00	0.00	0.47	0.22
Item 8. I get along well with others.	1.55	0.16	0.75	0.56	1.55	0.16	0.78	0.60
Social Awareness	**0.92**	**0.10**	**0.87**	**0.75**	**0.89**	**0.09**	**0.87**	**0.76**
Item 2. I think about how others feel.	1.00	0.00	0.66	0.43	1.00	0.00	0.64	0.41
Item 6. I care about how others feel.	1.13	0.08	0.70	0.49	1.13	0.08	0.70	0.50
Social Harmony	**0.65**	**0.08**	**0.85**	**0.73**	**0.91**	**0.11**	**0.96**	**0.93**
Item 4. I am good at solving conflicts with others.	1.00	0.00	0.41	0.17	1.00	0.00	0.51	0.26
Item 10. What others think is important.	1.23	0.11	0.54	0.29	1.23	0.11	0.59	0.35
Item 11. I am good at waiting for what I want.	1.14	0.11	0.49	0.24	1.14	0.11	0.56	0.31

Note. N = 540. Estimator = MLR. B = unstandardised factor loading; SE = standardised error; b = standardised factor loading;

r^2= the percentage of explained variance. The factor loadings were fixed at the same for Time 1 and Time 2.

4.2 The Function of Social-emotional competencies

4.2.1 The Causal Link Between Social-Emotional Competencies and Academic Performance

Four percent of cases with one or two missing values on the standardized test scores in reading, math, and science. Little's missing completely at random (MCAR) test suggested that the data were missing completely at random. The pairwise deletion was used to deal with the missing data. With Mahalanobis distance, eight outliers were identified. These cases were kept for analysis since there was no evidence suggesting these data were inputted by mistake. Table 13 presents the descriptive statistics of academic performance by groups. Although the intervention group showed slightly higher performance across all three subjects at Time 1, the academic growth of the intervention group was higher than the control group (also see Figure 5 - 7 in Appendix A). The academic scores are approximately normally distributed across the time points, groups, and subjects (also see Figure 8 - 10 in Appendix A). Although homogeneous variances across groups were not met for math and science performance at Time 2 as suggested by the Levene's tests, ANOVA is generally robust to violations of the assumption as long as group sizes are roughly equal, that is the ratio of the largest to the smallest group being less than 1.5 (Bouneau, 1960; Blanca et. al, 2018). The assumption of sphericity was met across the subjects.

Table 12

Descriptive Statistics of Students' Academic Performance

Academic Performance	Intervention Group				Control Group			
	M	SD	Skewness	Kurtosis	M	SD	Skewness	Kurtosis
Time 1								
Reading	0.41	0.14	0.31	-0.43	0.40	0.16	0.53	-0.33
Math	0.45	0.12	0.23	-0.19	0.44	0.12	0.17	-0.33
Science	0.47	0.14	-0.14	-0.50	0.46	0.14	0.05	-0.51
Time 2								
Reading	0.61	0.18	-0.53	-0.44	0.56	0.18	-0.29	-0.70
Math	0.71	0.18	-0.59	-0.41	0.65	0.19	-0.24	-0.87
Science	0.67	0.14	-0.77	-0.33	0.64	0.16	-0.67	0.01

Note. n = 573 for the intervention group; n = 540 for the control group. SE = 0.01 across subjects, groups, and time points. $\Delta reading = 0.20, \Delta math = 0.26, \Delta science = 0.20$ for the intervention group; Δreading = 0.02, Δmath = 0.07, Δscience = 0.02 for the control group.

Type 1 sums of squares was used for estimation given the experimental design with a roughly equal sample size (Tabachnick & Fidell, 2014, p.257). As shown in Table 14, a significant interaction between group and time was found in reading and math, but not science. It indicated that students' academic growth in reading and math between the two-time points was significantly different between the two groups. According to the mean differences (see Table 13), the intervention group showed significantly higher growth on reading and math tests. Although the effect size was small, especially for reading, the causal link between social-emotional competencies to reading and math performance was generally supported. The results did not change when excluding the students in the control group, who also received the interventions as they moved from satellite schools to main schools, and their comparisons.

Table 13

Students' Academic Performance Across Time and Groups

Subject	**Effects**					
	Group		**Time**		**Time × Group**	
	F	η^2	F	η^2	F	η^2
Reading	13.314**	0.009	1,413.700**	0.244	20.273**	0.005
	(1, 1,088)		(1, 1,088)		(1, 1,088)	
Math	18.475**	0.013	2713.889**	0.367	47.435**	0.010
	(1,097)		(1,097)		(1,097)	
Science	8.283**	0.006	2,516.692**	0.310	2.171	0.000
	(1, 1097)		(1, 1097)		(1, 1097)	

Note. The numbers in parentheses are degrees of freedom. Reading: n = 531 for the intervention group and n = 540 for the control group; Math: n = 567 for the

intervention group and n = 532 for the control group; Science: n = 563 for the intervention group and n = 536 for the control group. Sums of squares = Type 1. Three decimal points are kept in this table to capture the differences in η^2.

** $p < .05$.

4.2.2 Teacher-Student Relationship as A Mediator

Before fitting data with the hypothesized model, measurement invariance analysis was conducted to test the measurement stability of teacher-student relationships. The data cleaning procedures were the same as in previous analyses. Less than 5% of data were missing not completely at random. Up to four cases out of 573 cases that have more than 60% of data missing were deleted before mean imputation (four cases for math teacher-student relationships and two cases for reading teacher-student relationships). Multivariate normality was violated and therefore MLR was used for estimation. With Mahalanobis distance, around 20 outliers were identified across the two subjects. These cases were kept for analysis since there was no evidence suggesting these data were inputted by mistake. The goodness of fit indexes are presented in Table 15. According to the evaluation criteria, both metric and scalar invariance was fully supported for reading and math. The metric invariance model was used in the following model since the mode did not estimate means.

Table 16 presents the correlations among the variables that constructed the model. The correlation between academic performance at Time 1 and Time 2 was the strongest (around 0.6), followed by the concurrent correlation between social-emotional competencies and teacher-student relationship (0.31 for reading and 0.39 for math). Teacher-student relationships between Time 1 and Time 2 showed the lowest association (less than 0.2). The other correlations ranged from 0.20 to 0.30. The covariance matrix of the latent variables for reading and math is presented in Table 9 and Table 10 in Appendix B.

Table 14

Goodness of Fit Indexes of Measurement Invariance Analysis for Teacher-Student Relationship

Model	χ^2	df	p	RMSEA	CFI	SRMR	$\Delta\chi^2$	Δdf	p	$\Delta RMSEA$	ΔCFI	$\Delta SRMR$
Reading												
Configural	55.517	34	0.011	0.040	0.987	0.025						
Metric	66.022	38	0.003	0.043	0.983	0.044	11.219	4	<.010	0.003	0.004	0.019
Scalar	83.698	43	0.000	0.047	0.976	0.057	21.411	5	<.000	0.004	0.007	0.013
Math												
Configural	62.973	34	0.002	0.046	0.982	0.035						
Metric	69.999	38	0.001	0.045	0.981	0.046	6.981	4	.137	-0.001	0.001	0.011
Scalar	87.896	43	0.000	0.049	0.974	0.049	20.743	5	<.000	0.004	0.007	0.003

Note. N=571 for Reading, N=569 for Math**;** $\Delta\chi^2$= Satorra–Bentler scaled χ^2 difference test. Cut-off for $\Delta\chi^2$ p>0.05, ΔRMSEA ≤ 0.015, ΔCFI ≤0.01, ΔSRMR ≤ 0.03 for metric invariance and ΔSRMR ≤ 0.01 for scalar invariance.

Table 15

Correlations Among Social-emotional competencies, Academic Performance, and Teacher-Student Relationship

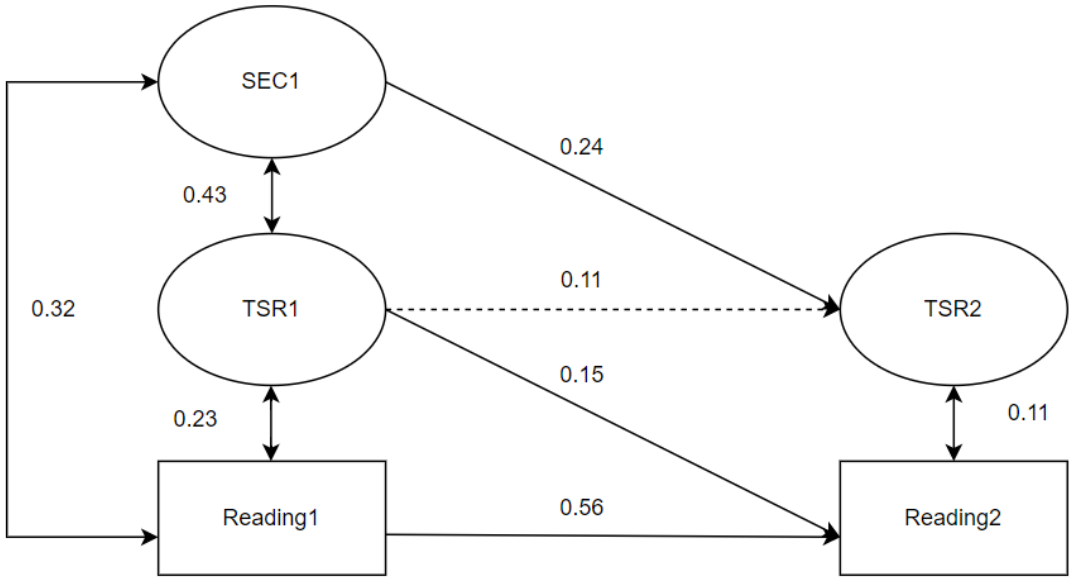
	read1	math1	read2	math2	sec1	tsr1	tsm1	tsr2	tsm2
read1	1.00								
math1	0.52	1.00							
read2	**0.60**	0.54	1.00						
math2	0.55	**0.65**	0.72	1.00					
sec1	**0.28**	**0.18**	0.33	0.23	1.00				
tsr1	**0.21**	0.16	**0.25**	**0.20**	**0.31**	1.00			
tsm1	0.27	**0.18**	0.28	0.23	**0.39**	0.68	1.00		
tsr2	0.20	0.11	**0.24**	0.19	**0.25**	**0.19**	0.26	1.00	
tsm2	0.15	0.17	0.24	**0.29**	**0.16**	0.09	**0.18**	0.60	1.00

Note. read1 = reading performance at Time 1; read2 = reading performance at Time2. math1 = math performance at Time 1; math2 = math performance at Time2. tsr1 = teacher-student relationship for reading at Time 1; tsr2 = teacher-student relationship for reading at Time 2. tsm1 = teacher-student relationship for math at Time 1; tsm2 = teacher-student relationship for math at Time 2. The correlations between the key variables in the hypothesized model are in bold.

