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Parental Involvement, Students' Self-Engagement, and Academic Achievement: A Structural Equation Model

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Abstract

In the ever-evolving landscape of China's education system, the gap between the rural and urban was always an important issue, not only the multifaceted interplay of parental involvement, student self-engagement, and academic performance. This study utilized a comprehensive national survey dataset through a thorough understanding of cultural nuances and educational intricacies specific to the Chinese context. Its aim was not only to decipher the underlying constructs of parental involvement and student self-engagement but also to investigate how these factors impacted academic achievement among students. The research unfolded in several stages using a representative sample of 10750 students from 112 schools in the China Education Panel Survey for the Academic Year 2013-15. Initially, through meticulous factor analyses, reliable constructs for parental involvement and student self-engagement were established. The study then rigorously assessed the stability and consistency of these constructs across diverse perspectives, incorporating parents' vs. children's and two-time points' data to enrich the understanding. The research probed the intricate web of causal relationships among parent involvement, student self-engagement, and academic achievement by employing a sophisticated structural equation model. The findings illuminated the major dimensions of parental involvement and student self-engagement, offering insights into their stability over time and from different vantage points. The results unraveled the nuanced dynamics of how these factors collectively shaped academic outcomes and how parental involvement plays important roles, especially the parents' expectations. Additionally, exploring the rural-urban gap underlined the socio-educational disparities that underscore China's educational landscape. The results uncovered the moderate effects of Hukou. Agricultural Hukou students faced enormous challenges in academic performance, indicating the impact of socioeconomic disparities and institutional differences. It highlighted the significance of understanding the intersections of parental involvement and Hukou's influence on academic outcomes, urging targeted interventions for equitable education access in the Chinese context.

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In the ever-evolving landscape of China's education system, the gap between the rural and urban was always an important issue, not only the multifaceted interplay of parental involvement, student self-engagement, and academic performance. This study utilized a comprehensive national survey dataset through a thorough understanding of cultural nuances and educational intricacies specific to the Chinese context. Its aim was not only to decipher the underlying constructs of parental involvement and student self-engagement but also to investigate how these factors impacted academic achievement among students. The research unfolded in several stages using a representative sample of 10750 students from 112 schools in the China Education Panel Survey for the Academic Year 2013-15. Initially, through meticulous factor analyses, reliable constructs for parental involvement and student self-engagement were established. The study then rigorously assessed the stability and consistency of these constructs across diverse perspectives, incorporating parents' vs. children's and two-time points' data to enrich the understanding. The research probed the intricate web of causal relationships among parent involvement, student self-engagement, and academic achievement by employing a sophisticated structural equation model. The findings illuminated the major dimensions of parental involvement and student self-engagement, offering insights into their stability over time and from different vantage points. The results unraveled the nuanced dynamics

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Background

On July 24, 2021, the general office of the Central Committee of the Communist Party of China (CPC) and the general office of the State Council printed and issued Opinions on Further Reducing the Burden of Homework and Off-Campus Training for Students during the Period of Compulsory Education (State Council Gazette Issue No.22 Serial No.1741), which was called "Double Reduction Policy." After the policy was published, parental involvement became a hot topic again in China. As we all know, school and home are the most critical spaces shaping students' development. Adolescents with poor academic performance in early middle school usually did not obtain a high school diploma and had lower lifetime career and financial success (Day & Newburger, 2002). To ensure their children's future, parents made an effort to help their children get better academic scores and did many extra after-school activities, not just the urban districts but also the rural areas. These engagements included school-based activities, such as parent-teacher communication and parent participation in school committees (Dearing et al., 2006; Hill & Taylor, 2004), and home-based activities, such as helping with homework (Hoover-Dempsey et al., 2001; Patall et al., 2008).

Educational researchers had identified a large body of positive relationships between parental involvement and children's academic achievement (Fan & Chen, 2001;

Hill & Tyson, 2009; Patall et al., 2008; Zong et al., 2018). Parental engagements involved not only specific home or school activities but also included emotional and psychological support. Some researchers posited that parental involvement mediated children's academic and emotional development by creating a positive and warm environment (Skinner et al., 2009; Wang & Sheikh-Khalil, 2014). Policymakers and researchers agreed that parents' active participation in children's academic and psychological development critically contributes to children's social, emotional, and intellectual growth (Green et al., 2007; Graves & Brown, 2011).

Other researchers argued that part of the parents' engagement involved psychological control entangled with the country's culture and values (Chao, 1994; Kim et al., 2010; Jeynes, 2011; Zong et al., 2018). Considering all kinds of parental involvement in children's different age periods and cultural environments, even not to mention the complex situation of the disparities between the urban and rural areas, there still were some confounding issues regarding the association between parental involvement and academic achievement.

Statement of Research Issues

First, the definition of parental involvement is inconsistent, and no standard constructs are defined. Parental involvement was often conceptualized in the literature as a multidimensional construct (Boonk et al., 2018), which referred to a wide variety of parental behaviors and beliefs or attitudes directly or indirectly related to children's school achievement. The concept of parental involvement was operationalized, measured, and applied in so many ways that it had become somewhat unclear what exactly was

meant by the meaning (Bakker & Denessen, 2007). Li et al. (2020) viewed parental involvement as the parenting approaches such as parents' psychological control or autonomy support activities instead of traditional home-based or school-based involvements. The wide range of research on parental involvement, reflected in different study methodologies, research questions, operationalization, and findings, can benefit from a research synthesis (Wilder, 2014). Some practical issues depended on how the survey questionnaires were designed, where the data were collected and used, and what specific models and methodologies were applied. These operations led to inconsistent results.

Moreover, parental engagement might differ from parents' and children's perspectives (Rogers et al., 2009). There is a question here about whether the data source for reporting parental involvement (student vs. parent reporting) impacts parental involvement on a student's academic achievement. There was limited research on the different resources (reporting from parents, students, or teachers) of data to compare whether the parents' perspective on parental involvement differed from that of the children (Fan, 2001). Whether the latent construct is stable across various time points is also an important research issue. Several factors could influence the stability of the latent construct over time, such as changes in the measurement instrument, changes in the sample composition, or changes in the construct itself (Anusic & Schimmack, 2016). The big reasons for this were either the data availability, the research design, or the cost of the procedure to carry out the research. A combination of different perspective pictures and an extensive timeline dataset are necessary.

Academic achievements also have different standards. Grade point average (GPA) from schools and subjects' standard test scores were the most common indicators for the indicators. Mathematics and English scores were the most frequently used for academic achievement. Other indicators included sciences, social studies, foreign language, and other curricular subjects (art, music, etc.; Castro et al., 2015). Considering different school systems and the data collection timing cross-culturally, middle-term test scores, homework completion, international test scores, and literacy rates could also be used as indicators.

Second, education involved an ecological system (Bronfenbrenner, 1979), including the parent-child relationship, the child's adjustment, the school environment, and the whole society, which had various attitudes and beliefs, cultural values, races, and economic indicators. Considering the cross-cultural values, school institutions, and educational systems, whether the role of parental involvement in children's development differs in various countries remains an issue. How the culturally specific parenting dimensions and school systems in different countries affect the efficiency of education remains for further research. And whether parents' involvement in various cultures and value systems has similar efficiency in achieving achievement goals is also confounding.

The ideologies of learning and parents' role in education in different countries may differ or shape parental engagement activities in multiple ways. Still, most of these investigations have been carried out in American and European countries. For example, Li et al. (2020) suggested the American and Western parents' ideologies of education as the acquisition of knowledge differed from Chinese parents' moral endeavor, which

shaped the parental approaches as autonomy-supporting and psychologically controlling. Considering the cultural heritage of Confucius, Chinese parents merited the worth of the family honor and collective effort, and this value, called "guan," had a positive association with social competence (Lan et al., 2019; Chang et al., 2011).

Due to various economic development levels across regions, educational resources have been unevenly distributed and received. Parents and students adjust their behaviors and efforts to the degree of competition. Compared to learning in America, Chinese teachers focused on finding the single key answer in math classes while omitting the process of exploring various solutions (Cai, 2005). However, even though the school systems were different from the Chinese mainland, Hong Kong, and Taiwan, China generally implemented a set of similar institutions, including centralized educational resources, standardized curricula, textbooks and examinations, and top-down instruction in the education systems (Huntsinger & Jose, 2009). Since the Chinese government rescinded the One-child policy in 2015, parents may balance the resources for multiple children. The varied facets of parental engagement could yield distinct outcomes in families with only one child as opposed to those with multiple children (Wei et al., 2016).

Compared to the western developed countries, China has a particular situation with the arrangement of an institution. The rural and urban students are marked by residence status (Hukou) in the school system and job markets. This institutional arrangement of the educational system influences various facets of family choices concerning school-related matters. Many studies about Chinese parental involvement have applied data on limited areas or specific cities. Omitting this indicator of residence

status could lead to a result without a whole picture of generalization. And it was rare for the dataset to include the entire country of China. The majority of the accessible datasets were confined to particular municipalities, such as Zhengzhou City (Xiong et al., 2021), Zhuhai (Wang & Cai, 2017), Hainan Province (Gan & Bilige, 2019), and Taiwan (Chen & Ho, 2012). Incorporating various cultural, regional, and social characteristics into the investigations can broaden the research parameters and boundaries.

Third, children adjust their academic activities and efforts according to parental engagement. The student self-determination engagements must also be within the system by considering parental involvement's direct and indirect effects. Controlling for parental participation, diligent students had the highest Iowa Test of Basic Skills (ITBS) scores and GPA (Mbaluka et al., 2021). Self-regulated learners engaged in learning activities according to family or school expectations and autonomously used coping strategies during the study (Ginsburg & Bronstein, 2008). Adolescents' autonomy and self-determined learning were indirectly mediated significantly by parents' involvement and academic performance (Wang & Cai, 2017). Whatever the parents did to help their children can’t take place the children’s engagement by themselves.

Fourth, additional variables need to be taken into account when examining the relationship between parental involvement and student academic achievement. Many studies presented parental expectation and aspiration as two main dimensions of parental involvement that had strong positive relationships with student academic achievement (Fan & Chen, 2001; Hill & Tyson, 2009; Jeynes, 2011; Boonk et al., 2018; Sorbring & Lansford, 2019). Other than these two dimensions, further exploration of additional

variables related to parental involvement, such as parental discipline, parental communication, and other supporting engagements, is required for a comprehensive investigation. Other mediation and moderating effects from socio-economic status (SES), parental education level, and parental style also need to be further studied (Zhang et al., 2021; Zong et al., 2018; Sorbring & Lansford, 2019; Wu et al., 2018). If these mediating or moderating indicators were taken into account, mediating or moderating indicators could provide a more nuanced understanding, and the relationship between the parental involvement variables could be positive or negative but different from the previous research (Boonk et al., 2018; Lan et al., 2019). SES considered a range of factors beyond just residency status, such as income, education level, and occupation. Still, on the other hand, the residence status (Hukou) restricted the family from obtaining those resources. By incorporating other variables and measurements, such as those mentioned above, a more nuanced comprehension of the context of Chinese students could be achieved.

Researchers have done a lot of investigations to study how parental involvement contributes to student academic achievement through mediation or moderation from different perspectives. However, some issues existed regarding the relationships between parents, students, and students' academic achievement. First, the constructs of parental involvement, students' engagement, and the indicators of student academic achievement were not clearly defined. Second, the contexts of diverse attitudes and beliefs, cultural values, races, and economic indicators weren’t thoroughly considered. Third, it was crucial to thoroughly investigate the stability and consistency of the latent constructs when the dataset supplies parents' and students' viewpoints across two time periods.

Fourth, more variables should be included in the path when we try to establish relations among the parents, students, and the achievement goals when considering the region's specific features. Since the parent-child relationship, the child's adjustment, and the educational environment around the students all matter, there was a need to use international data sources to fully understand the relationship between parental involvement, school engagement, and children's academic achievement.

Research Goals and Purpose

This study aimed to apply a dataset from a national survey in China to determine the factors within the parents' involvement and children's self-construct engagement and how these factors influenced children's academic performance by adding specific cultural features through a set of statistical models. It comprised several levels of goals. The first goal was to establish reliable and valid constructs for parental involvement by using factor analysis and confirmative analysis. The second goal was to derive the latent constructs of student self-engagement from the student self-report data with reasonable validity and reliability. The conformative analysis followed the exploratory factor analysis. Different perspectives and two timeline datasets were applied to test the latent factors' stability, consistency, and invariance. Then, the path analysis among parental involvement, student self-engagement, and student academic achievement built the causal relationships among these variables. The specific indicator of residence status in China was also added to study the differences between rural and urban in such causality to find the gap. Finally, the combination of direct and indirect effects presented the picture of parents, children, and society within a sophisticated structural equation model.

This type of examination was essential to supply a methodology procedure guideline to explore general research questions about what and how the effects work in the field of social study, education, and psychology based on the national survey questions. It presented how to use a set of statistical models in front of diverse questions collected from research subjects and build a reliable research analysis based on the existing information. Specifically, this study was designed to gain a deeper understanding of the factors that influence academic achievement in a country and identify areas for improvement. The results of the complex structure analysis would be valuable for policymakers, educators, and researchers alike, as they aim to address the needs and challenges students face in such communities.

Understanding parental involvement is not a new concept. It is crucial to comprehend the ideology behind the parent, school, community, and society if we can properly contextualize them. The findings of this study may highlight the importance of integrating multiple theories to understand parents' and children's engagements in non-western cultures. It helped not only reveal generalization and extend boundary conditions for Western-originated theories but also inform practical endeavors at promoting children's educational achievement worldwide on the strengths of different cultures.

This study gave us a perspective to understand not only how parenting engagement affects the development of children but also how the specific cultural environment could make a difference. It comprehensively explained Chinese middle school students, including rural-urban gap distribution and social class differences in academic outcomes. It brought up some points when we tried to explain aspects of

society, such as migration and the gap between rural and urban in a specific culture in the Chinese context.

Research Questions

Based on the research design, the specific research questions are:

1. What are the major dimensions of parental involvement and student self-engagement?

2. Are these latent factors invariant from the perspectives of parents and students and across two time points (baseline and tracing line time points)?

3. How do parental involvement and self-engagement impact students' academic achievement as examined by a structure equation model?

4. As evaluated through a structural equation modeling approach, how does such an analysis reveal the rural-urban gap distributions among parental involvement, student self-engagement, and the student's academic outcomes?

Chapter Two: Literature Review

According to ecological theories (Bronfenbrenner, 1979), various contexts and hierarchical levels of factors, including family, school, community, and the whole society, could influence the children's school achievements. To fully understand parental involvement in both home and school settings, it was necessary to consider the educational systems and external factors such as parent's relationships and cultural backgrounds (Seginer, 2006).

Research has consistently shown that when parents were actively engaged in their child's education, they were more likely to have higher academic achievement, better behavior in school, and a more positive attitude toward learning (Bronfenbrenner, 1979; Seigner, 2006; Fan & Chen, 2001). Children can benefit from numerous parental efforts and engagements extended from parents' education, cultural networks, experiences, and capacities. Multiple-step models and multivariate statistics analysis were used by adding more variables covering sociocultural settings that could mediate or moderate educational outcomes in such topics.

The Development of Parental Involvement

Parental involvement in a child's education has been the subject of numerous research studies over the past decades. The development of parental involvement has been examined from various perspectives, including its impact on academic achievement,

the factors that influence parental involvement, the construct of parent involvement, and the strategies and modeling techniques that can be used to understand the comprehensive educational system.

Early studies were developed from the low academic achievements of specific student groups, family background, and social status, and then to establish an ecological system including student, family, school, community, and the whole society (Bronfenbrenner, 1979; Seigner, 2006). The literature often started from two kinds of parental involvement: school-based and home-based. Then, when the focus of the investigation was restricted to within-the-family processes or extended to adding schools or societal features, the studies found the children and parent's characteristics or social structure could mediate or modify the effects on children's academic achievements (Rogers et al., 2009; Castro et al., 2015). Later, the researchers found parental engagements involved any form of parental participation or practice in allocating resources to help children achieve educational progress (Fan & Chen, 2001; Seginer, 2006). The development of techniques and the availability of advanced multivariate analytic methods, such as longitude multiple regressions with fixed effects (Stull, 2013), structure equation models (SEM; Wang & Sheikh-Khalil, 2014), hierarchical linear modeling (HLM; Shen et al., 2014), meta-analysis (Hill & Tyson, 2009), and latent growth model (Xu et al., 2020), extended the ways to discuss the structures of the parental involvement and build the relationship between parental involvement and children's engagements to both macro and microscopes.

The availability of data from diverse sources also added strength to the different cultures and social structures. Researchers studied various views about how parents influenced their children's academic achievement differently and agreed that parental involvement was a multidimensional construct with mediation and moderation effects (Hill & Taylor, 2004; Seginer, 2006; Jeynes, 2011; Castro et al., 2015). These analyses could be summarized into four kinds of context: activities and management at home, attitudes or implementations, the interpersonal communications between the parents and students or schools, sociocultural contexts, and the extension of macro and micro educational systems (Seginer, 2006).

Constructs of Home-based Parental Involvement

Home-based involvement usually included activities helping with homework, home supervision, and home behavior disciplines. And later, it extended to parent-child interaction, communication, and any kind of spiritual and physical support. Participation in and management of learning at home, such as reading together (Evans, 1998) and organizing or monitoring children's time (Finn, 1998), can motivate children to learn (Seginer, 2006). Parent-child interactions regarding school issues were another stream of involvement, including rewarding learning-related behaviors (Dearing et al., 2006), punishment, or coercive interactions (Pomerantz & Eaton, 2001). Parents' supplying positive and rewarding emotional participation to children at a young age was also a form of home involvement (Rogers et al., 2009; Jeynes, 2011). Some researchers suggested that home-based involvement even played an increasingly important role in secondary school (Karbach et al., 2013). Other researchers argued that activities like helping with

homework, monitoring children's time, or supervising don't always work well with children (Jeynes, 2011; Castro et al., 2015) when considering the school periods.

In the early studies, researchers analyzed the effects using regression and separated each activity that parents do at home into the investigations. Desimone (1999) checked different parent home activities individually with 8th-grade students. The activities involved discussing with the child about high school, talking with parents about post-high school plans, rules about homework, GPA, & chores, rules about TV, friends & duties, parents checking homework, discussing with parents about school, talking with the father about planning high school program, and social capital (e.g., knowing the parents of their child's friends). However, the form of individual activity depended on the source of how it was designed and whether it was collected from the data source (Ingels et al., 1990). A large number of individual activities reduced the reliability and validity. Later, the researchers used latent constructs to separate similar activities into different groups through factor-reduction techniques.

Usually, home-based involvement included the activities as follows (Boonk et al., 2018):

1. Educational expectations/aspirations
2. Valuing of education/academic achievement
3. Reading with children
4. Educational trips (going to the library or the museum)
5. Academic pressure/control
6. Engagement in learning activities at home

7. Assistance/help with homework
8. Parent-child discussions about school experiences
9. Parent-child discussions about selecting courses/programs
10. Parent-child discussions about the post-high school plan
11. Parental support/encouragement in learning
12. Rules for TV/parental limit-setting

In the questionnaires, each engagement above usually included at least one item about parental activities. Since there were no standard definitions of the dimension of parental involvement, and due to the development of statistical tools and techniques, the researchers used item reduction techniques to find the common dimensions of parental involvement. Most research now considered home-based involvement to be what parents did at home to promote their children's learning (Boonk et al., 2018). Definitions of home involvement included some directions: parents' communication with the child either on school issues or other types, monitoring or guidance in learning activities at home, parental expectations or aspirations for their child's academic achievement or future, and even emotional and spiritual support.

Parents' Expectations and Aspirations

Parental involvement enhanced children's school achievement through motivation (Cheung & Pomerantz, 2012). Parents' expectations and aspirations were the most essential forms of stimulation, more important than communication, home rules, and school activity participation (Singh et al., 1995). Many meta-analyses had verified that parents' expectations and aspirations were the dimensions of parental involvement that

contributed the strongest to the student's development in different school periods (Fan & Chen, 2001; Hill & Tyson, 2009; Jeynes, 2011; Castro et al., 2015). When the children were in the beginning stage of school, parents' expectations and aspirations were strongly linked to school readiness scores and parental involvement in children's learning (Gorard et al., 2012). The review also suggested that parental expectations were connected to a child's success at a higher level of schooling and out of school in adulthood. The effects could last a long time after the children graduate from school.

Two theoretical models can explain and understand the mechanism of how parental expectations and aspirations work between the parent and child. The two models were the parent-to-youth transmission process of educational ambitions or the expectancy-value model of achievement motivation (Eccles & Wigfield, 2000) and the two-step model of value transmission (Grusec & Goodnow, 1994). The mechanism worked in three aspects: first, parents' expectations may influence how the parents allocate the time, money, social network, and other resources related to their children's education; second, parents' expectations may shape their children's expectations and values about school success and the future; third, parents' expectations may shape the way both in school where parents responded to opportunities, problems, and teachers, and the parents' beliefs about their children's competencies and guide parent-child interactions (Ren & Edwards, 2017; Barnett & Taylor, 2009).

School-based Parental Involvement

School-based involvement generally included communications between parents and teachers, parental participation in school activities, such as parent-teacher

conferences and school events, volunteering in the classroom, taking class trips, and participating in school functions.

Usually, school-based involvement included the activities as follows (Boonk et al., 2018):

1. Attendance at Parent-Teacher Association (PTA) meetings
2. Volunteering at school
3. Visiting the classroom
4. Attendance at school or class events
5. Participation in school functions (such as membership in PTA)
6. Teacher-parent communication about academic performance
7. Teacher-parent communication about problems or difficulties at school

One question was whether these activities promoted parent-school connection, knowing the school's arrangements and students' behavior by understanding children's growing up. Since these activities made no direct contribution to academic development but were related to children's personal health development, we need to include this indirect effect in the study.

The Academic Achievement or Educational Outcomes

In this study, some terms referred to similar means, such as academic achievement, educational outcome, academic outcome, or school outcome. They referred to a child's level of measurable outcome in educational assessments of any kind. For a young or preschool kid, it can be the child's school readiness, indicated by the ability to read letters of the alphabet and count numbers. Early childhood education emphasized the

skills, abilities, knowledge, and behaviors that were facilitated to prepare for K-school (Ma, 2016). Williams (2010) referred to the educational outcome as literacy achievement. Fantuzzo (2004) used children's behavior as the educational outcome for kindergarten children. The outcomes for school-age children can be any level of qualifications, teacher reports, or formal test scores of any subjects in or out of school. Regarding all of these types of academic outcomes, studies usually used several categories of academic achievement as follows (Castro et al., 2015):

1. General achievement (GPA)
2. Mathematics scores (standard or non-standard test scores)
3. Reading (the alphabet, the literacy scores, or reading test scores)
4. Sciences (the concepts of understanding or test scores)
5. Social studies (the concepts understanding or test scores)
6. Foreign language (the alphabet, literacy scores, or reading test scores)
7. Other curricular subjects (art, music, etc., standard or non-standard test scores)

Other academic achievement dimensions were used when cross-cultural or international comparisons were investigated. For example, the Trend in International Mathematics and Science Study (TIMSS), Program for International Student Assessment (PISA), and The Progress in International Reading Literacy Study (PIRLS) scores were applied in some pieces of literature (Hartas, 2015; Chen & Ho, 2012; Blaver, 2009). For cross-cultural research, some indicators of academic achievement were combined with

specific educational systems, such as the National College Entrance Examination (NCEE) in China.

Parental Involvement and Students' Academic Achievement's Relationship

The relationship between parental involvement and academic achievement has been a hot topic for researchers for an extended period. In the early studies, researchers analyzed correlations using the regression coefficients and studied the associations between parental involvement and student achievement. With the development of techniques and dataset availability, path analysis, structure equations, hierarchical linear modeling, and growth models have become popular applications in this field. Research can discuss complex relationships and causality, including macro and micro variables in the educational system, and explore the dynamic change of the effects. Gorard, See & Davies (2012) summarized research on this topic from early childhood to early adulthood and concluded that parental interest and involvement in their child's education was a cause of children's educational and occupational success from preschool to post-16 participation. Parents' active participation in their children's education was beneficial for the children to develop social, emotional, and academic growth (Green et al., 2007; Jeynes, 2011; Graves & Brown, 2011). Several forms of parental involvement in these studies were positively associated with students' academic achievement.

However, the forms of parental involvement in the literature only were separated into several kinds, and they may have cross-group effects. Not all documents had a consistently positive impact on children's achievements.

Mixed Directions of the Relationship

Overall, meta-analysis results in the field indicate that there were statistically significant relationships existing between parental involvement and academic achievement in general (Fan & Chen, 2001; Jeynes, 2011, 2007; Hill & Tyson, 2009; Gorard et al., 2012; Castro et al., 2015; Boonk et al., 2018). Although it was widely acknowledged that parental engagement played a crucial role in enhancing children's education, there remained some uncertainty regarding certain aspects of parental involvement and their impact on student achievement. These aspects included the different forms of parental involvement, the varying effects on different age groups, the disparities among ethnic groups, and the direct and indirect effects.

Empirical studies did not clarify a predictive relationship between the specific types of parental involvement and achievement. Among the various constructs of parental involvement, some dimensions are associated (e.g., parental expiration or aspiration) with significant positive effects on academic achievement, some (e.g., homework helping, school connection) were not correlated with students' academic achievement, and some studies were found to be significantly negatively associated with achievement. Such parental involvement forms, involvement in homework, participation in decision-making, involvement in volunteering, and involvement in communication with teachers had been significantly investigated.

Parents' expectations and aspirations were the two most prominent dimensions of parental involvement, contributing to significant positive effects on student academic grades (Singh et al., 1995). Many meta-analyses had verified that parents' expectations

and aspirations were the dimensions of parental involvement with a strong positive relationship with student academic achievement in different school periods (Fan & Chen, 2001; Hill & Tyson, 2009; Jeynes, 2011; Castro et al., 2015; Boonk et al., 2018). Castro et al. (2015) asserted that there was a causal relationship between those two.