The path models with standardized estimates are presented in Figure 5 for reading and Figure 6 for math. Both models demonstrated good model fits. The model explained 37.40% of the variance in students' reading performance and 43.10% of the variance in students' math performance. Teacher-student relationship mediated the association between social-emotional competencies and reading performance but not math. The path from social-emotional competencies to teacher-student relationship was not significant for math. As shown in Table 17, the product term of the mediation paths was only significant for reading. It is worth noting that the path from teacher-student relationship at Time 1 to Time 2 was not significant for reading but for math.

Figure 5

The Half-Longitudinal Mediation Model for Reading

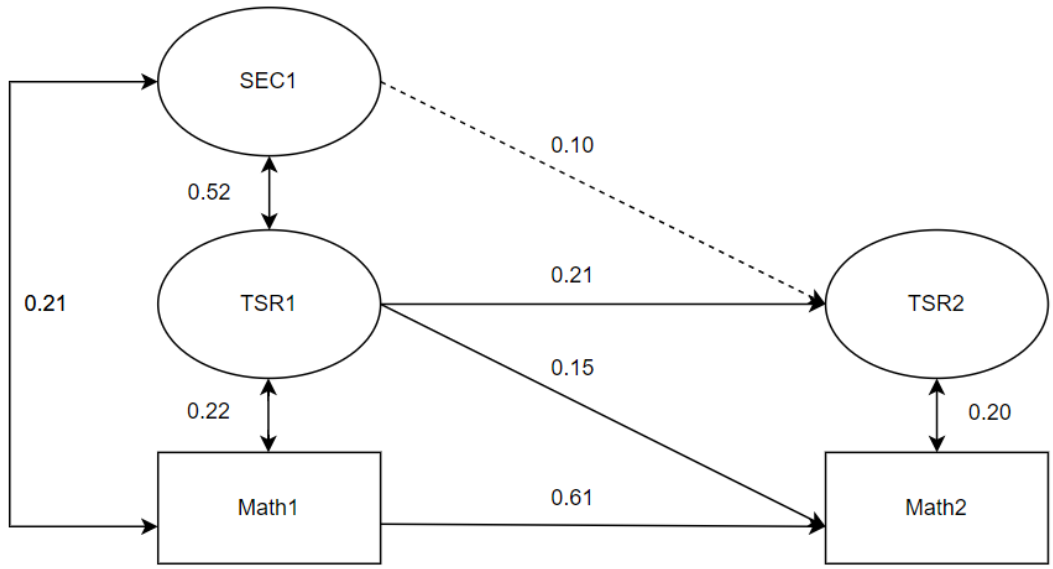


Note. SEC1 refers to social-emotional competencies at Time 1 and Time 2. TSR1 and TSR2 are students' perceived relationships with their reading teachers at Time 1 and Time 2. Reading1 and Reading 2 are reading performance at Time 1 and Time 2. The latent variables are in ovals and the observed variables are in rectangles. The dashed line

represents a non-significant pathway. Values on the arrow lines are standardised regression estimates. N=500; Estimator = MLR; χ^2[225] = 407.01, p =.00; CFI = 0.94; RMSEA = 0.04, 90% CI = [0.03, 0.05]; SRMR = 0.05.

Figure 6

The Half-Longitudinal Mediation Model for Math



Note. SEC1 refers to social-emotional competencies at Time 1 and Time 2. TSR1 and TSR2 are students' perceived relationships with their math teachers at Time 1 and Time 2. Math1 and Math 2 are reading performance at Time 1 and Time 2. The latent variables are in ovals and the observed variables are in rectangles. The dashed line represents a non-significant pathway. Values on arrow lines are standardised regression estimates. N=500; MLR χ^2[225] = 318.78, p =.00; CFI = 0.97; RMSEA = 0.03; 90% CI = [0.02, 0.04]; SRMR = 0.05.

Table 16

The Mediation of Teacher-Student Relationship in the Association Between Social-Emotional

Competencies and Academic Performance

Subject	Est	SE	p	Bootstrapped 95% CI
Reading	0.006	0.002	.013	[.002, .011]
Math	0.003	0.002	.274	[-.002, .007]

Note. Est = unstandardised product term of the mediation paths; SE = standard error; CI = confidence interval. Bootstrap=1,000. Three decimal points are kept in this table to capture the small differences in the estimates.

Chapter 5 Discussion

This study aims to investigate the structure and function of social-emotional competencies during the transition years to adolescence in Western China. Utilising the data from a SEL programme, the study tries to answer: (1) Does the structure of social-emotional competencies as defined by the CASEL framework replicate in a collectivistic culture? More specifically, is responsible decision-making, as defined in the CASEL framework, a valid factor in the construct of social-emotional competencies in the transition years before adolescence in Western China? (2) Is the structure of social-emotional competencies stable during the transition to early adolescence in Western China? (3) What is the association between social-emotional competencies and academic performance? More specifically, did participation in a SEL programme improve students' academic performance on standardised tests in reading, math, and science? (4) Does teacher-student relationship mediate the association between social-emotional competencies and academic performance? This chapter interprets the statistical results from Chapter 4 and explains how the findings answer the research questions based on the existing literature. The strengths and limitations of the study are presented at the end along with the implications for future research and educational practices.

5.1 The Structure of Social-Emotional competencies

It was found that responsible decision marking did not stand as a separate domain as described in the CASEL framework. Items said to tap into this domain in the CASEL framework were found to instead be integrated into the domain of self-management, relationship skills and social awareness. The finding aligns with the theoretical and empirical evidence in the literature about the independent self in more individualistic cultures and the interdependent self in more collectivistic cultures. Unlike the goal of separating the self from others in more individualistic cultures, the interdependent self that nurtured in more collectivistic cultures tends to integrate the perspectives of others into the self. Therefore, as a domain of considering others' perspectives, items originally marked as responsible decision marking was not valid as an individual domain anymore in the more collectivistic culture of the present study.

Instead, social harmony that represents the effort and willingness to achieve collective benefits emerged as a separate factor. This aligns with the conceptual framework of the adapted SEL programme that being examined in this study, in which collective awareness and management are separated from awareness and management of the self and others. The three items loaded on the new factor included two items reflecting the skills to achieve collective benefits ("I am good at solving conflicts with others" and "I am good at waiting for what I want") and one item representing collective awareness ("What others think is important"). Further, the item "I blame others when I am in trouble" was found to be a poor item in terms of internal consistency, stressing the value of social harmony in the collectivistic culture.

The four-factor model obtained from EFA was found to be stable during the transition to early adolescence (11-13 years). However, the social harmony domain replaced the self-management domain, becoming the most influential factor in social-emotional competencies as students transiting to adolescence, while social awareness and relationship skills remained the same. This aligns with the previous literature on the increasing influence of

peers during adolescence. As peers are valued more and more by young adolescents, the need to “fit in” a social group may increase at the same time in more collectivistic cultures. Therefore, the social harmony domain that reflects the awareness and ability to “fit in” became more salient than the domain of self-management in Grade 6.

5.2 The Function of Social-Emotional Competencies

It was found that the adapted SEL programme under investigation improved students reading and math performance on the standardised tests but not science. This aligns with the evidence from other intervention studies that science tends to have a smaller effect size compared to reading and math (Corcoran et al., 2018). The SEL programme showed a larger effect size on math than reading. The finding seems not support the idea that social-emotional competencies overlaps with the learning content of humanity subjects. Moreover, it was found that teacher-student relationships only mediated the association between social-emotional competencies and reading performance but not math. The findings indicated that there are other paths from social-emotional competencies to academic performance for the investigated SEL programme.

Specifically, social-emotional competencies at Time 1 did not predict the relationships with math teachers at Time 2, while the relationships with math teachers at Time 1 did predict math performance at Time 2. In addition, teacher-student relationships at Time 1 did not predict teacher-student relationship at Time 2 for reading, but the path was significant for math. It is possible that the interventions were mainly implemented by reading teachers as the SEL curriculum links more closely with the reading subject. Students might form emotional bonds with the teachers through SEL classes. Meeting the basic psychological need for relatedness could motivate students to engage more in the subject taught by the teachers.

In addition, the SEL programme may directly impact students’ motivation to learn, since the SEAL programme, from which the SEL programme was adapted, included the domain of motivation in the conceptual framework. Some research suggests that learning

behaviours may have a stronger impact on math than reading (McDermott, Mordell, & Stoltzfus, 2001; Mägi et al., 2016; Zhang et al., 2018; Tulis & Fulmer, 2013; Levitt et. al, 2016). Since math concepts are relatively abstract and complex, learning math may be more cognitively demanding and therefore require more motivation and persistence (Clements, Sarama, & Germeroth, 2016; Zimmerman & Campillo, 2003, Chapter 8). This may explain the larger effect found in math than reading. Regarding the null result on science performance, it is possibly due to the less importance attached to the subject. Science is taken as a “minor” subject in China, accounting for less than 10% of teaching time, while math and reading as “main” subjects account for around 15% and 20% of the teaching time respectively (Ministry of Education, China, 2020).

5.3 Strengthens and Limitations

This study contributes to the literature in several ways. First, it uncovers the cultural differences in social-emotional competencies between a typically more individualistic society and with a typically more collective society. The study alerts researchers and practitioners in the field that assuming universals in social-emotional concepts could be problematic. Second, the study is believed to be the first to demonstrate the positive impact of an adapted school-based SEL programme on students’ academic performance in Western China. It provides promising evidence on the improvement of students’ learning outcomes in reading and math to support the implementation of SEL programmes in disadvantaged areas in China, especially with a large portion of ethnic minority and left-behind children. Last, the study suggests how an effective SEL programme may improve students’ performance, providing reference or questions for future research. For example, the inclusion of motivation contents into the SEL curriculum may be critical to improve students’ academic performance. In addition, teacher facilitated SEL programme may be more effective since it was found that teacher-student relationship mediated the association between social-emotional competencies and reading performance in this study.

There are also some limitations to the study. First, the sample was not randomly

selected in China. It was drawn from the CFS schools in Mile, which were selected jointly by UNICEF China and local educational authorities with a focus on vulnerable children, including ethnic minorities and left-behind children. Therefore, the findings might not apply to the whole student population in Mile or other areas in China, but may be most relevant to disadvantaged children such as those in rural schools or who are ethnic minority and left-behind. Second, only 57% of the fourth graders in the first wave were followed in the second wave. Given the sampling was done at the class level, the large attrition was likely caused by re-assigning students to different classes and schools when they moved to higher grades, especially the children in satellite campuses without higher grades. However, it is not possible to assess the effect of attrition on the results in the current study. Third, with two-time-point data, it is not feasible to confirm that the effect of the social-emotional competencies on teacher-student relationship from Time 1 to Time 2 would be followed by the effect of teacher-student relationship on the change of academic performance from Time 2 to Time 3. Similarly, it cannot be guaranteed that the causal effects observed between the two measurement occasions would emerge again if a third wave of data were collected. Future research is needed to confirm the mediation effect with at least three-time point data. Finally, the data was nested in nature: students nested within classes or schools. Multi-level modelling is the ideal method to deal with the issue. However, it is not feasible for the author to do it within the timeframe of the dissertation.