There were mixed findings from a variety of other studies. If the parents supplied positive and rewarding emotional participation, there would be a higher return in the school grades at a young age (Rogers et al., 2009; Jeynes, 2011). Even home-based involvement played an increasingly important role in secondary school (Karbach et al., 2013), activities like helping with homework, monitoring children's time, or supervising didn't always show positive relationships with children's academic achievements (Jeynes, 2011; Castro et al., 2015) when considering the school periods. Desimone (1999) checked 12 types of parent involvement with 8th-grade mathematics and reading scores and found that parents' contact with the school and regularly checking homework were negatively correlated with school academic performance. Singh et al. (1995) explored the effect of parental participation in school-related activities from four components of parental involvement on the achievement of 8th graders. Parental involvement in school activities did not affect achievement. Parent-child discussions had a slightly positive impact on achievement. On the contrary, Ho Siu-Chu & Willms (1996) found that parent-child discussions at home had the most substantial positive relationship with 8th graders' academic achievement. They also found that parental involvement in school moderately impacted achievement.

The child's grade and ethnicity were two factors that shaped the changes in the associations between parental engagement and achievement. When children transition from early childhood to adolescence, parents may perceive their children's need for autonomy and consequently reduce their school involvement or home supervision to build the need for independence from their children. However, Boonk et al. (2018) revealed that parental engagement did not decrease when the activities changed from direct, such as reading and homework, to indirect involvements, such as academic encouragement, support, and spiriting control. Li (2018) used a dataset from China to study various dimensions of parental involvement and found that parent-child communication and activities could significantly improve children's academic performance, while homework supervision and tutoring had no significant impact on children's academic performance. Jeynes (2011) conducted multiple meta-analyses of students in both elementary and secondary school, taking into account the ethnicity and diversity of the students, and found that, overall, school-based forms of parental engagement were not particularly significant. Still, some variations depended on the racial group when socio-economic status was taken into account. Boonk (2018) conducted a review of studies that looked at the impact of various forms of parental involvement on three different age groups (up to 6 years old, 6 to 12 years old, and 12 to 18 years old). The findings indicated that while school-based forms of parental involvement were positively associated with academic performance in early childhood, this correlation weakened and diminished as the children grew older and even turned into

a negative association in high school. The effects varied considerably with age and school period.

Mediating or Moderating Role

Mediating and moderating variables are important concepts in social science research as they help to explain the relationship between independent and dependent variables. Mediating variables act as intermediaries between the independent and dependent variables. In contrast, moderating variables are used to describe the conditions under which a relationship between the independent and dependent variables occurs. Mediating variables often explain how an independent variable influences a dependent variable. For example, a study by Jeynes (2011) might find that parental involvement positively affected students' academic achievement. However, a mediating variable, such as the quality of the parent-child relationship, might be used to explain how parental involvement leads to improved academic achievement. Moderating variables, conversely, are used to describe the conditions under which a relationship between the independent and dependent variables is stronger or weaker. For example, a study by Hampden-Thompson (2013) found that parental involvement positively affected students' academic achievement. Still, this effect was stronger for students from low-income families than those from high-income families. In this case, the moderating variable was income level.

Both mediating and moderating variables are essential for understanding the complex relationships between variables in social science research. Researchers used various statistical techniques to analyze the effects of these variables on the independent and dependent variables. These techniques included regression analysis, path analysis,

and interaction effects analysis. For instance, the study by Wang (2015) used path analysis to investigate the relationship between parental involvement, self-efficacy, and academic achievement.

Between parental involvement and the student's school achievement, many factors could impact the student's school achievement, such as ethnicity/race, socio-economic status, gender, age, and other child personal characteristics. If children's academic achievement is the educational outcome, parental involvement, and student self-engagement are two variables that can cause this outcome. All other factors can mediate or moderate the product. The various dimensions of these two critical variables of parental involvement and student self-engagement could mediate or moderate each other and produce complex results (Gorard et al., 2012). Parental involvement and students' academic achievement have been found to be positively correlated with factors such as parent's education level, income, and occupation (Jeynes, 2011). Using statistical techniques, these factors about parents had been combined into a single factor known as family socioeconomic status (SES).

Social-economic status (SES) was another crucial indicator of parental involvement (Singh et al., 1995; Seginer, 2006; Jeynes, 2011). SES could impact how much effort and how to allocate resources parents have to support the development of children. SES could have directly affected the educational outcome, while parental academic involvement could mediate the relationships between family SES and children's Chinese and math achievement (Zhang et al., 2020). Seginer (2006) argued that social classes, ethnic or religious groups, or persons living in particular regions, communities,

neighborhoods, or other types of broader social structures constitute a macro-system that indirectly affected the children's school outcomes.

More factors can be considered to be mediating or moderating roles. Rogers et al. (2019) used children's characteristics as the mediators, and they found that children's academic competence and self-concept would mediate the relations. Parents put more academic pressure on their sons while using more encouragement to support their daughters. Parenting style can be treated as a moderator. In a study with 614 Chinese fourth and fifth-grade students, parental psychological control was found to moderate the relationships between school performance and two specific types of parental involvement (Zong et al., 2018). Phillipson & Phillipson (2012) posited a cognitive-affect model of achievement based on the finding that a child's cognitive ability beliefs were mediated between the parent's influence and the child's academic achievement. This model proposed that parent-child interaction communications of beliefs and expectations sent the information to the children to help the children build the self-evaluation of cognitive ability that affected the children's school outcomes.

Parent education levels were also found to mediate between parental involvement and the children's academic outcome, and the children would benefit more from a mother with a higher educational level (Dearing et al., 2006; Englund et al., 2004). Multiple studies on various race groups suggested that the association between parental involvement and student academic outcome was moderated by racial/ethnic characteristics (Hill et al., 2004; Hong & Ho, 2005). Hill et al. (2004) investigated 463 adolescents from 7th through 11th grades and found that parent academic involvement

was positively related to achievement for African Americans but not European Americans. Hong & Ho (2005) checked the direct and indirect effects of parental involvement on children's academic achievement with a longitude dataset and found significant ethnic differences in the direct effects of parental involvement on academic achievement.

The mediating or moderating effects depend on the paths between the variables put into the equations. The relationships and the causality would be very complex if more variables were built from the macro and micro frameworks when the families, students, schools, community, and society are all considered. And the definition and number of parent involvement dimensions also confounded the results.

The Adolescents' Self-determined Engagement and Academic Activities

Children took actions to learn, study, make decisions, and attain educational outcomes and occupational achievements. Personal characteristics, such as attitudes toward school and learning, aspirations and expectations for the future, and self-regulated behaviors, contributed directly to school attainment and performance (DiPerna & Elliot, 1999). Hong (2001) found that students with such personal features as motivation, independence, organization, and perseverance could obtain high school grades in their academic work. These studies suggested that children were encouraged and self-disciplined through feedback from parents at home and teachers at school. Goodman & Gregg (2010) posited that as children transitioned to middle school at about 14 years old, young students' attitudes and behaviors contributed the most to the gap in test scores. Since most academic activities were not inherently fun for children, parent engagements

needed to nurture self-driven learning and to motivate children to persistently stay interested in school-related activities (Ryan & Deci, 2000b).

The Self-determination theory (SDT) aimed to depict human motivation and personality in social conditions that facilitated or hindered the development of autonomous self-regulated learning (Ryan & Deci, 2012). This theory worked to determine the effects of extrinsic rewards on intrinsic motivation. Learning activities, such as doing homework, reading, and reviewing class contents, can be internalized as important tasks by students if the values behind these activities were accepted in their minds (Ryan & Deci, 2012). Parental involvement created an autonomous supportive environment to support the adolescents through actively adopting parental values and norms and further making self-regulation an internalization (Cheung & Pomerantz, 2012). Wang & Cai (2017) checked the parental involvement and Self-determination theory and found that, in general, parental engagement was positive for children's self-regulation learning. Still, it depended on the specific kind of parental involvement. Parental leisure involvement was positively and significantly associated with the development of self-determined learning, but parental academic assistance involvement was not.

However, it was difficult to state that student attitudes towards educational issues, motivation, aspiration, self-esteem, or self-regulation had a causal relationship with school achievements (Gorard et al., 2012). Motivation can be as feedback from schooling and conversely affects the achievement outcome. Aspirations, attitudes, and expectations were changeable due to the quality of the feedback they received from schools or parents.

Motivation, aspirations, attitudes, self-esteem, self-regulation, and behaviors intertwined with others, and the combinations of the integrations influenced subsequent academic performance.

The Family Social Economic Status and Students' Academic Achievement

Family SES (social economics status) refers to the social position defined according to the social resources possessed by a family in society, including income, education, financial assets, and occupational status, as the most widely accepted measures (Conger & Donnellan, 2007). The studies revealed how parents' economic situation impacted the children's cognitive ability, social competence, school success, attachment, and psychological well-being. SES was an indicator combined with family wealth, parental occupations, and parental education level. Each component of SES had different direct effects on students' mathematic achievements mediated by parental expectations (Long & Pang, 2016).

It has been widely accepted that family SES was a significant factor to consider when research included parenting factors. Parenting was closely associated with examining its economic, social, political, and historical context (Taylor et al., 2004). Many studies attested to the usefulness of including an SES index in analyses of student learning outcomes, generally including an SES index for two primary purposes (Buchmann, 2002). One was to understand the extent to which and the mechanisms by which family SES was associated with academic achievement. The other was to evaluate the influence of individual, family, school, and community aspects while controlling for SES.

SES has become so important in determining children's educational achievement that it tightly relates to parents' ability to obtain economic resources, create a warm family environment, and enter qualified schools. In higher-SES families, parents did learning activities, such as reading, playing, and cognitively stimulating their children more than those in lower-SES families (Ashdown & Faherty, 2020). Skokut (2009) found that only SES was significantly correlated to school completion, and other parental involvements were not for Latino English-language learners in California. Parents would compete for high-quality educational resources for their children to ensure a better educational outcome. What parents did led to the result that their families' socio-economic status more significantly influenced the academic performances of urban students than those of students living in rural areas (Li & Qiu, 2018). This was because parents' options were more restricted due to the constraints of residing in rural.

The effect of family SES on children's academic outcomes varies with school age. Johnson et al. (2007) used a set of adopted children to investigate parental expectations on children's school outcomes. They found that children's prior IQ mainly explained the association between SES and outcomes. Similar results were found by Dearing et al. (2009) in early childcare. When the children were at the school stage, the research showed that SES was linked to various dimensions of parental involvement, including parental aspiration and expectation, attitude, and interaction communications, mediating the children's school outcomes (Gorard et al., 2012). The reason was that children in high-SES families had more chances to reach environments that might enhance learning, and the home could create an atmosphere that nurtured learning.

Parental involvement was correlated with family social status, and the association might impact the effects on each other. When the children were of school age, Hango (2007) suggested that greater parental involvement could compensate for some of the adverse impacts of low SES. Marjoribanks (2005) used a Longitudinal Surveys of Australian Youth dataset to study parental participation. They found that including or reducing a predictor for student academic outcome would change the association between the SES and the student school outcome. Duan et al. (2018) found that the effect of parental involvement on children's self-discipline behavior was positively stronger among low-SES families than in high-SES families.

In summary, SES impacted the size and orientation of the associations between parent engagement and student academic achievement. Considering the SES in the analysis is necessary to avoid overestimating or omitting the effect from all variables and dimensions that could impact the student school outcome.

The Cross-cultural Difference in Parental Involvement,

School engagement and its impact on academic achievement Education was highly valued in economics and often determined the level of individual success in different cultures. Specific parenting activities differed due to the direction of various ideologies, customs, religions, and cultures. And how these factors affected the children's development in multiple aspects.

Parental Involvement Difference between China and the Western Culture

Parents' time and energy for their children varied significantly in different cultural environments. Cheung & Pomerantz (2011) listed multiple parenting activities across

cultures. The quantities and quality of these activities varied due to different cultural ideologies about learning. In terms of quantity, Western parents were less responsible for spending learning time with their children than Asian parents (Chao, 1994). Especially in early childhood, Chinese mothers often chose reading, studying, and playing academically related games such as puzzles and chess as the after-school supporting activities. Western mothers would choose social and creative activities such as social interactions with friends and family, television, sports, and extracurricular activities (music and dance classes, Boy and Girl Scouts). Chinese mothers tended to train their children to practice academic skills, such as reading, calculating, writing, and filial piety, from their children at a relatively young age. Conversely, American mothers tended to make progress in healthy social-emotional development and body exercises during early childhood (Ren & Edwards, 2017).

School-based formal academic involvement included volunteering in the classroom, frequently communicating with subject teachers, or helping with homework outside school and other school-related activities. According to the school-based involvement, East Asian mothers had been reported to spend more time helping their children with homework and academic tutoring to prepare for tests than mothers in the USA (Kinlaw et al., 2001; Chao, 1994). Asian mothers fostered educational goals for their children and emphasized the importance of effort in achieving the goal (Cheung & Pomerantz, 2011). Conversely, American parents were less involved with school work, more easily satisfied with their children's school outcomes, and more focused on sports and balancing innate abilities (Cheung & Pomerantz, 2011).

There may be differences in the types of parental involvement that were most effective in different cultural contexts. Perceptively, parents treated their role in their child's education differently. For example, some studies suggested that parental involvement in reading and literacy activities was particularly important for children's academic success in the Western world, while in China, academic tutoring and test preparation may be more crucial (Fan & Chen, 2001). In China, children's learning was a significant responsibility of parents after school, particularly in the academic area, which occupied most of their leisure time; even the research showed that leisure involvement was sometimes more important than other kinds of involvement, such as tutoring homework, to the children's academic success (Wang & Cai, 2017). In the Western world, parental involvement often focused on providing emotional support and encouragement rather than direct academic involvement (Desforges & Abouchaar, 2003).