5.4 Implications for Future Research and Practices

The study highlights the need for social-emotional competencies scales that fit the Chinese culture, since the Western scales appear to dominate the studies with Chinese students. Future research is also in need to replicate the findings of the causal link between social-emotional competencies and academic performance and investigate the indirect pathways, especially through motivation and relatedness. However, more cultural appropriate social-emotional interventions are required before that. The SEL programme investigated in this study was arguable the first school based SEL programme that has

demonstrated promising effects on students' academic performance. Although it was adapted from a Western SEL programme, the adaptation was guided by a conceptual framework that appears to be appropriate to the local culture (e.g., including the perspective of the collective). Structural level changes were observed in the adapted curriculum following the framework. This could be a reference for future intervention development or educational practices in social-emotional learning in China.

References

Abrahams, L., Pancorbo, G., Primi, R., Santos, D., Kyllonen, P., John, O. P., & De Fruyt, F. (2019). Social-emotional skill assessment in children and adolescents: Advances and challenges in personality, clinical, and educational contexts. *Psychological Assessment, 31*(4), 460–473. https://doi.org/10.1037/pas0000591

Ainsworth, M. S. (1989). Attachments beyond infancy. *American Psychologist*, *44*(4), 709-716. https://doi.org/10.1037/0003-066X.44.4.709

Areepattamannil, S., Freeman, J. G., & Klinger, D. A. (2011). Intrinsic motivation, extrinsic motivation, and academic achievement among Indian adolescents in Canada and India. *Social Psychology of Education, 14*(3), 427-439. https://doi.org/10.1007/s11218-011-9155-1

Bear, G. G., Yang, C., Glutting, J., Huang, X., He, X., Zhang, W., & Chen, D. (2014). Understanding teacher-student relationships, student-student relationships, and conduct problems in China and the United States. *International Journal of School & Educational Psychology, 2*(4), 247-260. https://doi.org/10.1080/21683603.2014.883342

Bear, G., Yang, C., Harris, A., Mantz, L., Hearn, S., & Boyer, D. (2019). *Technical Manual for the Delaware School Survey: Scales of School Climate; Bullying Victimization; Student Engagement; Positive, Punitive, and Social Emotional Learning Techniques; and Social and Emotional Competencies*. Delaware Positive Behavior Support (DE-PBS) and School Climate Transformation Projects. https://www.researchgate.net/publication/340934241_Technical_Manual_for_Delaware_School_Surveys_2019

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological bulletin, 107*(2), 238–246. https://doi.org/10.1037/0033-2909.107.2.238

Berlin, L.J., Cassidy, J., & Appleyard, K. (2008). The influence of early attachments on other relationships. In J. Cassidy & P.R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 333–347). Guilford Press.

Blanca, M. J., Alarcón, R., Arnau, J., Bono, R., & Bendayan, R. (2018). Effect of variance ratio on ANOVA robustness: Might 1.5 be the limit? *Behavior Research Methods*, *50*(3), 937-962. https://doi.org/10.3758/s13428-017-0918-2

Boneau, C. A. (1960). The effects of violations of assumptions underlying the t test. *Psychological Bulletin*, *57*(1), 49-64. https://doi.org/10.1037/h0041412

Briggs, N. E., & MacCallum, R. C. (2003). Recovery of weak common factors by maximum likelihood and ordinary least squares estimation. *Multivariate Behavioral Research*, *38*(1), 25-56. https://doi.org/10.1207/S15327906MBR3801_2

Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: Research perspectives. *Developmental psychology, 22*(6), 723. https://psycnet.apa.org/buy/1987-06791-001

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological methods & research*, *21*(2), 230-258. https://doi.org/10.1177/0049124192021002005

Caliendo, M., & Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of economic surveys*, *22*(1), 31-72. https://doi.org/10.1111/j.1467-6419.2007.00527.x

Chen, C., Yang, C., & Nie, Q. (2021). Social-emotional learning competencies and problematic internet use among Chinese adolescents: A structural equation modeling analysis. *International journal of environmental research and public health, 18*(6), 3091. https://doi.org/10.3390/ijerph18063091

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural equation modeling: A multidisciplinary journal, 14*(3), 464-504. https://doi.org/10.1080/10705510701301834

Chen, X., & French, D. C. (2008). Children's social competence in cultural context. *Annual Review of Psychology, 59*, 591-616. https://doi.org/10.1146/annurev.psych.59.103006.093606

Chen, X., Cen, G., Li, D., & He, Y. (2005). Social functioning and adjustment in Chinese children: The imprint of historical time. *Child development, 76*(1), 182-195. https://doi.org/10.1111/j.1467-8624.2005.00838.x

Chung, K. K. H., Lam, C. B., & Liew, J. (2020). Studying children's social-emotional development in school and at home through a cultural lens. *Early Education and Development, 31*(6), 927-929. https://doi.org/10.1080/10409289.2020.1782860

Clements, D. H., Sarama, J., & Germeroth, C. (2016). Learning executive function and early mathematics: Directions of causal relations. *Early Childhood Research Quarterly*, *36*, 79-90. https://doi.org/10.1016/j.ecresq.2015.12.009

Cole, D. A., & Maxwell, S. E. (2003). Testing Mediational Models With Longitudinal Data: Questions and Tips in the Use of Structural Equation Modeling. *Journal of Abnormal Psychology, 112*(4), 558–577. https://doi.org/10.1037/0021-843X.112.4.558

Collaborative for Academic, Social, and Emotional Learning. (2013). *Effective Social and Emotional Learning Programs.* https://ed.buffalo.edu/content/dam/ed/alberti/docs/CASEL-Guide-SOCIAL-EMOTIONAL-LEARNING.pdf

Corcoran, R., P., Cheung, A., C.K., Kim, E., & 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*, *25*, 56-72. https://doi.org/10.1016/j.edurev.2017.12.00

Crystal, D. S., Watanabe, H., Weinfurt, K., & Wu, C. (1998). Concepts of human differences: A comparison of American, Japanese, and Chinese children and adolescents. *Developmental Psychology, 34*(4), 714–722. https://doi.org/10.1037/0012-1649.34.4.714

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological methods*, *1*(1), 16. https://psycnet.apa.org/buy/1996-03170-002

Davis, H. A. (2003). Conceptualizing the role and influence of student-teacher relationships on children's social and cognitive development. *Educational psychologist*, *38*(4), 207-234. https://doi.org/10.1207/S15326985EP3804_2

De Fruyt, F., Wille, B., & John, O. P. (2015). Employability in the 21st century: Complex (interactive) problem solving and other essential skills. *Industrial and Organizational Psychology*, *8*(2), 276-281. https://doi.org/10.1017/iop.2015.33

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development, 82*(1), 405-432. https://doi.org/10.1111/j.1467-8624.2010.01564.x

Eccles, J. S. (1999). The development of children ages 6 to 14. *The future of children*, *9*(2), 30-44. https://doi.org/10.2307/1602703

Elias, M. J., & Haynes, N. M. (2008). Social competence, social support, and academic achievement in minority, low-income, urban elementary school children. *School Psychology Quarterly, 23*(4), 474–495. https://doi.org/10.1037/1045-3830.23.4.474

Ellefson, M. R., Ng, F. F. Y., Wang, Q., & Hughes, C. (2017). Efficiency of executive function: a two-generation cross-cultural comparison of samples from Hong Kong and the United Kingdom. *Psychological science*, *28*(5), 555-566. https://doi.org/10.1177/0956797616687812

English, T., & Chen, S. (2007). Culture and self-concept stability: Consistency across and within contexts among Asian Americans and European Americans. *Journal of Personality and Social Psychology, 93*(3), 478–490. https://doi.org/10.1037/0022-3514.93.3.478

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods, 4*(3), 272–299. https://doi.org/10.1037/1082-989X.4.3.272

Fearon, R. P., Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Lapsley, A. M., & Roisman, G. I. (2010). The significance of insecure attachment and disorganization in the development of children's externalizing behavior: a meta-analytic study. *Child development*, *81*(2), 435-456. https://doi.org/10.1111/j.1467-8624.2009.01405.x

Field, A., Miles, J., & Field, Z. Discovering Statistics Using R (2012). *Sage*.

Finn, A. N., Schrodt, P., Witt, P. L., Elledge, N., Jernberg, K. A., & Larson, L. M. (2009). A meta-analytical review of teacher credibility and its associations with teacher behaviors and student outcomes. *Communication education*, *58*(4), 516-537. https://doi.org/10.1080/03634520903131154

Frydenberg, E., Martin, A., & Collie, R. (2017). *Social and emotional learning in Australia and the Asia-Pacific: Perspectives, programs and approaches*. Singapore.

Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology, 95*(1), 148–162. https://doi.org/10.1037/0022-0663.95.1.148

Gresham, F., Elliott, S., Metallo, S., Byrd, S., Wilson, E., Erickson, M., Cassidy, K., & Altman, R. (2020). Psychometric fundamentals of the social skills improvement system: Social–emotional learning edition rating forms. *Assessment for Effective Intervention*, *45*(3), 194-209. https://doi.org/10.1177/1534508418808598

Groh, A. M., Fearon, R. P., Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Steele, R. D., & Roisman, G. I. (2014). The significance of attachment security for children's social competence with peers: A meta-analytic study. *Attachment & human development*, *16*(2), 103-136. https://doi.org/10.1080/14616734.2014.883636

Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of personality and social psychology, 52*(5), 890-898. https://psycnet.apa.org/buy/1987-26534-001

Hayashi, A., Liew, J., Aguilar, S. D., Nyanamba, J. M., & Zhao, Y. (2022). Embodied and social-emotional learning (SEL) in early childhood: Situating culturally relevant SEL in Asian, African, and North American contexts. *Early Education and Development, 33* (5), 746-763. https://doi.org/10.1080/10409289.2021.2024062

Hecht, M. L., & Shin, Y. (2015). Culture and social and emotional competencies. In J. A. Durlak, C. E. Domitrovich, R. P. Weissberg, & T. P. Gullotta (Eds.), *Handbook of social and emotional learning: Research and practice* (pp. 50–64). The Guilford Press.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: A multidisciplinary journal*, *6*(1), 1-55. https://doi.org/10.1080/10705519909540118

Hu, L.-t., Bentler, P. M., & Kano, Y. (1992). Can test statistics in covariance structure analysis be trusted? *Psychological Bulletin, 112*(2), 351–362. https://doi.org/10.1037/0033-2909.112.2.351

Hughes, J. N. (2012). Teacher–student relationships and school adjustment: Progress and remaining challenges. *Attachment & human development*, *14*(3), 319-327. https://doi.org/10.1080/14616734.2012.672288

Humphrey, U., Kalambouka, N., Bolton, A., Lendrum, J., Wigelsworth, A., Lennie, M., & Farrell, C. (2008). *Primary social and emotional aspects of learning (SEAL): Evaluation of small group work*. Department for Children, Schools and Families. https://www.research.manchester.ac.uk/portal/en/publications/primary-social-and-emotional-aspects-of-learning-seal-evaluation-of-small-group-work(193d0e6c-9555-4a41-b41e-4b05b946315b).html

Jia, Y., Way, N., Ling, G., Yoshikawa, H., Chen, X., Hughes, D., ... & Lu, Z. (2009). The influence of student perceptions of school climate on socioemotional and academic adjustment: A comparison of Chinese and American adolescents. *Child development, 80*(5), 1514-1530. https://doi.org/10.1111/j.1467-8624.2009.01348.x

Jones, S., Bailey, R., Brush, K., Nelson, B., & Barnes, S. (2016). *What is the same and what is different? Making sense of the "non-cognitive" domain. Helping Educators Translate Research into Practice*. Easel Lab, Harvard Graduate School of Education. https://easel.gse.harvard.edu/files/gse-easel-lab/files/words_matter_paper.pdf

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*(1), 31-36. https://link.springer.com/article/10.1007/BF02291575

Kam, C. M., Wong, L. W. L., & Fung, K. M. S. (2011). Promoting social-emotional learning in Chinese schools: A feasibility study of PATHS implementation in Hong Kong. *The International Journal of Emotional Education, 3*(1), 30-47. https://www.um.edu.mt/library/oar/handle/123456789/6101

Keller, M., Edelstein, W., Schmid, C., Fang, F.-x., & Fang, G. (1998). Reasoning about responsibilities and obligations in close relationships: A comparison across two cultures. *Developmental Psychology, 34*(4), 731–741. https://doi.org/10.1037/0012-1649.34.4.731

Kim, D., Lim, J. H., & An, J. (2022). The quality and effectiveness of Social-Emotional Learning (SEL) intervention studies in Korea: A meta-analysis. *PLoS ONE, 17*(6), e0269996. https://doi.org/10.1371/journal.pone.0269996

Kim, S. H. (2003). Korean cultural codes and communication. *International Area Review*, *6*(1), 93-114. https://doi.org/10.1177/223386590300600107

King, G., Nielsen, R., Coberley, C., Pope, J. E., & Wells, A. (2011). Comparative effectiveness of matching methods for causal inference. *Institute for Quantitative Social Science, Harvard University*. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.230.3451&rep=rep1&type=pdf

Kwong, E., Lam, C. B., Li, X., Chung, K. K. H., Cheung, R. Y. M., & Leung, C. (2018). Fit in but stand out: A qualitative study of parents' and teachers' perspectives on socioemotional competence of children. *Early Childhood Research Quarterly, 44*, 275-287. https://doi.org/10.1016/j.ecresq.2018.02.018

Lee, J. (2021). Teacher–student relationships and academic achievement in Confucian educational countries/systems from PISA 2012 perspectives. *Educational Psychology*, *41*(6), 764-785. https://doi.org/10.1080/01443410.2021.1919864

Lee, J. S. (2014). The relationship between student engagement and academic performance: Is it a myth or reality? *The Journal of Educational Research*, *107*(3), 177-185. https://doi.org/10.1080/00220671.2013.807491

Levitt, S. D., List, J. A., Neckermann, S., & Sadoff, S. (2016). The behavioralist goes to school: Leveraging behavioral economics to improve educational performance. *American Economic Journal: Economic Policy*, *8*(4), 183-219. https://www.aeaweb.org/articles?id=10.1257/pol.20130358

Li, Y., Huang, F., Spier, E., & Osher, D. (2017). *Evaluation of China's Child Friendly Schools Initiative, sampling for Mile County* [Internal Working Memo]. American Institute of Research.

Little, T. D. (2013). *Longitudinal structural equation modelling*. Guilford press.

Lockett, M. (1988). Culture and the problems of Chinese management. *Organization studies*, *9*(4), 475-496. https://doi.org/10.1177/017084068800900402

MacCallum, R. C., Widaman, K. F., Preacher, K. J., & Hong, S. (2001). Sample size in factor analysis: The role of model error. *Multivariate behavioral research*, *36*(4), 611-637. https://doi.org/10.1207/S15327906MBR3604_06

MacCann, C., Jiang, Y., Brown, L. E. R., Double, K. S., Bucich, M., & Minbashian, A. (2020). Emotional intelligence predicts academic performance: A meta-analysis. *Psychological Bulletin, 146*(2), 150–186. https://doi.org/10.1037/bul0000219

Madigan, S., Atkinson, L., Laurin, K., & Benoit, D. (2013). Attachment and internalizing behavior in early childhood: A meta-analysis. *Developmental Psychology, 49*(4), 672–689. https://doi.org/10.1037/a0028793

Mägi, K., Männamaa, M., & Kikas, E. (2016). Profiles of self-regulation in elementary grades: Relations to math and reading skills. *Learning and Individual Differences*, *51*, 37-48. https://doi.org/10.1016/j.lindif.2016.08.028

Malecki, C. K., & Elliot, S. N. (2002). Children's social behaviors as predictors of academic achievement: A longitudinal analysis. *School Psychology Quarterly, 17*(1), 1–23. https://doi.org/10.1521/scpq.17.1.1.19902

Mann, L., Radford, M., Burnett, P., Ford, S., Bond, M., Leung, K., Nakamura. H., Vaughan, G., & Yang, K. S. (1998). Cross-cultural differences in self-reported decision-making style and confidence. *International journal of psychology*, *33*(5), 325-335. https://doi.org/10.1080/002075998400213

Mantz, L. S., Bear, G. G., Yang, C., & Harris, A. (2018). The delaware social-emotional competency scale (DSECS-S): Evidence of validity and reliability. *Child Indicators Research*, *11*(1), 137-157. https://doi.org/10.1007/s12187-016-9427-6

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98*(2), 224–253. https://doi.org/10.1037/0033-295X.98.2.224

McDermott, P. A., Mordell, M., & Stoltzfus, J. C. (2001). The organization of student performance in American schools: Discipline, motivation, verbal learning, and nonverbal learning. *Journal of Educational Psychology*, *93*, 65–76. https://doi.org/10.1037/0022-0663.93.1.65.

Mikk, J., Krips, H., Säälik, Ü., & Kalk, K. (2016). Relationships between student perception of teacher-student relations and PISA results in mathematics and science. *International journal of science and mathematics education*, *14*(8), 1437-1454. https://doi.org/10.1007/s10763-015-9669-7

Ministry of Education, China. (2020). *Yiwu Jiaoyu Kecheng Biaozhun [The curriculum programme for compulsory education]*. Beijing Normal University Publishing Group. http://www.moe.gov.cn/srcsite/A26/s8001/202204/W020220420582343217634.pdf

Miserandino, M. (1996). Children who do well in school: Individual differences in perceived competence and autonomy in above-average children. *Journal of Educational Psychology, 88*(2), 203–214. https://doi.org/10.1037/0022-0663.88.2.203

MOE-UNICEF SEL Programme Team. (2020). *Social and Emotional Learning Teacher's Book (Grade 4)*. UNICEF & Department of Teachers Affairs, Ministry of Education. https://www.unicef.cn/documents/sel-resources

Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and research in Education*, *7*(2), 133-144. https://doi.org/10.1177/1477878509104318

Oberle, E., Schonert-Reichl, K. A., Hertzman, C., & Zumbo, B. D. (2014). Social–emotional competencies make the grade: Predicting academic success in early adolescence. *Journal of Applied Developmental Psychology*, *35*(3), 138-147. https://doi.org/10.1016/j.appdev.2014.02.004

Organization for Economic Co-operation, and Development [OECD] (2014). PISA 2012 Technical Report. https://www.oecd.org/pisa/pisaproducts/PISA-2012-technical-report-final.pdf

Pallini, S., Baiocco, R., Schneider, B. H., Madigan, S., & Atkinson, L. (2014). Early child-parent attachment and peer relations: A meta-analysis of recent research. *Journal of Family Psychology, 28*(1), 118–123. https://doi.org/10.1037/a0035736

Panayiotou, M., Humphrey, N., & Wigelsworth, M. (2019). An empirical basis for linking social and emotional learning to academic performance. *Contemporary Educational Psychology*, *56*, 193-204. https://doi.org/10.1016/j.cedpsych.2019.01.009

Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental review*, *41*, 71-90. https://doi.org/10.1016/j.dr.2016.06.004

Reeve, J., Jang, H., Carrell, D., Jeon, S., & Barch, J. (2004). Enhancing students' engagement by increasing teachers' autonomy support. *Motivation and emotion*, *28*(2), 147-169. https://doi.org/10.1023/B:MOEM.0000032312.95499.6f

Roeser, R. W., Van der Wolf, K., & Strobel, K. R. (2001). On the relation between social–emotional and school functioning during early adolescence: Preliminary findings from

Dutch and American samples. *Journal of School Psychology*, *39*(2), 111-139. https://doi.org/10.1016/S0022-4405(01)00060-7

Ryan & Deci (2009) Promoting self-determined school engagement: Motivation, learning, and well-being. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook on motivation at school* (pp. 171–196). Routledge.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary educational psychology, 61*, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Sabol, T. J., & Pianta, R. C. (2012). Recent trends in research on teacher–child relationships. *Attachment & human development*, *14*(3), 213-231. https://doi.org/10.1080/14616734.2012.672262

Saeed, S., & Zyngier, D. (2012). How motivation influences student engagement: A qualitative case study. *Journal of Education and learning, 1*(2), 252-267. http://dx.doi.org/10.5539/jel.v1n2p252

Schneider, B. H. (1998). Cross-cultural comparison as doorkeeper in research on the social and emotional adjustment of children and adolescents. *Developmental Psychology, 34*(4), 793–797. https://doi.org/10.1037/0012-1649.34.4.793

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of educational research*, *99*(6), 323-338. https://doi.org/10.3200/JOER.99.6.323-338

Schuengel, C. (2012). Teacher–child relationships as a developmental issue. *Attachment & Human Development*, *14*(3), 329-336. https://doi.org/10.1080/14616734.2012.675639

Shi, J., Cheung, A. C., Zhang, Q., & Tam, W. W. Y. (2022). Development and validation of a social emotional skills scale: Evidence of its reliability and validity in China. *International Journal of Educational Research, 114*, 102007. https://doi.org/10.1016/j.ijer.2022.102007

Somaa, F., Asghar, A., & Hamid, P. F. (2021). Academic Performance and Emotional Intelligence with Age and Gender as Moderators: A Meta-analysis. *Developmental Neuropsychology*, *46*(8), 537-554. https://doi.org/10.1080/87565641.2021.1999455

Spier, E., Li, Y., Huang, F., & Osher, D. (2016). *Child Friendly Schools evaluation, school matching for Mile County* (Internal Working Memo). American Institute of Research.

Stevens, J. (2002). Applied multivariate statistics for the social sciences (4th ed.). Routledge.