Cross-cultural Differences with Parental Involvement on Students

The differences in parental involvement between China and the Western world may impact children's academic achievement in various ways. For example, the more authoritarian style of Chinese parenting may lead to a greater emphasis on academic success and achievement, which could translate into higher academic performance among Chinese children (Chao, 1994). On the other hand, the more emotionally supportive approach to parental involvement in the Western world may contribute to children's sense of well-being and motivation, which could also positively impact their academic performance (Desforges & Abouchaar, 2003). Moreover, the types of parental involvement most effective in different cultural contexts may also play a role in children's

academic achievement. For example, suppose Chinese parents were more involved in academic tutoring and test preparation. This could lead to higher academic performance in math and science, which was often emphasized in Chinese education. Conversely, suppose Western parents were more involved in reading and literacy activities. It could contribute to better language skills and reading comprehension, which were important for success in many academic areas (Fan & Chen, 2001).

There was a combination of factors, such as cultural, political, and economic factors, that created an environment around parents to guide their children toward achieving exceptional academic results. The psychological impact of such pressure can positively or negatively influence children. Research suggested that teenagers in China encountered similar or higher levels of emotional turbulence, such as depression and anxiety when compared to their American peers. (Hesketh & Ding, 2005).

Student Self-engagement Difference between China and the Western Culture

In China, the emphasis on academic success can lead to high levels of student self-engagement and motivation to succeed. Chinese adolescents often faced significant pressure from their parent's high degree of involvement to excel academically, which could bring high inspiration and pressure. Chinese students were often described as highly focused and disciplined in their approach to academics, with a strong work ethic (Lee & Zhou, 2014). However, some studies suggested that this emphasis on academic success may also lead to high levels of stress and pressure among Chinese students, which could negatively impact their mental health and well-being (Hesketh & Ding, 2005).

In the Western world, self-engagement was often more focused on developing critical thinking skills, creativity, and problem-solving ability rather than rote memorization and test-taking. Western education systems also often emphasized student-centered learning, where students were encouraged to actively participate in their education and pursue their interests and passions (Richardson & Mishra, 2018). For example, the high levels of self-engagement and motivation to succeed among Chinese students may contribute to their academic success, particularly in areas such as math and science, which were often emphasized in Chinese education. On the other hand, the focus on critical thinking, creativity, and problem-solving ability in the Western world may also contribute to academic success, particularly in fields that require innovation and creativity, such as the arts and technology. Additionally, the student-centered learning approach in the Western world may foster a greater sense of autonomy and self-efficacy among students, which could positively impact their academic achievement (Richardson & Mishra, 2018).

Set Chinese Culture as Background

China's long history of collectivism emphasized obedience to authority, the pursuit of collective goals, and the value of family members. The Confucian-based education system served ancient China for thousands of years. In the traditional examination system, the old empire test had rigid requirements that endorsed the way of memorizing the classic texts and internalizing Confucian doctrines. Confucianism's virtues valued filial piety, loyalty, harmony, dignity, hard work, valuable skills, thrift,

justice, and perseverance. Those had a very profound long-term effect on today's educational learning and parenting.

Chinese Culture Shaping Chinese Parenting Practice

The famous sentence to describe the effort that Chinese parents expected from their children was "not losing at the starting line." Continuous improvement of grades and obeying the traditional disciplines at school were the most crucial routines, which were treated as a collective sense of honor (Chen et al., 2018). Parents were willing to find a private tutor to give children extra teaching, and teachers at school also supplied after-class support. Even more, family members must make the best effort and sacrifice individual interests to maximize the whole family's interests. In return, family members would have the possibility to get strong support from family when family members were experiencing difficulties. Chao and Tseng (2002) identified this parenting feature as the centrality of family and family interdependence.

Many studies suggested one of the prominent features of Asian parenting style was psychological control (Chao &Tseng, 2002; Wu et al., 2002; Chang et al., 2011; Zhu & Chang, 2019), which was related to the filial piety tradition (Chen & Ho; 2012). Parental control was referred to as "a form of parental governing that is demonstrative of involvement and concern" (Nelson et al., 2006, p.2) in Asian culture. Parenting with high control meant parents behaved authoritatively with a requirement of children's high obedience and academic achievement. Chang et al. (2011) compared the parenting styles of Chinese parents and their American counterparts and found that Chinese parenting involved heightened psychological control, but American parenting was more

autonomous. Wu et al. (2002) also compared parental involvement characteristics between Chinese parents and their U.S. counterparts. The study suggested that Chinese parenting engaged in practices like encouraging modesty, discouraging expression, and resorting to withheld affection or shaming as an effective way of psychological control. At the same time, for the quantity of parental involvement, Chinese parents made more effort and time for their children compared to their American counterparts (Chang et al., 2011).

Chinese parents used the filial piety tradition to bind the children to the whole family and to achieve a result that glory and loss happened together. So, Chinese parents had high expectations and aspirations for their children's future success. At the same time, children made obligations to the family, especially to their parents. This mechanism of the filial mediational effect was significant and reciprocal, which meant parental involvement and children's perceived control interplay with each other (Chen & Ho, 2012). This interdependence between the parents and children ensured that children accepted their parents' guidance, conformed, and achieved academic success in return.

Chinese Educational System and Policy

In China, 9-year compulsory education covering elementary and middle school implemented nationwide after 1986 provides affordable public education to children. After completing the nine years of compulsory schooling, students can choose to attend upper-secondary education for an additional three years, which leads to the Senior High School graduation certificate. The Chinese educational system strongly emphasizes academic achievement, with a heavy focus on rote learning and test-taking skills. The

National College Entrance Examination (NCEE), also known as the "gaokao," is a highly competitive exam determining which students will be admitted to universities. The gaokao is considered one of China's most important exams, and students typically spend years preparing for it.

Due to the various features of diverse regions, education resources were distributed unequally. And the differences between the urban and rural areas were apparent. For example, Zhu & Chang (2019) mentioned that essential (or key) schools in certain areas and big cities would lead to intense competition during the whole education period because these essential schools prioritized obtaining the best teachers and state funds. This effect had a long-term influence and even affected the career and socioeconomic status of the students after they graduated from college. Chinese parents believed that entering a better-quality primary school at the beginning would give them better chances to enroll at the best schools at the next level. The parents' efforts finally pointed to the National College Entrance Examination (NCEE).

Second, students used standard curriculums and books and received the same educational ideology from the education department across regions. The Ministry of Education released a set of textbooks with the names of publishing houses to the local departments once in a while. These textbooks emphasized traditional Chinese culture, core socialist values, and the Communist Party of China's revolutionary traditions (Zhu & Chang, 2019). At the same time, the standard learning content led to similar teaching methods and usually finding the correct standard answers. Students were encouraged to

memorize the knowledge and the right way to solve the problem instead of exploring various solutions and having fun when learning.

Chinese Educational System's Impact on Learning and Achievement

The Chinese educational system strongly emphasized academic achievement, which can significantly impact students' learning and achievement. The schools still relied on top-down instruction from teachers to convey knowledge. Lan et al. (2009) compared the teacher's activity in class between the Chinese and American classes and found that the teachers' direction occupied 93% of the Chinese students' class time compared with 58% of the student's class time in U.S. schools. The Chinese educational system focused heavily on a narrow range of subjects, such as math, science, and the Chinese language, which could lead to students having a limited understanding of other subjects.

The Chinese educational system heavily emphasized rote learning and test-taking skills. It could lead to students having a solid foundation in memorization and recall. Chang et al. (2011) argued these education practices enhance social learning achievement through standard tests in the academic competition only at the cost of the student's critical learning. These educational practices may bring up a stable society and millions of problem-solving individuals but with little creativity and scientific innovation inside.

The Chinese educational system placed a heavy emphasis on academic achievement and test scores, which could limit opportunities for students to express their creativity and individuality. Since the late 1990s, a series of reforms intended to change the teacher-centered learning model to a student-centered one and tried to implement

more flexible, problem-solving-oriented classrooms and extracurricular activities in urban areas (Zhu & Chang, 2019). Since the National College Entrance Examination was believed to be the fairest opportunity for an ordinary individual to have a higher-level resource of education, many attempts to modify the test had made little progress. The academic competition for students is still intense in China.

Even though the current education system brought some adverse effects, the Chinese educational system also positively impacted students' learning and achievement by providing a strong foundation in math and science and promoting hard work and discipline. Additionally, recent efforts were carried out to focus more on critical thinking, creativity, and problem-solving skills, which may also lead to students having more well-rounded and diverse skill sets. However, all traditions had their trends. Its path was not usually straightforward; sometimes, it took three steps forward and one step back, or sometimes, it took one step forward and three steps back.

Chinese Parenting and Students' Academic Achievement

Qi & Du (2020) proposed a Collective Desirable Path (CDP) model to describe the factors and how these factors ensure the successful path of a Chinese child. In this model, a highly collectivist culture, fierce competition among society members, the one-child policy, and a narrowly defined success were necessary factors that formed the utilitarian perspective on education. Combined with the long-term orientation and past success experiences, the adopted path of parenting outcome created a complex picture.

This path theory depicted a set of potential causal relationships between Chinese parenting and academic achievement. First, the high expectations and heavy focused on

students' academic excellence in the National College Entrance Examination, which conducted pressure top-down, made Chinese parents involve very much effort in their children's schoolwork at home (Qi & Du, 2020). Second, the predetermined social goals of entering the best universities and stable, highly-paid jobs required children's conformity in thinking and behavior, which may damage nurturing independence, critical thinking, and creativity (Shen, 2011). Third, children were encouraged by their parents to fit into collective norms, rules, systems, and expectations, pushing the individuals to achieve narrowly defined success beneficial to their families (Griffiths, 2013).

Research hasn't supported the view that the restrictive, demanding, or authoritarian parenting style of Chinese parents generally benefits academic success. Parents using authoritarian practices and psychological control may help with school assignments but moderate the effectiveness of home involvement (Li et al., 2020; Zong et al., 2018). More perceived parental involvement and the focal test scores were negative for nurturing the children's minds because stress, conflict, and disconnect arose in family relationships and ruined the parent-child relationship. These social and parental practices may be closely related to intense academic competition, a utilitarian view of education, and the uniformity of teaching and learning, both of which were beneficial to social learning (Cheung & Pomerantz, 2011). But the adverse effects, the pressure, and the damage to the parent-child relationship would last a lifetime for the individuals.

The Urban-Rural Gap in China

In China, there is an institutional indicator called Hukou, which refers to household registration status in a specific location. One citizen can only be registered for

one place for the right of residence. The Chinese Hukou system is a household registration system that was first implemented in China in the 1950s. It is a government-mandated system that assigns each individual a permanent residence status, determining their access to public services such as education, healthcare, and social welfare. The rights and obligations of citizenship depend on the Hukou. The rights and obligations of citizenship depend on the Hukou. It leads to huge differences when parents and students try to find educational resources, especially in rural areas, limiting students' learning and achievement opportunities.

The Hukou system is officially divided into two categories: rural and urban. Rural Hukou holders are those who are registered in a rural area, while urban Hukou holders are those who are registered in an urban area. Urban Hukou holders typically have greater access to public services and benefits than rural Hukou holders. Where the student can go to school and take the National College Entrance Examination also depends on where the student's Hukou is. For example, suppose the student's parents work in a city without a Hukou in this city. In that case, the student can't attend a local public high school or have healthcare benefits in this city even though the family lives there. Rural or urban status has different liabilities and obligations. The institution of Hukou separates the urban cities from rural areas in various forms of resources. And the One-child Policy had long last impacted the structure of families in both urban and rural areas (Wang & Cai, 2017), which made the parents bet on the child and push the education completion intensely for an extended period. Because of economic, cultural, and other related factors, education

completion was still fierce and somewhat escalated even after the One-child Policy was abolished.

Children's Hukou was acquired through a direct linkage to the residential status of their parents before they reached adulthood. This unique system in China tied a child's household registration directly to their parents' residential location and status. Essentially, the Hukou status of children was determined by the official household registration of their parents, and it served as a critical identifier, influencing various aspects of a child's life, including educational opportunities, social services, and access to public resources. Recently, the Chinese government has implemented some reforms to the Hukou system, such as loosening restrictions on rural-to-urban migration and providing essential welfare services to rural Hukou holders. However, the system remains a significant barrier to social mobility and access to public services.

Families in Urban Cities.

Due to globalization and the effect of Western culture, the parenting styles and activities of the young Chinese generation have changed a lot since the 1990s. Parents changed their strict and rigid management to supply and create warmer parent-child relations (Qi & Du, 2020). At the same time, parents paid more attention to cultivating their children's social skills and individual creativity (Jankowiak & Moore, 2016). However, the only way to enter the best key universities was to obtain the highest National College Entrance Examination scores. Even in urban cities, parents and schools were still obsessed with academic success to ensure that their children could find stable and well-paid jobs after graduation from college.

Families in Rural Areas.

During the high economic growth period, millions of rural workers migrated to urban cities (Fang & Dewen, 2003). Their children were left behind in the rural areas and taken care of by their grandparents because of the Hukou policy. During the spring festival, these migration workers returned home to be with their children and other family members. This formed a pattern of labor migration every year in China. Even though the parents of the migration workers couldn't accompany their children, they still expressed their high expectations and positive aspirations for their children (Qi, 2018). As a result of the long separation between parents and children, there was a high level of depressive symptoms among these children. A meta-analysis suggested that the depressive symptoms among left-behind children are about 8% higher than those of non-left-behind children (30.7% to 22.8%; Wang et al., 2019), and this negative effect may last for the children's whole life.

The Connections between the SES and Residence Status in China

Evidence from existing research suggested a strong relationship between Socioeconomic Status (SES) and Residence Status (Hukou) in China. The research found that individuals with a higher SES tended to have a different Hukou status than those with a lower SES, which could lead to disparities in access to education, employment opportunities, and other resources (Liu, 2005; Fu & Ren, 2010). For example, individuals with an urban Hukou tended to have better access to educational resources and opportunities than those with a rural Hukou since the hukou system denied the rural population access to education and urban employment, contributing major factors to

rural-urban inequality. As a result, students from urban areas were more likely to achieve higher academic outcomes than their rural counterparts. This was due, in part, to the differences in the quality of education and resources available to students in urban and rural areas.

In addition, researchers found that the Hukou system reinforced existing socio-economic inequalities in China, as individuals with a higher SES were more likely to have an urban Hukou and better access to resources and opportunities (Wu, 2011; Wu, 2010). This could lead to persistent disparities in educational outcomes and overall socio-economic status across generations. Ma et al. (2018) examined the academic gap between migrant and local urban children. They argued that Hukou, as an institutional inequality arrangement in education, affected rural students' educational achievement even as second-generation students. The researchers found evidence of a stronger relationship between the educational attainment of parents and their children in urban areas for those with higher levels of education compared to those with lower levels of education (Chen et al., 2019). Conversely, in rural areas, the intergenerational persistence in education (the passing down of educational attainment from parents to children) was stronger for those with lower levels of education. In other words, if a parent had a higher level of education, their children were more likely to have a higher level of education, especially if the family lived in an urban area. On the other hand, if a parent had a lower level of education, their children were more likely to have a lower level of education, especially if the family lived in a rural area. To such a degree, Hukou predicted the SES in the future.

These studies highlighted the importance of considering the interplay between SES and place of residence (urban vs. rural) in educational attainment and socio-economic inequality. Studies. The relationship between SES and Hukou in China was complex and interrelated, with SES playing a significant role in determining Hukou status and vice versa. Hukou status could be used as a proxy for SES in some research studies, especially when studying the impact of socioeconomic factors on educational outcomes in China (Chen et al., 2019). The Hukou system categorized individuals into urban or rural residences, was closely related to SES in China, and had significant implications for access to resources, opportunities, and education.

However, it's important to note that Hukou status and SES are not identical concepts and can have different implications for individuals and their educational outcomes. For example, while Hukou status provides a rough indicator of SES in China, it may not capture all socio-economic factors that influence educational outcomes, such as family income, parental education, and other resources. Therefore, while Hukou status can be used as a proxy for SES in some studies, we have to consider the balance of SES and Hukou status when investigating the impact of socio-economic factors on educational outcomes in the Chinese context.

Methodology Issues

In this study, there were several estimation models in the procedure. Generally, the development of scales and the application of Factor Analysis (EFA, CFA) and SEM required large sample sizes because the sample size dramatically impacts the precision

and replicability of the results. For each of the techniques, there were some issued to address.

Exploratory Factor Analysis (EFA)

Exploratory factor analysis was a multivariate statistical technique to find common underlying factors among a set of observable variables (Meyers et al., 2016). The goal of EFA was to reduce a large number of observed variables into smaller factors or latent variables that explain the majority of the variation in the data. The factors were derived from the correlation or covariance matrix of the observed variables and were typically interpreted in terms of the underlying constructs or dimensions they represent. It was commonly used when the researcher had no previous theoretical hypothesis about those measured variables. Observable variables can be any features of people. Since there are many observed variables, grouping these variables with similar characteristics is necessary and necessary. Usually, when there was a large number of observed variables, the researcher presumes a small number of latent variables could be derived from these observed variables. The researchers operationally defined the latent variables in terms of similar featured behaviors representing these unobserved or indirectly measured variables. As such, the latent variables were derived and measured by the observed variables. All the observed variables were associated with the latent unobservable factors.

The latent factors were extracted from the data using a factor extraction method such as EFA. The number of factors to extract was typically determined using a combination of statistical criteria such as eigenvalues, scree plots, and parallel

computation. There were a bunch of indicators and procedures to make assessments about how many factors the research should retain and how reliable the factors are.

For example, the eigenvalues indicated the amount of variance in the data explained by each factor. A common rule of thumb was to extract factors with eigenvalues greater than 1, as they accounted for more variance in the data than a single variable (Kaiser, 1960). Factor loadings indicate the strength of how strongly the factor impacts the observed variables. Generally, factor loadings of .3 or higher were considered acceptable, and those above .5 were considered firm (Howard, 2016). Communalities were the proportion of the variance in each variable that was accounted for by the factors. High commonalities (above .6) indicated that the factors represented a variable well, while low communalities (below .4) suggested that the factors did not sufficiently describe a variable (Hair et al., 2010).

The researcher can theoretically assess the factors' quality according to reasonable empirical scales. To label the factors in the model, the researchers must carefully consider the factor patterns and the features of those observed variables. The researcher must decide which items to which factors based on what those items have in common. What the items had in common told the underlying meaning of the factor. The researchers should present a clear principle about the boundaries between the factors.

Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis was another remarkable factor analysis when the researcher tried to test whether their constructs were consistent with the theoretical model they would apply (Meyers et al., 2016). CFA was a more formal and stringent approach

than EFA. If the data fit the theoretical model well, the researchers could assume the constructs were confirmed. The researchers carefully chose the theoretical model because this hypothesized model was based on previous analytic research. From this point, the constructs from the exploratory factor analysis could be the theoretical model that waits to be tested.

In confirmatory factor analysis, researchers focused on studying how well the observable data fits one or more unobserved variables. The investigation was assessed by estimating and evaluating the loading of each item used to find the features of the unobserved latent variable. It involved specifying the number of factors, the factor loadings, and the error variances for each observed variable. The model was then fit to the data using maximum likelihood estimation (MLE) or weighted least squares (WLS), and the model's goodness of fit was evaluated using various fit indices. There was a set of the model of fit indicators to tell results and how much covariance the results have explained. A good fit didn't tell the correctness of the model. It only showed a plausible model that the sample data fits well. When confirmatory factor analysis was accomplished, one was supposed to report the theoretical models, any modifications made, which items identified each latent variable with loadings, correlations between latent variables, and any other constraints (Jackson & Purc-Stephenson, 2009). An appropriate fit model needs to balance the qualities of all the indicators.

Structure Equation Modeling (SEM)

Structural Equation Modeling (SEM) was a mathematical and statistical method used to analyze a structural theory based on matrix algebra and generalized linear models.

It was a prevalent and flexible quantitative application that provided a method for testing a hypothesized theoretical model. The SEM commonly combined path analysis and measurement models. It always employed specific statistical models and computer programs to investigate the structural connections between unobserved constructs underlying the variables taken from observed sample data (Kline, 2015). The structure of the hypothesized model was carried on the sample data and then tested in a simultaneous analysis in one statistical estimation procedure to discover to what extent the model fits with the observed variables. The assumed connections among variables were plausible if the model fitted statistics on a reasonable scale.

The SEM conceptually included two kinds of models: the measurement model, which was a latent analytical model, and the full structural model, which combined the measurement model and the structural model. The structural model intended to present the relations between the unobserved latent variables. The measurement model tried to find the latent constructs of the observed variables. In a full SEM, the regression results presented the links between the observed latent factors defined in measurement models in forms of both sizes and directions. The model assessed the quality of the model with a bunch of indicators.

Sample Size

Kyriazos (2018) reviewed the simulation methods, sample size, and model power. The study summarized the sample requirement and the simulation methods to ensure statistical power. Analysis methods, such as ML (Maximum likelihood), MLR (Multiple linear regression), DWLS (diagonally weighted least squares), and WLS (weighted least

square), correspond with sample size and variable features. The sample size required for CFA and SEM is determined by several factors, such as the type of study design (e.g., cross-sectional or longitudinal), the number of connections among indicators, the reliability of the indicators, the format of the data (e.g., categorical or continuous), the estimation method used (e.g., maximum likelihood, robust maximum likelihood), the level and pattern of missing data, and the complexity of the model (Brown, 2015).

For an accurate analysis, the smaller the sample size can be when the data is strong, particularly when using EFA. The quality of EFA's analysis depended on the nature of the data (Fabrigar et al.,1999). The factor loadings, parameter estimates, chi-square tests for CFA and SEM, and general goodness of fit indices were sensitive to sample size. The sample size was essential for obtaining a good CFA or SEM model. If the sample size reached over 500, the EFA, CFA, and SEM can achieve robust results for binary and ordinal variables using the MLR (Bandalos, 2014; Kyriazos, 2018).

Estimation Method

As Likert scales are widely used in social research, it is important to determine the appropriate methodology for analyzing the data obtained. Despite being categorized as ordinal data, Likert scales are often analyzed using techniques designed for cardinal measures. It may lead to confounding and inaccurate construction, and it is necessary to use methods that consider the data's ordinal nature. When the observed variables are continuous, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) can reach robust results using Pearson correlation matrices. The measurement scale should be

considered when the research analysis needs to test the construct validity of a measurement instrument.

Polychoric Correlation Method

The polychoric correlation method is a statistical technique used to estimate the correlation between two ordinal or continuous variables because the variables are ordinal or continuous but not normally distributed. Polychoric or tetrachoric correlations with categorical variables can provide a more accurate construct building of the model used to generate the data than Pearson correlations (Holgado –Tello et al., 2010). , Polychoric correlations were presumed to be consistent and robust estimators (Kampen & Swyngedouw, 2000). In the case of the polychoric correlation method, the likelihood function was defined as the probability of observing a particular matrix of frequencies (i.e., a contingency table) given the correlation between the two variables and the marginal distributions of the variables. The correlation parameter was estimated by maximizing the likelihood function using numerical optimization techniques.

When the appropriate estimation methods were applied, the assumptions, the features of the observed variables, and the sample sizes must be considered thoroughly. Each method had its scale of application with assumptions and limitations. Ordinal/categorical variables should match the estimation method for the best reliability and validity.

Summary

To sum up, Chinese culture profoundly impacted Chinese parents' ideology and educational parenting practice. There were some perspectives. Firstly, the heritage of the

traditions, customs, and cultures of collectivism emphasized conformity and interdependence on the family members, and parents put the family glory on the children. The culture and traditions shaped parental practices and students' learning. Secondly, institutional arrangements played a crucial role in shaping various aspects of life, including the education system and policy in schools, the job market, social welfare, and public services. The Chinese education system extended the intense competition from school to home and spread to the whole society.

Furthermore, the residence registration system made the gap between the urban and rural areas even bigger. When the parents considered all these pressures, they would make all efforts to compete for the resources to ensure their children's future. However, the gap between the rural and urban was still significant. Urban Hukou status was associated with higher SES. In contrast, rural Hukou status was associated with lower SES. The strong relationship between Hukou status and SES reinforced socioeconomic inequalities across generations. The bright side was that the pattern of Chinese parental involvement was conducive to social learning. However, it also brought stress, pressure, and conflict in the relationship between the parents and children.

The investigation of this study was placed in a broader context with several extensions. First, the dimensionality of parental involvement was checked when considering the cultural impact. Second, the consistency of the dimensionalities between the students' and the parents' perspectives was analyzed to ensure reliability. Third, a larger dataset and an international view extended the boundary conditions for Western-originated theories. It represented how these specific features could impact the theories in

a specific cultural environment. Fourth, the causal relationships between all the factors and the effect sizes were investigated to tell how they impacted the student's academic achievements.

The central goal of the current research was to examine the role of children's parent-oriented self-engagement in mediating the effects of parents' involvement on children's achievement with an extension beyond the previous investigations by adding specific factors indicating culture or institution and a new dataset in multiple estimation models. That was, I evaluated the mechanisms through which parents' involvement in children's learning contributes to children's achievement by adding residence status Hukou (a social economic status indicator in China) to discuss the gap between the rural and urban in China. An issue of much importance but beyond the scope of the earlier studies.

We all knew that education was essential in shaping individuals' futures. Grasping parental involvement isn't novel. It's imperative to grasp the underlying ideologies within the realms of parents, schools, communities, and societies to adequately contextualize them. Returning to the beginning of the research, I mentioned the "Double Reduction" policy. Competition in Chinese society became intense after the One-child Policy. Due to concerns over the labor market, the Chinese government had already changed the propaganda from restriction to encouraging second and more children. This study brought a slight shimmer for understanding the parents, students, and society in today's China. It supplied some views to help us see what we understood in the past or future and gave us some suggestions for policy and made an assessment about those policies.

The findings from this study may underscore the significance of amalgamating various theories to comprehend parental and children's engagements in non-Western cultures. This not only purposed to unveil generalizations and expanding boundary conditions for theories originating from the West but also informs practical initiatives aimed at enhancing children's educational attainment globally, leveraging the strengths of diverse cultures. It provided a comprehensive understanding of Chinese middle school students, including the distribution of the rural-urban gap and disparities in academic outcomes based on social class. These findings shed light on societal aspects like migration and the rural-urban gap within a specific culture, serving as valuable references for policymakers.