Tabachnick, B. G. & Fidell, L. S. (2014). *Using multivariate statistics* (6th ed.). Pearson.

Taylor, R. D., Oberle, E., Durlak, J. A., & Weissberg, R. P. (2017). Promoting Positive Youth Development Through School-Based Social and Emotional Learning Interventions: A Meta-Analysis of Follow-Up Effects. *Child Development, 88*(4), 1156-1171. https://doi.org/10.1111/cdev.12864

Triandis, H. C. (1995). Individualism and collectivism. Westview.

Tulis, M., & Fulmer, S. M. (2013). Students' motivational and emotional experiences and their relationship to persistence during academic challenge in mathematics and reading. *Learning and Individual Differences*, *27*, 35-46. https://doi.org/10.1016/j.lindif.2013.06.003

Turban, D. B., Tan, H. H., Brown, K. G., & Sheldon, K. M. (2007). Antecedents and outcomes of perceived locus of causality: An application of self-determination theory. *Journal of Applied Social Psychology*, *37*(10), 2376-2404. https://doi.org/10.1111/j.1559-1816.2007.00263.x

Vallerand, R. J., & Blssonnette, R. (1992). Intrinsic, extrinsic, and amotivational styles as predictors of behavior: A prospective study. *Journal of personality*, *60*(3), 599-620. https://doi.org/10.1111/j.1467-6494.1992.tb00922.x

Verschueren, K., & Koomen, H. M. (2012). Teacher–child relationships from an attachment perspective. *Attachment & human development*, *14*(3), 205-211. https://doi.org/10.1080/14616734.2012.672260

Verschueren, K., Doumen, S., & Buyse, E. (2012). Relationships with mother, teacher, and peers: Unique and joint effects on young children's self-concept. *Attachment & human development*, *14*(3), 233-248. https://doi.org/10.1080/14616734.2012.672263

Wang, C. J., Liu, W. C., Kee, Y. H., & Chian, L. K. (2019). Competence, autonomy, and relatedness in the classroom: understanding students' motivational processes using the self-determination theory. *Heliyon*, *5*(7), e01983. https://doi.org/10.1016/j.heliyon.2019.e01983

Wang, S., Dong, X., & Mao, Y. (2017). The impact of boarding on campus on the social-emotional competence of left-behind children in rural western China. *Asia Pacific Education Review, 18*(3), 413-423. https://doi.org/10.1007/s12564-017-9476-7

Wang, Y., Yang, Z., Zhang, Y., Wang, F., Liu, T., & Xin, T. (2019). The effect of social-emotional competency on child development in western China. *Frontiers in psychology, 10*, 1282. https://doi.org/10.3389/fpsyg.2019.01282

Wang., Y. & Xin, T. (2019). *The impact study of the Child Friendly School during the Ministry of Education-UNICEF China 2016-2020 Country Programme* [Internal Working Report]. Beijing Normal University.

Watkins, M. W. (2018). Exploratory factor analysis: A guide to best practice. *Journal of Black Psychology*, *44*(3), 219-246. https://doi.org/10.1177/0095798418771807

Weisz, J. R., Rothbaum, F. M., & Blackburn, T. C. (1984). Standing out and standing in: The psychology of control in America and Japan. *American Psychologist, 39*(9), 955–969. https://doi.org/10.1037/0003-066X.39.9.955

Whipple, N., Bernier, A., & Mageau, G. A. (2009). Attending to the exploration side of infant attachment: Contributions from self-determination theory. *Canadian Psychology / Psychologie canadienne, 50*(4), 219–229. https://doi.org/10.1037/a0016322

Widaman, K. F., & Reise, S. P. (1997). Exploring the measurement invariance of psychological instruments: Applications in the substance use domain. In K. J. Bryant, M. Windle, & S. G. West (Eds.), *The science of prevention: Methodological advances from alcohol and substance abuse research* (pp. 281–324). American Psychological Association. https://doi.org/10.1037/10222-009

Wong, A. S., Li-Tsang, C. W., & Siu, A. M. (2014). Effect of a social emotional learning programme for primary school students. *Hong Kong Journal of Occupational Therapy, 24*(2), 56-63. https://doi.org/10.1016/j.hkjot.2014.11.001

Wu, F., Fraser, M. W., Guo, S., Day, S. H., & Galinsky, M. J. (2016). Strengthening the social Information–processing skills of children: A controlled test of the Let's Be Friends Program in China*. Research on Social Work Practice, 26*(5), 525-538. https://doi.org/10.1177/1049731514556995

Yang, C., Bear, G. G., Chen, F. F., Zhang, W., Blank, J. C., & Huang, X. (2013). Students' perceptions of school climate in the U.S. and China. *School Psychology Quarterly, 28*(1), 7–24. https://doi.org/10.1037/spq0000002

Zhang, X., Hu, B. Y., Ren, L., & Fan, X. (2018). Sources of individual differences in young Chinese children's reading and mathematics skill: A longitudinal study. *Journal of school psychology*, *71*, 122-137. https://doi.org/10.1016/j.jsp.2018.10.008

Zhao, M. (2022). *The pedagogical implications from an empirical research about the link between social and emotional competence and academic performance in senior pupils* [Master's thesis, Sichuan Normal University]. CNKI. https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CMFD&dbname=CMFD202102&filename=1021065827.nh&uniplatform=NZKPT&v=px15ptk_zMZDp8zA-8BUW6spWSUz2TMTdS_SOFBOIJrVajGhWfNMsI0GS_mGN9R6

Zhou, M., & Ee, J. (2012). Development and validation of the social emotional competence questionnaire (SECQ). *The International Journal of Emotional Education, 4*(2), 27-42. https://www.um.edu.mt/library/oar/handle/123456789/6140

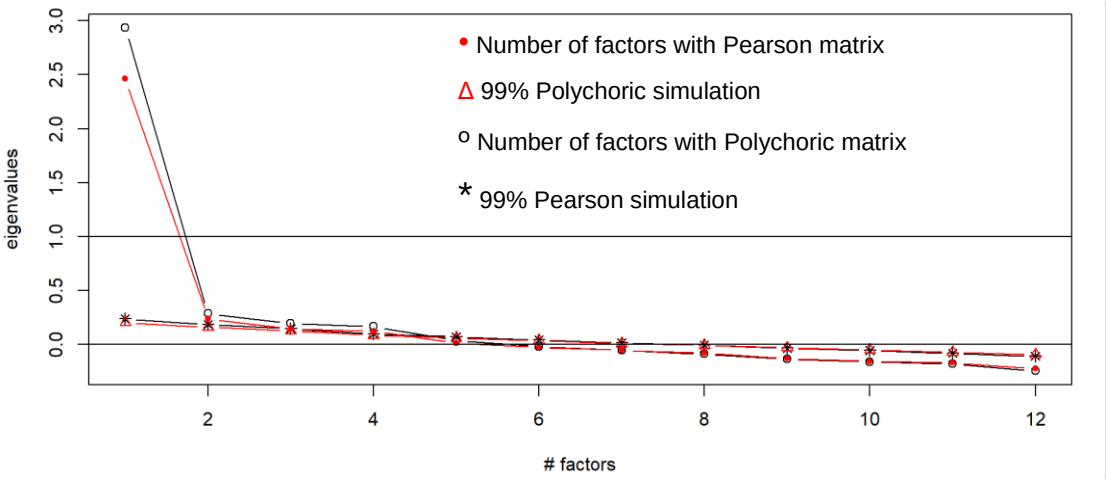
Zhu, X. X. (2016). *Study on the reliability and validity of the Chinese version of Delaware Social and Emotional Competency Scale* [Master's thesis, Sichuan Normal University]. CNKI. https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CMFD&dbname=CMFD201602&filename=1016085571.nh&uniplatform=NZKPT&v=s9ZcVUxe_2DuBVwLkqgT0qQfubjQE3HqkNTpL3zIJb_Xp6PjgbLoXXwCrz_R0R_R

Zimmerman, B. J., & Campillo, M. (2003). Motivating self-regulated problem solvers. In J. E. Davidson & R. J. Sternberg (Eds.), *The psychology of problem solving*, pp. *233-262*. Cambridge University Press.

Appendix A

Figure 1

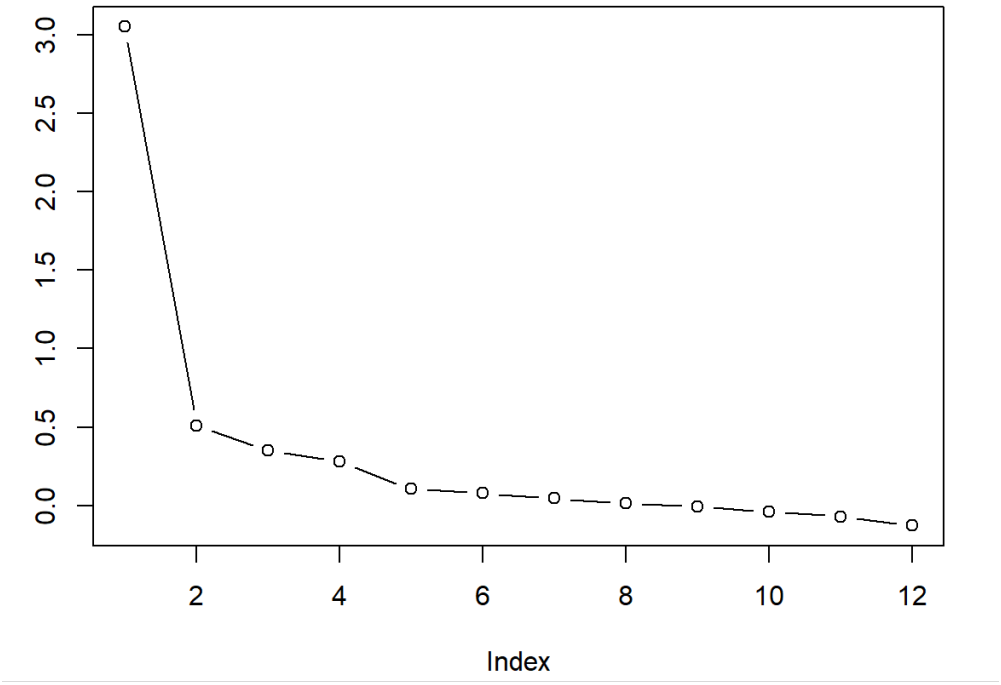
The Results of the Parallel Analysis for the EFA



Note. The figure was obtained from R version 4.1.2.

Figure 2

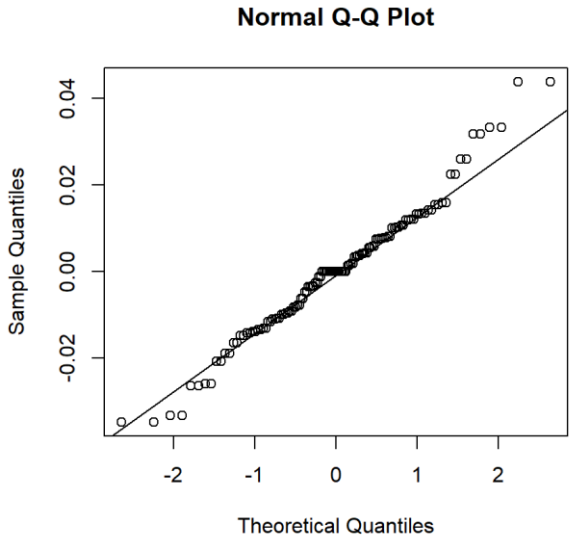
The Scree Plot of the EFA



Note. The figure was obtained from R version 4.1.2.

Figure 3

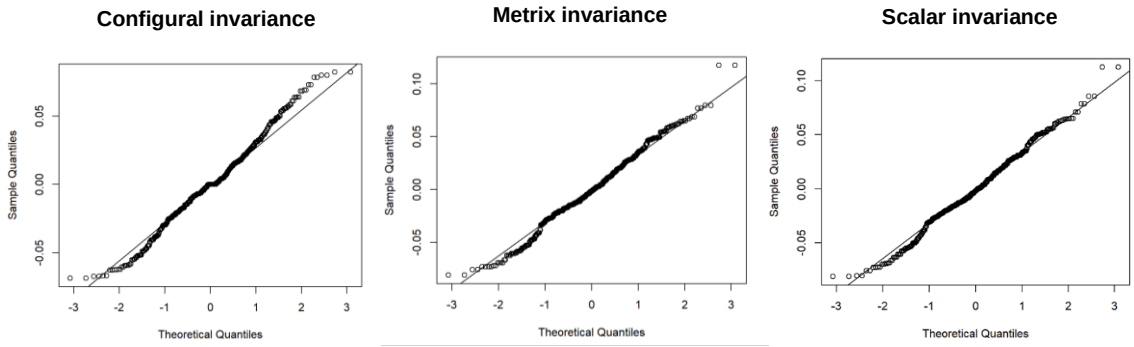
The Normal Q-Q Plot of Residuals for the CFA



Note. The figure was obtained from R version 4.1.2.

Figure 4

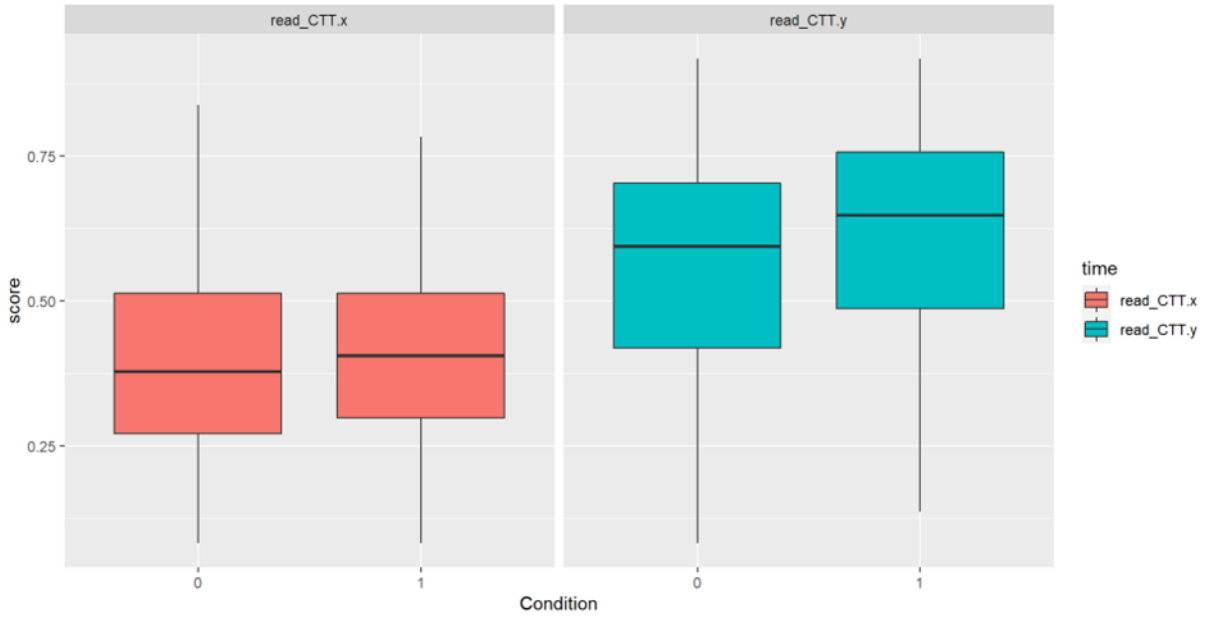
The Normal Q-Q Plot of Residuals for the Measurement Invariance Analyses



Note. The figure was obtained from R version 4.1.2.

Figure 5

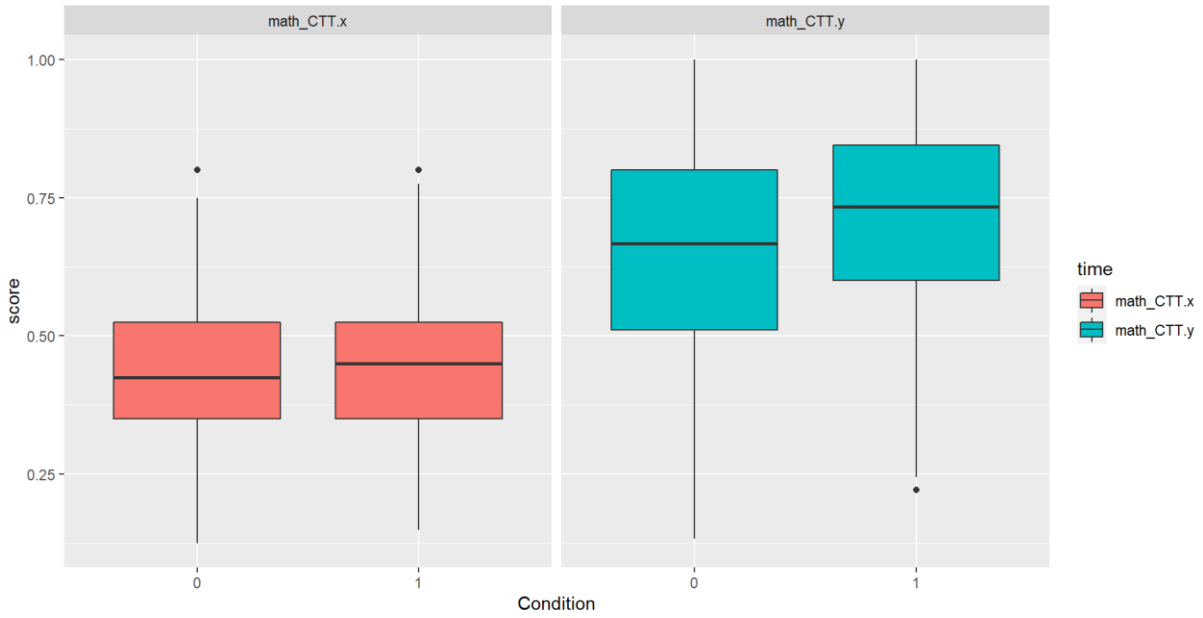
The Means of Reading Performance by Time and Groups



Note. The figure was obtained from R version 4.1.2. read_CTT.x = reading performance at Time 1; read_CTT.y = reading performance at Time 2.

Figure 6

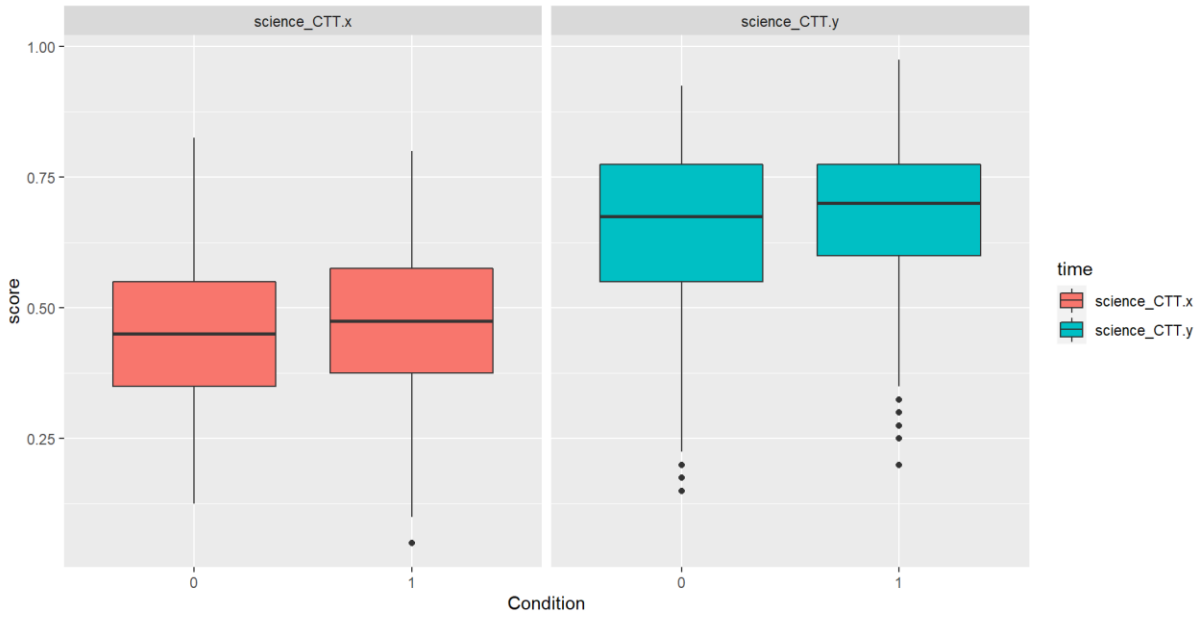
The Means of Math Performance by Time and Groups



Note. The figure was obtained from R version 4.1.2. math_CTT.x = math performance at Time 1; math_CTT.y = math performance at Time 2.

Figure 7

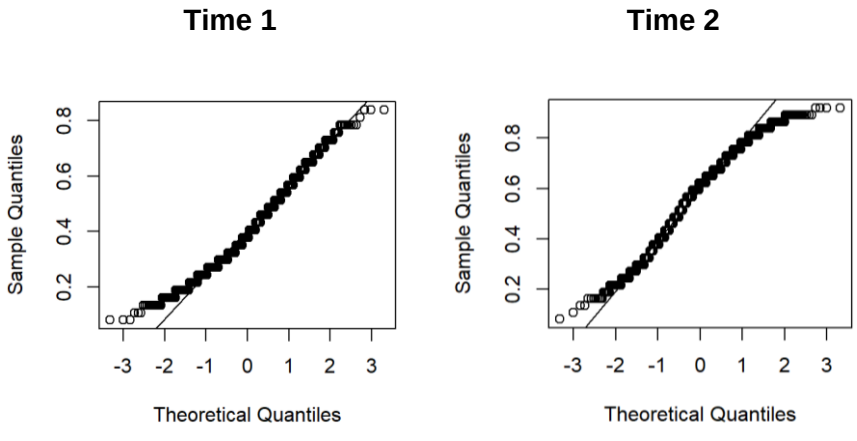
The Means of Science Performance by Time and Groups



Note. The figure was obtained from R version 4.1.2. science_CTT.x = science performance at Time 1; science_CTT.y = science performance at Time 2.