Chapter Three: Methods

Research Procedure

Research Conceptual Model

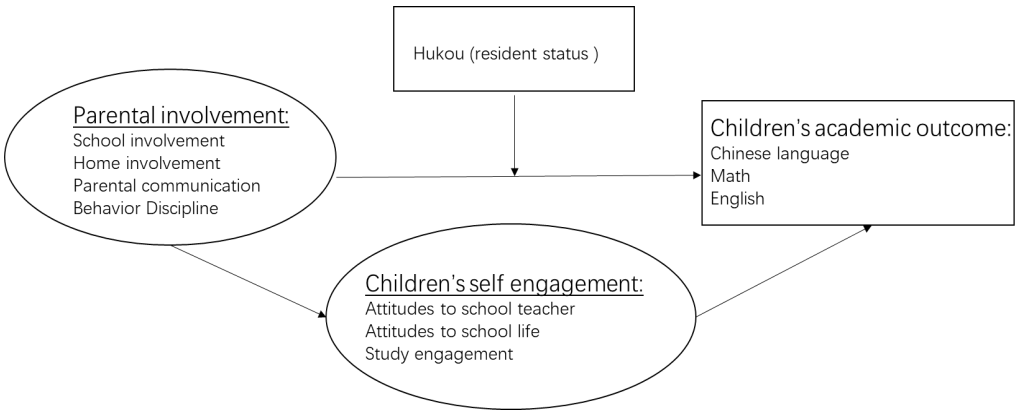

Figure 3.1. The Conceptual Design Diagram

The conceptual design provided an ideal context for examining the hypothesized pathway (see Figure 3.1). The associations among parental involvement, students' self-engagement, and academic achievement were in Figure 3.1, which Chen & Ho (2012) adjusted by adding the residence status as a control variable. There were three different levels of this research. The latent structure building of parental involvement and student self-engagement was carried out first. The path analysis followed to find the relations among parental involvement, student self-engagement, and academic achievement. The

third step was the structural equation analysis, which included the effects of the residence status on the urban and rural gap.

Parents' involvement in children's learning facilitated children's academic achievement or enhances children's engagement, thereby contributing to children's achievement. The critical mediating variable residence state (urban/rural) was added later to check the change. Given that student achievements were represented by raw test scores derived from various standards, several adjustments were made to ensure comparability and consistency across different assessments.

The Flow Chart of the Research Methods

Based on the conceptual design, this study proposed a comprehensive methodology to investigate an educational problem within a specific cultural context. The process integrated several statistical methods and models to analyze a large national dataset. Generally, the procedures followed the steps in the flow chart in Figure 3.2. Some actual method challenges need to be addressed in each stage or phase.

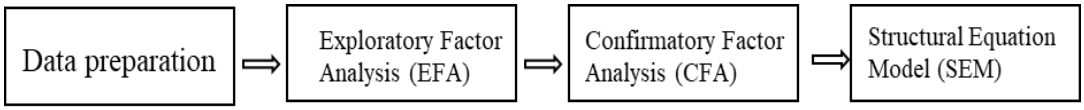

Figure 3.2. The Flow Chart of the Research Methods

The research followed the diagram procedure in Figure 3.2. Various estimation models were employed to analyze the relationships between parental involvement, student self-engagement, and academic performance. The investigation started with

measurement models by building latent constructs. Primary statistical screening, exploratory factor analysis (EFA), and confirmatory factor analysis (CFA) techniques were applied in this stage. Then, the connections between the latent factors were analyzed by path analysis. The path analysis built the fundamental relationships among the latent factors in the previous stage to present the primary relationships among parent involvement, student self-engagement, and student academic achievement. Finally, all the measurements and how they were related to each other were investigated in a composite structural model. The residence status (Hukou) was put into the path analysis and analyzed in complex structural equation modeling equations (SEM). The gap between the rural and urban for the effects of parent involvement and student self-engagement on students' academic outcomes is investigated to present the interrelationships.

EFA was utilized to identify underlying factors within parental involvement items and student self-engagement questions, allowing for the reduction of complex data into several interpretable latent constructs. Through methods such as eigenvalues, scree plots, and factor loadings, researchers determined the number of factors and assessed their reliability. CFA was then employed to validate the constructs derived from EFA against a predetermined theoretical model, assessing how well the observed data fit the hypothesized structure. SEM further integrated these constructs, allowing for the simultaneous testing of structural relationships among variables. By combining path analysis and measurement models, SEM provided insights into the complex interplay between parental involvement, student self-engagement, and academic outcomes.

Sample size and estimation methods played critical roles in ensuring the reliability and validity of the analyses. Researchers considered factors such as study design, variable reliability, and data complexity when determining sample sizes for EFA, CFA, and SEM. Estimation methods, including maximum likelihood and polychoric correlation, were selected based on the nature of the observed variables and their distributional properties. Additionally, researchers carefully considered the ordinal nature of Likert scale data, opting for appropriate methodologies such as polychoric correlation to ensure accurate analysis. Ultimately, the meticulous consideration of sample sizes and estimation methods contributed to robust and meaningful findings, enhancing the overall validity and reliability of the study's results.

The Models in Current Research

In the present study, the hypothesized model was designed to test the underlying effects of parental influences on students' academic achievement. In order to investigate the mediating effect of students' self-engagement as well as how this mediating effect works, the current study utilized polychoric correlation matrices in estimation exploratory factor analysis, confirmative factorial analysis, and structural equation modeling based on the variable features, the limitations, and application of those methods discussed above. The research followed the diagram procedure in Figure 3.1. First, the latent structures of parental involvement and students' school engagement were built separately. Polychoric correlation matrices were carried out instead of traditional linear Pearson correlation when the item questions were on a categorical scale to improve the estimation quality and circumvent the limitations associated with non-continuous item scales.

Secondly, it was common practice to use a random sample of the data for EFA and then use the remaining data for CFA to confirm the factor structure obtained from EFA (Johnson et al., 2019). The "split-sample" approach allowed for an unbiased estimation of the factor structure in EFA and then a confirmation of the structure in CFA. However, it was important to note that the sample size used for EFA should be large enough to ensure that the factor structure obtained is stable and can be replicated in CFA.

Thirdly, two samples, collected at different time points or from different perspectives, could be used to examine the stability of the factor structure over time or to compare the factor structure between two groups or samples (Seppälä et al., 2009; Fan, 2001). However, it was important to note that when using this approach, it was essential to ensure that the two datasets were comparable and that any differences between them were considered. Factors such as sample size, measurement instruments, potential biases, and demographic characteristics should be addressed when comparing the factor structure obtained from the two datasets.

Finally, the path analysis among parental involvement, students' engagement, and academic achievement were analyzed to see the paths among the latent factors. By adding residence status, the direct and indirect effects on the children's educational outcomes were checked to investigate the whole picture between rural and urban families' education in China. Here, some specific issues were cleared out.

There were several advantages to applying SEM as a robust methodological approach when the research tried to find the causal relations between groups of latent constructs defined by many observed variables. First, the variables in the equations can

be defined in a very complex way by observed indicators. Exploratory and confirmatory factor analysis models present the measurement part from the indicators, and the path analysis showed potential causal links between those latent factors and exogenous variables. All the observed variables kept the variances, and they predicted the covariance between the latent factors. Second, SEM allowed all measurements and tests to operate simultaneously in multiple regression equations, which meant a variable could be a predictor and dependent outcome in the same estimation procedure. Thus, the direct and indirect (mediating or moderating) effects could be studied in the estimation. Third, since the SEM tests multiple regression equations simultaneously, the errors throughout the model were calculated using all information from the model. It was essential to remember that a model's fit did not necessarily imply that it accurately represented the underlying construct. If the model fitted the sample data well, we could say the model was reasonable or plausible.

Sample size. The dataset applied in this study was big data with about ten thousand observations. It satisfied the prerequisites of a priori sample size determination of all the statistical models employed in the research to ensure the statistical power of model buildings. In a study, Alpha, Beta, statistical power, and Effect size were the four basic parameters related to statistical power analysis, and sample size had an essential effect on these parameters. The methods used in this research, EFA, CFA, and SEM, were all designed for use with large sample sizes. The dataset in this study caused no issues with sample precision and replicability of the results because of the large sample size.

Model estimation. Because of the impact of categorical variable type, estimation model or method was an essential issue. The Polychoric correlation method was appropriate for categorical data in this study. The specific steps of the research were as follows:

Step 1: Exploratory Factor Analysis

The tracing line dataset for parents and students was analyzed to obtain the essential constructs for parents, students, and the whole family. The tracing line cross-section dataset was chosen as the primary research data. The baseline dataset was used to cross-check the constructs. The cross-section data was randomly cut into half and a half to do the EFA and follow CFA for building construction.

a. Measuring the Parental Engagement Construct

The polychoric correlation method of EFA was applied by multiple-item indicators from parents' and students' reports for the same items. Moreover, multigroup invariant tests of the constructs from two perspectives or timelines determined the construct stability and consistency for parental involvement.

b. Measuring the Students' School Engagement Construct

Multiple-item indicators from student reports were used in the Polychoric correlation method exploratory factor analysis. Additionally, multigroup invariant tests of the constructs from two timelines determined the construct stability and consistency for student self-engagement.

c. School Performance

Students' academic performance was assessed by three subject grades: mathematics, Chinese language, and English. Because different schools had different standards of the maximum full marks, adjustment scores were applied.

Step 2: Confirmatory Factory Analysis

Another half of the dataset for the same group of students and parents was applied to confirm the latent structure for parental involvement and student engagement to check the validity and reliability of the constructs.

Step 3: Structural Equation Analysis

This phase had three parts: path analysis, direct/ indirect effects analysis, and model of fits. The data used in this section were the same from the CFA. Figure 3.2 presented the diagram of the phases and the steps were carried out in each phase of the study. After the latent constructs of the parent's involvement and student self-engagement were confirmed, the path analysis followed to establish the causal relationships among all the latent structures. It aimed to know how the parental involvement and student engagement variables affected the student's academic achievement, how the constructs of parental involvement affected student engagement, and how the direct and indirect effects among these two sets of constructs related to academic achievement.

The effects of residence status (Hukou) were tested simultaneously by adding it to the path analysis. I checked how residence status affects parental involvement and how the effect led to the differences in student academic achievements to see the gap between the urban and rural areas.

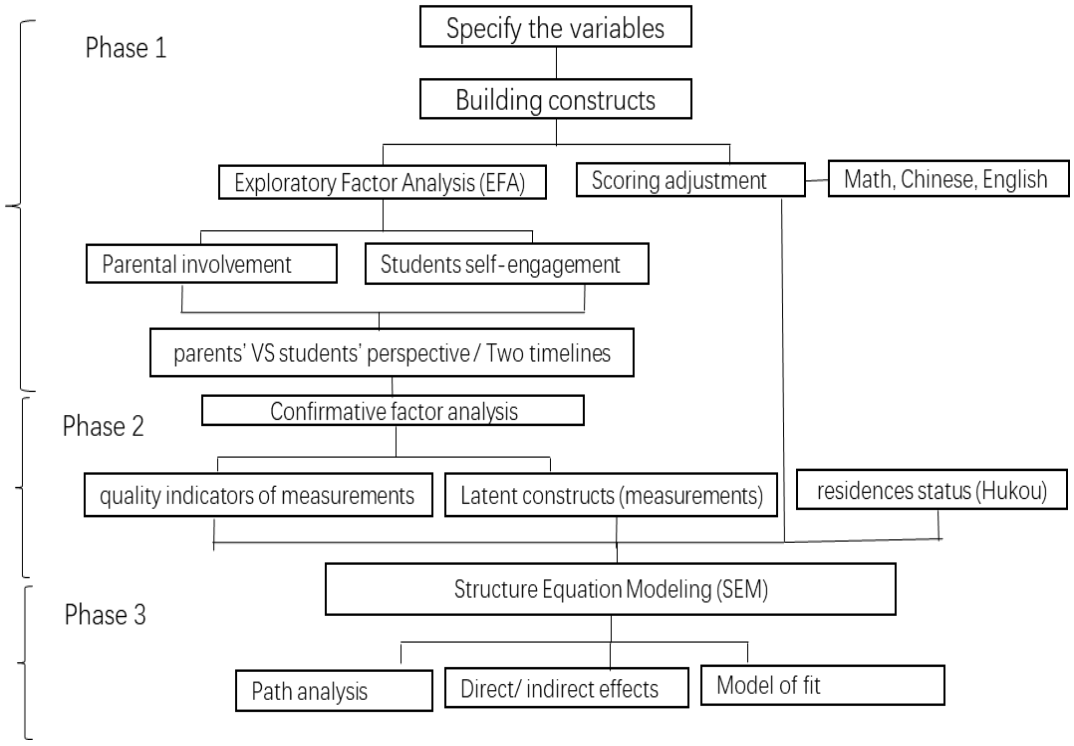

Figure 3.3. The Visual Representation of Analysis Procedure

Estimation Quality Indicators

Before any model estimation, the minimum requirement for data analysis was to ensure the data was appropriately cleaned and formatted. This process included checking for missing values, outliers, and errors in the data and making necessary corrections. Additionally, it was vital to check for assumptions of the model, such as the data distribution. Ensuring the sample size was large enough to support the analysis is also important. When it came to the model estimations, the statistical power could tell the audience how good the results were. There were a bunch of indicators to tell how well the model fitted the data. Fitting procedures of EFA estimated the factor loadings and unique variances of the model. The eigenvalue, which represented the amount of variance of the

variables accounted for by a factor, was a key indicator used to evaluate the number and nature of factors in factor analysis. CFA tested the hypothesis of whether the relationship between the observed variables and their underlying latent construct was reasonable by using a set of fit indicators different from EFA.