Figure 8

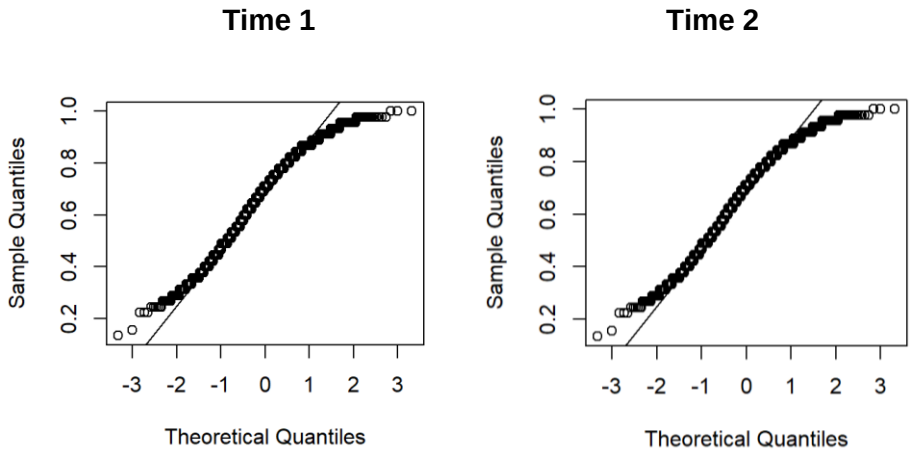
The Normal Q-Q Plot of Reading Performance



Note. The figure was obtained from R version 4.1.2.

Figure 9

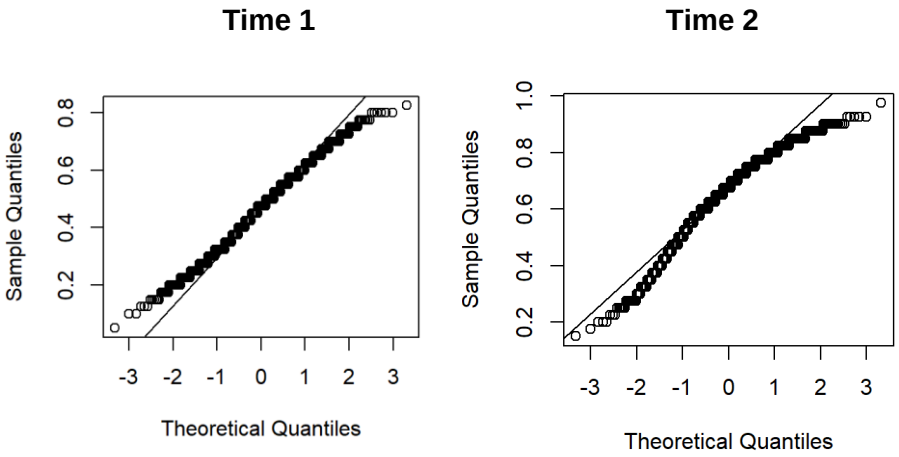
The Normal Q-Q Plot of Math Performance



Note. The figure was obtained from R version 4.1.2.

Figure 10

The Normal Q-Q Plot of Science Performance



Note. The figure was obtained from R version 4.1.2.

Appendix B

Table 1

The Correlation Matrix of the Outliers Identified for the EFA

	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
I1	1.00											
I2	-0.41	1.00										
I3	-0.13	0.18	1.00									
I4	-0.19	0.04	0.21	1.00								
I5	-0.12	0.19	-0.19	0.24	1.00							
I6	0.00	0.21	-0.16	-0.03	0.03	1.00						
I7	0.09	-0.06	0.00	0.09	-0.07	-0.15	1.00					
I8	-0.15	-0.20	-0.13	0.31	0.22	0.20	-0.12	1.00				
I9	-0.11	-0.25	0.11	0.12	-0.10	-0.26	0.03	0.04	1.00			
I10	0.08	0.00	0.20	0.12	0.10	0.15	-0.22	0.29	0.08	1.00		
I11	-0.25	0.00	0.04	0.10	-0.08	-0.06	0.15	0.01	-0.15	0.19	1.00	
I12	0.13	-0.06	0.00	0.09	0.03	-0.05	0.12	0.02	-0.23	0.17	0.31	1.00

Note. The table was obtained from R version 4.1.2. I1 = “I blame others when I am in trouble”; I2 = “I think about how others feel”; I3 = “I can control how I behave”; I4 = “I am good at solving conflicts with others”; I5 = “I feel responsible for how I act”; I6 = “I care about how others feel”; I7 = “I think before I act”; I8 = “I get along well with others”; I9 = “I am good at deciding right from wrong”; I10 = “What others think is important to me”; I11 = “I am good at waiting for what I want”; I12 = “I have one or more close friends”.

Table 2

The Polychoric Correlation Matrix for the EFA

	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
I1	1.00											
I2	0.17	1.00										
I3	0.18	0.28	1.00									
I4	0.00	0.26	0.16	1.00								
I5	0.17	0.32	0.31	0.15	1.00							
I6	0.14	0.44	0.29	0.19	0.29	1.00						
I7	0.18	0.32	0.36	0.14	0.31	0.30	1.00					

I8	0.20	0.31	0.32	0.18	0.26	0.32	0.32	1.00				
I9	0.14	0.28	0.29	0.21	0.30	0.28	0.36	0.25	1.00			
I10	0.06	0.32	0.21	0.22	0.23	0.29	0.30	0.24	0.24	1.00		
I11	0.10	0.21	0.17	0.16	0.21	0.20	0.26	0.20	0.26	0.25	1.00	
I12	0.21	0.22	0.21	0.13	0.22	0.23	0.25	0.39	0.21	0.19	0.23	1.00

Note. The table was obtained from R version 4.1.2. I1 = “I blame others when I am in trouble”; I2 = “I think about how others feel”; I3 = “I can control how I behave”; I4 = “I am good at solving conflicts with others”; I5 = “I feel responsible for how I act”; I6 = “I care about how others feel”; I7 = “I think before I act”; I8 = “I get along well with others”; I9 = “I am good at deciding right from wrong”; I10 = “What others think is important to me”; I11 = “I am good at waiting for what I want”; I12 = “I have one or more close friends”.

Table 3

The Pearson Correlation Matrix for the CFA

T2/T1	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
I1	1.00											
I2	0.17	1.00										

I3	0.18	0.28	1.00									
I4	0.00	0.26	0.16	1.00								
I5	0.17	0.32	0.31	0.15	1.00							
I6	0.14	0.44	0.29	0.19	0.29	1.00						
I7	0.18	0.32	0.36	0.14	0.31	0.30	1.00					
I8	0.20	0.31	0.32	0.18	0.26	0.32	0.32	1.00				
I9	0.14	0.28	0.29	0.21	0.30	0.28	0.36	0.25	1.00			
I10	0.06	0.32	0.21	0.22	0.23	0.29	0.30	0.24	0.24	1.00		
I11	0.10	0.21	0.17	0.16	0.21	0.20	0.26	0.20	0.26	0.25	1.00	
I12	0.21	0.22	0.21	0.13	0.22	0.23	0.25	0.39	0.21	0.19	0.23	1.00

Note. The table was obtained from R version 4.1.2. T1 = Time 1; T2 = Time 2; The first row are items at Time 1 while the first column are items at Time 2. I1 = “I blame others when I am in trouble”; I2 = “I think about how others feel”; I3 = “I can control how I behave”; I4 = “I am good at solving conflicts with others”; I5 = “I feel responsible for how I act”; I6 = “I care about how others feel”; I7 = “I think before I act”; I8 = “I get along well with others”; I9 = “I am good at deciding right from wrong”; I10 = “What others think is important to me”; I11 = “I am good at waiting for what I want”; I12 = “I have one or more close friends”.

Table 4

Descriptive Statistics of the Imputed Data for the Longitudinal Sample

Item	Mean	SD	Median	Skewness	Kurtosis
Time 1					
2	2.94	0.90	3.00	-0.60	-0.33
3	3.04	0.92	3.00	-0.71	-0.35
4	2.47	0.99	2.47	0.03	-0.99
5	2.88	0.95	3.00	-0.52	-0.62
6	3.05	0.91	3.00	-0.72	-0.29
7	3.08	0.91	3.00	-0.79	-0.17
8	3.32	0.84	3.32	-1.22	0.85
9	2.82	0.92	3.00	-0.36	-0.67
10	2.87	0.94	3.00	-0.46	-0.65
11	2.96	0.95	3.00	-0.58	-0.60
12	3.43	0.86	4.00	-1.52	1.39
Time 2					
2	3.25	0.72	3.00	-0.86	0.91
3	3.15	0.76	3.00	-0.66	0.11
4	2.74	0.89	3.00	-0.16	-0.77
5	3.23	0.75	3.00	-0.84	0.53
6	3.20	0.77	3.00	-0.80	0.37

7	3.09	0.85	3.00	-0.67	-0.20
8	3.39	0.75	4.00	-1.09	0.72
9	3.00	0.83	3.00	-0.43	-0.51
10	2.98	0.91	3.00	-0.56	-0.53
11	3.05	0.90	3.00	-0.64	-0.44
12	3.59	0.72	4.00	-1.90	3.35

Note. The statistics were obtained from R version 4.1.2.