The measures of fit commonly used for CFA and SEM are Chi-squared, Akaike information criterion (AIC), Bayesian information criterion (BIC), Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Residual (SRMR), Comparative Fit Index (CFI) or Tucker Lewis Index (TLI). Usually, the assessment of the model of fit depended on the combined quality of these indicators instead of a single one. The quality of the model of fit balanced the qualities from several parameters.

There were different recommendations for the model of fit since each indicator captures different elements of the model's fit. The researchers often started from a null hypothesis and chose a more parsimonious model. The report included a selection of varying fit measures to balance these elements. It was important to note that no single fit indicator was perfect, and it was recommended to use multiple fit indicators to understand the model's fit comprehensively. It was also important to consider the sample size and the nature of the data when choosing the appropriate fit indicators.

However, one possibility needed to be considered. If the model fit was inadequate, several steps can still be taken into account: Assess the model fit using various fit indices and reconsider the cut-off values for each. Checked for missing data, outliers, and errors affecting the model fit. Revised the model by adding, removing, or changing the relationships between variables. Considered using different estimation

techniques. Considered using alternative model methods or different clarifying data techniques from the beginning. Even with the best efforts, sometimes it may not be possible to achieve an acceptable model fit; in that case, it may be necessary to re-evaluate the research questions, design, or data collection process.

Data and Participants

The data used in the current study came from the China Education Panel Survey (CEPS) baseline (2013-2014) and the second-year (2014-2015) tracing data. The China Education Panel Survey was designed and implemented by the National Survey Research Center at Renmin University of China (NSRC). It was a large-scale, nationally representative survey aiming to reveal the impact of the family, school, community, and social structure on individual education output. Further, it explored the role that education played in participants' lifetimes. The baseline survey was conducted in the 2013–2014 school year, and the baseline sample included the cohort of grades 7 and 9, the first and the third year of middle school in the Chinese school system. The baseline data included 28 counties, 112 schools, and 438 classes with about twenty thousand students.

The survey used a multi-stage Probability-Proportional-to-Size (PPS) sampling method. In the first stage, 28 county-level units in mainland China were randomly selected. The sample was stratified based on the average educational level and the proportion of the migration population. In the second stage, four schools enrolling grade 7 and/or grade 9 students were randomly selected from each sample county-level unit. In the third stage, four classes in each sample school were selected, including two grade 7 classes and two grade 9 classes. In the fourth stage, all students, parents, headteachers,

core subject teachers (including Chinese teachers, math teachers, and English teachers), and school administrators from each sample class were included in the sample. The final sample included 112 schools and 438 classes selected from the 28 county-level units in mainland China, and 19,487 students participated in the baseline survey. The second tracing line sample (2014-2015) only surveyed the 8th grade 10,279 students in the baseline (7th grade). 9,044 students were traced successfully, with a proration of 91.9%.

The data used in this study included the observations collected at two timelines. Both the baseline and follow-up tracing data of the two academic years included four parts: school data, class data, student data, and parent data. Every student had a unique identification number. The unique school code was used when merging class, family, and student data. The unique class code was used when integrating class, family data, as well as student data. The individual student personal code was used when the family and student data were merged.

Data Structure

The baseline and the follow-up surveys adopted the same five sets of questionnaires, including a student, parent, class teacher, subject teacher, and school leader questionnaire. The student questionnaire mainly included personal information, family situation, parent-child interaction, educational expectations, in-school learning, extracurricular activities, physical and mental health, and social behavior development. The parent questionnaire mainly included basic parent information, living habits, parent-child interaction, family education investment, family education environment, community environment, views on school education, interaction with teachers, and

expectations for children's education. This study's data focused on parents' and students' modules and extracts the information from the questions from these two questionnaires.

Measurement Structure

There were seven measurements in the baseline and tracing surveys: Student Questionnaire, Parent Questionnaire, Head Teacher Questionnaire, Chinese & Math & English Teacher Questionnaire, Head of School Questionnaire, Cognitive Ability Test, and Chinese & Math & English Scores in Mid-term Examination. The data used in the current study was merged from these seven measurements. Every student had a unique identification number, the critical indicator when the family and individual student information was merged. The questionnaires had both Mandarin Chinese and English versions. The dataset was published in the version of the STATA package.

Parental Involvement

Some possible latent indicators were used to measure parental engagement based on the items that both children and parents answered. The questions from both student and parent questionnaires were in Appendix III Q7. Multiple-item indicators from parent and student report measures assessed parental discipline, communication, home companionship, and expectations.

Parental discipline. The latent construct scale of parent discipline included items about the parents' attitude towards children's examinations and homework, school behavior, who to make friends with, dressing style, time spent on the internet, and time spent on TV. The scales were from 1-3, from not caring to very strict.

Parental communication. The latent construct scale of parent communication included items about how often the parents discussed school issues with their children. The issues included things that happened at school, the relationship between the child and his/her friends, the relationship between the child and teachers, and the child's worries and troubles. The scales were from 1-3, marking from never to often. For the student questionnaire, the student needed to answer questions for both the mother's and the father's participation. The adjustment of averaging these two was applied to keep the parent questionnaire consistent.

Parental companion. The latent construct scale of parental home engagement included items about how often the parents spend time with the children to do some activities. The activities involved having dinner, visiting the zoo and museum, watching movies, and playing sports games in the past years. The scales were from 1 to 6, never marking, once a year, once every half year, once a month, once a week, and more than once a week. To keep the categories similar to the previous items, I adjusted the scale to 1-3 as very few, sometimes, and often.

Parental expectation. The construct of parental expectation included items about the school grade level, occupation, education level, where to live, and confidence in parents' expectations of their children. The education level, occupation, and where to live needed to be transformed into classes to keep the consistency of the scales. The education level, occupational expectation, and confidence level were classified on a scale from 1-3 (Degree: 1, complete compulsory education and under; 2, college and under; 3, graduate school. Occupation: 3, official, manager, and high professionals; 2, ordinary

professionals; 1, ordinary workers. Confidence of the children: no confidence to very confident).

Student Self-engagement

Some possible latent indicators were used to measure student engagement based on the items answered only by the student. The potential dimensions of the student engagement factors were student perspective from the main subject teachers' attitudes, student perspective to school life, and student engagement to study and leisure. Multiple items from students' reports assessed these factors. Appendix III Q8 showed the questions for these items.

Teachers' attitudes. The questionnaire asked nine questions about the students' thoughts about the main subjects (i.e., mathematics, Chinese, English) and teachers' attitudes. The issues included whether the teachers paid attention to the students, whether the teachers liked to ask the students to answer questions, and whether the teachers praised the students. The scales were from 1-4, marking from strongly disagree to agree strongly.

Attitudes to school life. The latent construct scale of attitudes to school life included ten items about how the students thought about their school life. The issues included the parents' attitudes, classmates' attitudes, and the students' feelings about the schools. The scales were from 1-4, marking from strongly disagree to agree strongly.

Study engagement. The questionnaire about the study included weekdays and weekdays. Study engagement on school days and weekends included four items about how much time they spent on their school and after-school homework and extra-

curricular study activities. The engagement consisted of doing school homework, doing assignments from parents or cramming school, and taking cram school courses. The scales were from 1 to 6 marks 0 hours, less than 1 hour, about 1-2 hours, about 2-3 hours, about 3-4 hours, and more than 4 hours. The study engagement of school days and the weekends were combined and graded as levels from 1 to 6.

School Academic Performance

School grades assessed students' academic performance in three main subject areas: mathematics, Chinese language, and English. The scores were absolute marks on students' midterm tests. The range of the three subjects in the original data differed because of the different standards among the local school districts. The final grades were adjusted on the same scale.

Residence Status (Hukou)

The indicator Hukou had two categories: agriculture and non-agriculture. Agricultural Hukou referred to rural residence status, a record identifying a person as a rural resident. Non-agricultural Hukou referred to urban residence status. Here, these two kinds of Hukou didn't recognize the location where the Hukou belonged to.

Summary of the Measurement

All the latent constructs described in the previous part were potential latent variables. It varied due to the results of the model estimation. In the model-building procedure, parental involvement or student self-engagement measurements were revised by adding or removing observed variables or changing the relationships between variables. Various model estimation techniques and specific issues arose when estimating

the composite variable. It was essential to carefully assessed the adequacy of the statistical power and considered alternative models or methods if necessary. The discussion part considered all the issues that caused problems.

Data Description

A detailed data description was performed to outline the dataset's key characteristics and statistical properties in this part. It presented summary statistics, such as means, standard deviations, and minimum and maximum values, for each variable, including academic scores, parental factors, and sociodemographic indicators. Additionally, the distribution of categorical variables, such as family status and Hukou, was explored to capture the diversity within the sample. The careful data description serves as the foundation for subsequent analyses, ensuring transparency and facilitating the interpretation of results.

Descriptive Statistics of Original Data

Descriptive statistics presented essential information on the students, parents, and families. This information created a comprehensive picture of the students and parents. Table 3.1 presented the basic information about the students' structure and the midterm scores of three main subjects.

The dataset contained information on a group of individuals, including their unique identification numbers (ID), classification IDs (clsids), school IDs (schids), and county IDs (ctyids). There were over 10,000 observations in total. There were 10279 observations in the 2013-14 base timeline and 10750 observations in the 2014-15 tracing timeline. The dataset also includes scores for three main subjects: Chinese, Math, and

English, with the 2014-15 tracing timeline having slightly higher mean scores than the 2013-14 base timeline. The standard deviations for these subject scores indicate significant variability in the scores. Since the standards of these scores for different schools and school districts were different, it may not be appropriate to compare the scores presented in this dataset directly. Additionally, the dataset includes information on gender and Hukou status (a household registration system in China/ residence status), with roughly equal proportions of individuals with agricultural and non-agricultural Hukou.

Table 3.1

Descriptive statistics of the students' information

	2013-14			2014-15		
Variable	Obs	Mean	SD	Obs	Mean	SD
ID	10,279			10,750		
Class ID	436			436		
School ID	112			112		
County ID	28			28		
Chinese scores	10,059	79.13	18.34	9,875	80.98	20.64
Math scores	10,055	76.83	28.08	9,880	74.66	32.02
English scores	10,061	82.46	28.05	9,867	72.19	29.94
Hukou	9,626	0.53	0.5	9,550	0.54	0.5

Appendix II Q7 presented the item questions about parental involvement in the questionnaires administered to parents and students. Appendix II Q8, on the other hand, presented the item questions about student self-engagement included in the questionnaires administered only to students. The dataset consisted of information from two time points, 2013-14 and 2014-15, and several tables provide descriptive information

on the answers to these questions. While some questions had responses from mothers and fathers, others had responses from only one parent.

Table 3.2 provided a detailed overview of the descriptive statistics for the item question answers from parents and students during the 2014-15 time points about the latent construct of parental involvement. The student and parent surveys each included two sets of items, represented by codes A2001-A2006 and A1701-A1706, that asked questions about the parents' attitudes towards various aspects of their children's lives, such as exams and homework, school behavior, social relationships, and media use. Responses were recorded on a scale of 1-3. In the student survey, items represented by codes A2101a-A2104b asked how often the parents discussed school issues with their children, with responses recorded separately for both the mother and father. In the parent survey, only one parent answered these questions (represented by codes A2601-A2604) using a 1-3 scale. The student and parent surveys also included items (coded A24-A26 and A11-A13) that asked how often the parents spent time doing activities with their children, with responses recorded on a 1-6 scale. Finally, items represented by codes A27-A30 and C6, A29, A30, and A32 asked questions about the parents' expectations of the children, such as grades, occupation, education level, and their confidence in their expectations.

Table 3.2

The descriptive statistics of item questions for parental involvement in the 2014-15 dataset

Items of Parental Involvement in the 2014-15 Dataset											
Student Survey						Parent Survey					
Items	Obs	Mean	SD	Min	Max	Items	Obs	Mean	SD	Min	Max
A2001	9,892	2.45	0.56	1	3	A1701	9,682	2.36	0.52	1	3
A2002	9,879	2.27	0.59	1	3	A1702	9,589	2.26	0.56	1	3
A2003	9,885	2.10	0.66	1	3	A1703	9,632	2.21	0.62	1	3
A2004	9,868	2.03	0.65	1	3	A1704	9,619	2.11	0.61	1	3
A2005	9,840	2.50	0.62	1	3	A1705	9,607	2.54	0.57	1	3
A2006	9,886	2.25	0.66	1	3	A1706	9,636	2.34	0.58	1	3
A2101a father	9,744	2.03	0.63	1	3	A2601	9,674	2.23	0.61	1	3
A2101b mother	9,548	2.34	0.66	1	3						
A2102a father	9,722	1.90	0.68	1	3	A2602	9,661	2.19	0.63	1	3
A2102b mother	9,534	2.20	0.70	1	3						
A2103a father	9,718	1.95	0.70	1	3	A2603	9,654	2.24	0.64	1	3
A2103b mother	9,519	2.18	0.71	1	3						
A2104a father	9,731	1.82	0.73	1	3	A2604	9,665	2.19	0.68	1	3
A2104b mother	9,546	2.12	0.77	1	3						
A24	9,792	5.45	1.19	1	6	A11	9,607	5.58	1	1	6
A25	9,765	2.32	1.21	1	6	A12	9,619	2.07	1.07	1	6
A26	9,829	2.23	1.33	1	6	A13	9,663	2.11	1.19	1	6
A27	9,814	2.14	0.88	1	4	C6	9,646	1.98	0.85	1	4
A28	9,850	6.82	1.65	1	10	A29	9,673	6.91	1.58	1	9
A32	9,860	3.06	0.71	1	4	A30	9,677	4.96	3.66	1	13
A30	9,842	6.63	4.74	1	14	A32	9,618	3.17	0.7	1	4

Note: The item code number in Student Survey orgions from questions number from Appendix III Q1. The item code number in Parent Survey orgions from questions number from Appendix III Q3.