Table 5

The Correlation Matrix of the Outliers in the Intervention Group Identified for the CFA

T2/T1	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
I1	**0.14**	0.11	-0.06	-0.10	-0.17	-0.19	0.42	-0.10	-0.06	0.20	-0.14	0.14
I2	-0.16	**-0.02**	0.18	-0.17	-0.07	-0.11	-0.29	-0.27	0.12	-0.09	-0.05	-0.16
I3	0.21	-0.20	**0.03**	-0.42	0.19	-0.29	0.09	0.00	-0.05	-0.32	-0.09	0.21
I4	0.41	0.03	0.11	**-0.06**	0.21	0.28	0.30	-0.12	0.05	0.05	0.28	0.41
I5	-0.17	-0.23	-0.04	0.07	**-0.01**	0.09	0.13	0.00	0.25	-0.01	-0.04	-0.17
I6	0.08	-0.23	-0.17	0.16	0.09	**-0.12**	-0.02	0.31	-0.20	-0.33	0.37	0.08

I7	0.38	0.29	0.22	-0.39	0.13	-0.04	**0.07**	-0.05	0.39	0.35	-0.18	0.38
I8	0.39	0.06	-0.06	-0.02	0.17	0.24	0.09	**0.28**	0.10	0.13	0.33	0.39
I9	-0.07	-0.05	-0.23	-0.03	0.03	0.27	-0.08	0.03	**0.13**	0.48	-0.38	-0.07
I10	0.16	0.11	0.05	-0.16	-0.11	0.13	0.29	-0.21	-0.03	**-0.21**	0.14	0.16
I11	0.34	-0.16	-0.17	-0.32	0.07	-0.31	-0.01	-0.02	-0.32	-0.04	**-0.04**	0.34
I12	0.14	0.11	-0.06	-0.10	-0.17	-0.19	0.42	-0.10	-0.06	0.20	-0.14	**0.14**

Note. The table was obtained from R version 4.1.2. T1 = Time 1; T2 = Time 2; The first row are items at Time 1 while the first column are items at Time 2. I1 = “I blame others when I am in trouble”; I2 = “I think about how others feel”; I3 = “I can control how I behave”; I4 = “I am good at solving conflicts with others”; I5 = “I feel responsible for how I act”; I6 = “I care about how others feel”; I7 = “I think before I act”; I8 = “I get along well with others”; I9 = “I am good at deciding right from wrong”; I10 = “What others think is important to me”; I11 = “I am good at waiting for what I want”; I12 = “I have one or more close friends”. The correlation coefficients between Time 1 and Time 2 are in bold.

Table 6

The Correlation Matrix of the Outliers in the Control Group Identified for the CFA

T2/T1	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12

I1	**-0.08**	0.00	-0.09	-0.07	0.04	0.21	0.13	-0.03	0.19	0.13	-0.02	-0.08
I2	-0.05	**-0.20**	-0.23	-0.06	-0.28	-0.05	-0.22	-0.16	-0.18	-0.11	0.18	-0.05
I3	-0.03	-0.17	**-0.26**	0.03	0.07	-0.21	-0.41	-0.10	-0.24	-0.09	-0.11	-0.03
I4	-0.35	-0.02	-0.24	**0.11**	-0.26	-0.25	-0.08	0.12	-0.05	-0.02	-0.28	-0.35
I5	0.23	-0.33	-0.25	-0.30	**-0.11**	-0.04	-0.43	-0.38	-0.10	0.14	0.12	0.23
I6	0.21	0.25	0.24	-0.22	0.30	**0.54**	0.04	0.38	0.32	-0.12	0.17	0.21
I7	0.11	-0.07	-0.49	-0.07	-0.11	0.06	**-0.12**	-0.14	0.08	0.10	-0.04	0.11
I8	0.13	-0.24	-0.01	-0.05	-0.24	-0.17	-0.09	**-0.36**	0.24	-0.02	-0.02	0.13
I9	-0.10	-0.05	0.05	-0.12	-0.03	-0.09	-0.19	-0.21	**0.09**	-0.50	-0.14	-0.10
I10	-0.30	0.43	0.02	0.09	-0.26	0.33	0.05	0.21	0.28	**-0.45**	0.03	-0.30
I11	0.06	-0.19	0.01	-0.26	-0.09	-0.21	0.11	-0.16	-0.22	-0.24	**-0.05**	0.06
I12	-0.08	0.00	-0.09	-0.07	0.04	0.21	0.13	-0.03	0.19	0.13	-0.02	**-0.08**

Note. The table was obtained from R version 4.1.2. T1 = Time 1; T2 = Time 2; The first row are items at Time 1 while the first column are items at Time 2. I1 = “I blame others when I am in trouble”; I2 = “I think about how others feel”; I3 = “I can control how I behave”; I4 = “I am good at solving conflicts with others”; I5 = “I feel responsible for how I act”; I6 = “I care about how others feel”; I7 = “I think before I act”; I8 = “I get along well with others”; I9 = “I am good at deciding right from wrong”; I10 = “What others think is important to me”; I11 = “I am good at waiting for what I want”; I12 = “I have one or more close friends”. The correlation coefficients between Time 1 and Time 2 are in bold.

Table 7

The Covariance Matix of the Control Group for the CFA

T2/T1	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
I1	**0.10**	0.08	0.00	0.08	0.06	0.10	0.05	0.11	0.06	0.05	0.03	0.10
I2	0.08	**0.03**	-0.02	0.09	0.06	0.11	0.02	0.08	0.02	0.05	0.03	0.08
I3	0.16	0.05	**0.08**	0.11	0.14	0.13	0.04	0.14	0.14	0.11	0.05	0.16
I4	0.09	0.14	0.04	**0.15**	0.07	0.15	0.10	0.14	0.08	0.10	0.07	0.09
I5	0.10	0.06	0.01	0.09	**0.06**	0.11	0.04	0.06	0.06	0.12	0.06	0.10
I6	0.10	0.12	0.04	0.15	0.11	**0.19**	0.08	0.17	0.06	0.11	0.05	0.10
I7	0.16	0.07	0.01	0.14	0.09	0.11	**0.12**	0.11	0.07	0.11	0.09	0.16
I8	0.12	0.12	-0.01	0.11	0.09	0.16	0.10	**0.11**	0.10	0.14	0.07	0.12
I9	0.17	0.11	0.09	0.19	0.14	0.15	0.14	0.16	**0.17**	0.14	0.10	0.17
I10	0.10	0.09	0.04	0.10	0.12	0.15	0.09	0.12	0.10	**0.08**	0.04	0.10
I11	0.07	0.07	-0.01	0.12	0.01	0.05	0.08	0.04	0.03	0.03	**0.09**	0.07
I12	0.10	0.08	0.00	0.08	0.06	0.10	0.05	0.11	0.06	0.05	0.03	**0.10**

Note. The table was obtained from R version 4.1.2. T1 = Time 1; T2 = Time 2; The first row are items at Time 1 while the first column are items at Time 2. I1 = “I blame others when I am in trouble”; I2 = “I think about how others feel”; I3 = “I can control how I behave”; I4 = “I am good at solving conflicts with others”; I5 = “I feel responsible for how I act”; I6 = “I care about how others feel”; I7 = “I think before I act”; I8 = “I get along well with others”; I9 = “I am good at deciding right from wrong”; I10 = “What others think is important to me”; I11 = “I am good at waiting for what I want”; I12 = “I have one or more close friends”. The covariances between Time 1 and Time 2 are in bold.

Table 8

The Covariance Matix of the Intervention Group for the CFA

T2/T1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
I2	**0.05**	0.11	0.02	0.06	0.05	0.04	0.05	0.05	0.00	0.03	0.09
I3	0.02	**0.10**	0.04	0.03	0.03	0.06	0.03	0.06	0.03	0.00	0.09
I4	0.06	0.05	**0.05**	0.04	0.08	0.11	0.07	0.10	0.02	0.00	0.13
I5	0.08	0.05	0.07	**0.13**	0.05	0.09	0.08	0.09	0.02	0.06	0.07
I6	0.07	0.06	0.04	0.04	**0.08**	0.11	0.06	0.09	0.06	0.02	0.09
I7	0.03	0.06	0.01	0.06	0.06	**0.08**	0.02	0.06	0.03	-0.03	0.07
I8	0.10	0.10	0.05	0.04	0.06	0.05	**0.08**	0.05	0.06	0.07	0.08

I9	0.07	0.12	0.05	0.06	0.05	0.09	0.10	**0.13**	0.05	0.05	0.10
I10	0.10	0.06	0.02	0.08	0.06	0.13	0.06	0.10	**0.10**	0.07	0.07
I11	0.04	0.11	0.09	0.06	0.03	0.07	0.04	0.06	0.03	**0.08**	0.06
I12	0.05	0.04	0.01	-0.01	0.04	-0.01	0.04	0.01	-0.02	0.01	**0.05**

Note. The table was obtained from R version 4.1.2. T1 = Time 1; T2 = Time 2; The first row are items at Time 1 while the first column are items at Time 2. I1 = “I blame others when I am in trouble”; I2 = “I think about how others feel”; I3 = “I can control how I behave”; I4 = “I am good at solving conflicts with others”; I5 = “I feel responsible for how I act”; I6 = “I care about how others feel”; I7 = “I think before I act”; I8 = “I get along well with others”; I9 = “I am good at deciding right from wrong”; I10 = “What others think is important to me”; I11 = “I am good at waiting for what I want”; I12 = “I have one or more close friends”. The covariances between Time 1 and Time 2 are in bold.

Table 9

The Covariance Matrix of the Latent Variables in the Half-Longitudinal Mediation Model for Reading

	sm1	rs1	sa1	ca1	sec1	tsr1	tsr2
sm1	7.66	2.48	3.51	3.48	2.58	1.12	0.77
rs1	2.48	1.92	1.31	1.29	0.96	0.42	0.29

sa1	3.51	1.31	2.85	1.83	1.36	0.59	0.41
ca1	3.48	1.29	1.83	2.82	1.35	0.58	0.40
sec1	2.58	0.96	1.36	1.35	1.00	0.43	0.30
tsr1	1.12	0.42	0.59	0.58	0.43	1.00	0.23
tsr2	0.77	0.29	0.41	0.40	0.30	0.23	1.10

Note. The table was obtained from R version 4.1.2. sm1 = self-management at Time 1; sm2 = self-management at Time 2. rs1 = relationship skills at Time 1; rs2 = relationship skills at Time 2. sa1 = social skills at Time 1; sa2 = social skills at Time 2. ca1 = collective awareness at Time 1; ca2 = collective awareness at Time 2. sec1 = social-emotional competencies at Time 1; sec2 = social-emotional competencies at Time 2. tsr1 = teacher-student relationship for reading at Time 1; tsr2 = teacher-student relationship for reading at Time 2.

Table 10

The Covariance Matrix of the Latent Variables in the Half-Longitudinal Mediation Model for Math

	sm1	rs1	sa1	ca1	sec1	tsr1	tsr2
sm1	6.06	2.29	3.65	3.04	2.25	1.16	0.48
rs1	2.29	2.03	1.65	1.38	1.02	0.53	0.22
sa1	3.65	1.65	3.63	2.20	1.62	0.84	0.35
ca1	3.04	1.38	2.20	2.83	1.35	0.70	0.29
sec1	2.25	1.02	1.62	1.35	1.00	0.52	0.21
tsr1	1.16	0.53	0.84	0.70	0.52	1.00	0.27
tsr2	0.48	0.22	0.35	0.29	0.21	0.27	1.08

Note. The table was obtained from R version 4.1.2. sm1 = self-management at Time 1; sm2 = self-management at Time 2. rs1 = relationship skills at Time 1; rs2 = relationship skills at Time 2. sa1 = social skills at Time 1; sa2 = social skills at Time 2. ca1 = collective awareness at Time 1; ca2 = collective awareness at Time 2. sec1 = social-emotional competencies at Time 1; sec2 = social-emotional competencies at Time 2. tsr1 = teacher-student relationship for math at Time 1; tsr2 = teacher-student relationship for math at Time 2.