Table 3.3

The descriptive statistics of item questions for parental involvement in the 2013-14 dataset

Items of Parental Involvement in the 2013-14 Dataset											
Student Survey						Parent Survey					
Variable	Obs	Mean	SD	Min	Max	Variable	Obs	Mean	SD	Min	Max
B2301	10,221	2.53	0.55	1	3	A801	9,984	2.42	0.53	1	3
B2302	10,210	2.38	0.60	1	3	A802	9,880	2.33	0.60	1	3
B2305	10,199	2.13	0.72	1	3	A805	9,906	2.23	0.65	1	3
B2306	10,188	2.14	0.70	1	3	A806	9,898	2.18	0.66	1	3
B2307	10,112	2.63	0.60	1	3	A807	9,854	2.65	0.54	1	3
B2308	10,208	2.40	0.66	1	3	A808	9,934	2.42	0.58	1	3
B24a1mother	10,087	2.29	0.66	1	3	A1401	9,920	2.30	0.60	1	3
B24b1father	9,621	2.00	0.69	1	3						
B24a2mother	10,027	2.13	0.73	1	3	A1402	9,887	2.24	0.63	1	3
B24b2father	9,588	1.88	0.74	1	3						
B24a3mother	9,990	2.17	0.74	1	3	A1403	9,889	2.36	0.64	1	3
B24b3father	9,572	1.98	0.76	1	3						
B24a5mother	10,037	2.03	0.81	1	3	A1405	9,895	2.32	0.67	1	3
B24b5father	9,625	1.88	0.79	1	3						
B2801	10,167	5.56	1.12	1	6	A1701	9,866	5.66	0.94	1	6
B2805	10,119	2.36	1.47	1	6	A1705	9,741	2.18	1.32	1	6
B2806	10,156	2.41	1.56	1	6	A1706	9,801	2.23	1.39	1	6
B30	10,209	2.09	0.88	1	4	C11	9,950	1.91	0.84	1	4
B31	10,187	6.84	1.74	1	10	A18	9,990	7.12	1.57	1	9
B33	10,237	5.89	3.73	1	11	A19	9,985	3.99	2.69	1	10
B35	10,236	3.21	0.70	1	4	A21	9,985	3.30	0.67	1	4

Note: The item code number in Student Survey orgions from questions number from Appendix III Q2. The item code number in Parent Survey orgions from questions number from Appendix III Q4.

Table 3.3 presented the original descriptive statistics of the item question answers from parents and students in both time points of 2013-14. Similar to those listed in Table 2, in both student and parent surveys, two set items (B2301- B2308 / A801- A808) asked questions about the degree of parents care strictness with children's bunch of activities. In the student survey, items (B24a1 - B24b5) asked questions about how often the parents discussed school issues with their children from both mother and father. Only one parent (item A1401- A1405) answered these questions in the parent survey. In both student and parent surveys, items (B2801, B2805, B2806 / A1701, A1705, and A1706) asked questions about how often the parents spend time with the children to do some activities. In student and parent surveys, items (B30, B31, B33, B35 / C11, A18, A19, A21) asked questions about parents' expectations of their children.

Tables 3.2 and 3.3 presented the number of observations, mean, standard deviations, and minimum and maximum values of the items question. All these variables were categorical, with different levels and some missing values.

Table 3.4

The descriptive statistics of item questions for student engagement in two timelines

Items of Student Self-engagement											
2013-2014 Student Survey						2014-2015 Student Survey					
Variable	Obs	Mean	SD	Min	Max	Variable	Obs	Mean	SD	Min	Max
C1304	10,147	2.73	0.89	1	4	B504	9,877	2.46	0.94	1	4
C1305	10,181	2.77	0.88	1	4	B505	9,883	2.54	0.91	1	4
C1306	10,150	2.85	0.90	1	4	B506	9,866	2.56	0.95	1	4
C1307	10,171	2.47	0.94	1	4	B507	9,885	2.34	0.96	1	4
C1308	10,151	2.52	0.92	1	4	B508	9,867	2.42	0.94	1	4
C1309	10,176	2.54	0.94	1	4	B509	9,876	2.37	0.96	1	4
C1706	10,147	3.26	0.84	1	4	B605	9,872	3.29	0.77	1	4
C1708	10,130	3.14	0.90	1	4	B606	9,870	3.11	0.89	1	4
C1709	10,142	2.77	1.03	1	4	B607	9,863	2.84	0.98	1	4
C1710	10,064	2.96	0.94	1	4	B608	9,850	2.95	0.90	1	4
C1711	10,093	1.61	0.86	1	4	B609	9,855	1.77	0.91	1	4
C1712	10,165	1.46	0.84	1	4	B610	9,876	1.59	0.91	1	4
Weekdays											
B14a1(hours)	9,952	2.11	2.36	0	24	B7a	9,890	3.50	1.16	1	6
B14a2(minutes)	9,870	16.80	16.03	0	59	B7b	9,874	1.76	1.04	1	6
B15a1(hours)	10,050	0.60	1.49	0	24	B7c	9,849	1.60	1.23	1	6
B15a2(minutes)	10,081	6.78	13.03	0	59	B7e	9,879	2.47	1.41	1	6
B15b1(hours)	10,084	0.34	1.17	0	24	B7f	9,865	2.25	1.44	1	6
B15b2(minutes)	10,069	2.31	8.20	0	56						
B15e1(hours)	10,021	0.98	2.01	0	24						
B15e2(minutes)	10,035	8.82	14.34	0	59						
B15f1(hours)	10,040	0.65	1.99	0	90						
B15f2(minutes)	10,063	5.85	12.39	0	59						
Weekends											
B14b1(hours)	10,024	2.69	2.47	0	24	B8a	9,878	3.00	1.04	1	6
B14b2(minutes)	9,852	13.76	16.51	0	59	B8b	9,859	1.60	0.84	1	6
B16a1(hours)	10,059	0.81	1.56	0	24	B8c	9,845	1.68	1.15	1	6
B16a2(minutes)	10,020	6.27	12.72	0	59	B8e	9,867	2.76	1.21	1	6
B16b1(hours)	10,080	0.74	1.66	0	24	B8f	9,844	2.61	1.36	1	6
B16b2(minutes)	10,009	2.99	9.24	0	56						
B16e1(hours)	10,040	1.77	2.29	0	24						
B16e2(minutes)	9,952	9.14	14.69	0	59						
B16f1(hours)	10,051	1.36	2.38	0	24						
B16f2(minutes)	9,973	6.76	13.08	0	59						

Note: The item code number in the 2013-14 Student Survey originates from the question number from Appendix III Q6. The item code number in the 2014-15 Student Parent Survey originates from the question number from Appendix III Q5.

Table 3.4 showed the means, standard deviations, and minimum and maximum values for several sets of variables in two student surveys, one conducted in the 2013-2014 baseline and the other in the 2014-2015 tracing line. The variables referred to different aspects of the student's school lives, such as their feelings toward teachers, peers, and schools, and their use of time to study and leisure. For example, variables C1304 to C1309 (in the 2013-2014 Student Survey) and B504 to B509 (in the 2014-2015 Student Survey) referred to the students' feelings about the main subject teachers' attitude toward them. Variables C1706 to C1712 (in the 2013-2014 Student Survey) and B605 to B610 referred to the students' feelings about their peers and the school around them. In the 2013-2014 Student Survey, the variables B14a1 to B15f2 referred to how the students used their time for various school or related school work and leisure. The variables B14b1 to B16f1 referred to how they use their time during weekends. The times were separated into hours and minutes as two parts. However, in the 2014-2015 Student Survey, student engagement and leisure levels ranged from 1 to 6. Some adjustments were needed to make the scales in the two surveys consistent.

Adjustment for Some Variables and Missing Values

There were different ways to make adjustments to the original data, including categorizing data, filling in the missing data, making the continuous variables into categorical variables, and rescoring the academic outcomes using standards.

Categorizing Data

Some specific variables needed to be adjusted to carry on the analysis. Hukou in the original data was grouped into four categories: "*Agricultural," "Non-agricultural*",

"*Residential*", and "*I have no Hukou*". The indicator was regrouped into Agricultural and Non-agricultural. The "*Residential*" was regrouped into non-agriculture, and "I have no Hukou" was regrouped into agriculture because of the educational resources they could get.

The education level and the occupation were the other two variables that need to be rescaled. The educational level in the original data had 9 or 10 categories. Here, the educational level was regrouped into four lower than high school: secondary high school, college degree, graduate school, and over. The occupations in the original data had 12 to 14 categories based on the specific job titles. The job numbers were presented from the government officials to technical jobs. Li (2005) calculated the occupation scores based on Chinese socioeconomic reality and obtained a scale of 9 to 90. Here, the occupations were leveled into 4 based on the occupation scores.

Other issues about the categorical variables were reversing the original scores. For example, in the feelings from peers and school, the items "I feel bored in this school" and "I hope that I could transfer to another school" need to reverse the code. The item "What is your parents' requirement on your academic record?" must also reverse the code from lower to higher to be consistent with other items.

Adjustments with Missing Values

It was essential to carefully consider the methods used to handle missing data, as the choice of method could impact the accuracy and reliability of the analysis results. Additionally, it was important to report any missing data and the methods used to handle missing data in the analysis report. Some common methods for handling missing values

included listwise deletion, pairwise deletion, mean imputation, and regression imputation. In this study, some students were deleted if they lost most of the important information. Mean imputation and regression imputation were the two main techniques to fill in the missing values in this study.

In a bunch of similar item questions, for example, attitudes from parents about the children's behaviors, mean imputation was applied. If the item questions asked both mother and father attitudes, such as in Table 3.4 and Table 3.5, for any individual child, the missing values from one parent were filled by the other parent based on the specific situations. First, if the mean of the raw data of one parent was bigger or less than the mean of the other parent within 0.5, then one parent's data could be filled by the other's data. If both parents' data were missing, the mean of the whole item was filled for both. Since the variables were categorical, the filling must be within a scale of no more than 0.5. For example, the missing values could be filled 2 if the mean of the item was no bigger than 2.5 and no less than 1.5. Similarly, the missing values were filled in such ways based on the similarity of the item questions.

Changing the Continuous Variables into Categorical Variables

Here, the variables that need to be modified referred to the data points collected on the time spent by children on school homework, cram school, or leisure activities on weekdays and weekends in the baseline 2013-14 dataset. To ensure consistency with the 2014-15 dataset, these items (weekday B14a1- B15f2 and weekend B14b1-B16f2) were adjusted by categorizing them on a scale of 1 to 6, marking time as 0 hours, less than 1 hour, about 1-2 hours, about 2-3 hours, about 3-4 hours, and more than 4 hours. The

engagement time for both weekdays and weekends was then weighted to obtain the average daily engagement for the baseline 2013-14 and tracing line 2014-15 datasets, taking into account that weekdays were weighted 5/7 and weekend days 2/7.

Rescoring the Academic Outcomes

Students' academic performance in three subject areas, namely Mathematics, Chinese language, and English, were evaluated through their scores on midterm tests. The original data had varying ranges for the three subjects due to the different standards followed by local school districts. To ensure consistency, the final grades were standardized on the same scale. The datasets supplied the standard full scores of all the districts, and then the original scores were adjusted by dividing the full scores to obtain the percentage. After the adjustments, the scores in various districts were comparable.

After obtaining the percentage of the full scores, 28 students scored more than 100 in math and 5 students in English in the 2014-15 dataset. However, the possibility of extra credit obtained by the students couldn't be ruled out. And the sample size for these outliers was very small compared to the datasets. Only one student had an outlier of 136.67 of the math score, which was deleted. And the correlation coefficients between the scores were 0.69, 0.67, and 0.73. The missing values of the scores were filled by the method of regression imputation. In the dataset of 2013-14, after the same adjustment of the data, 19 students scored more than 100 in Math, 14 in English, and 2 in Chinese. Only one outliner, with a math score of 269.33, was deleted. And the correlation coefficients between the scores were 0.69, 0.71, and 0.71. After adjusting the scoring, the regression imputation was applied to both datasets since the correlation coefficients were high

enough. After the missing values were filled by regression imputation, the mean of scores didn't change.

The Descriptive Statistics after Adjustment of Original Data

Table 3.5

The descriptive statistics of three main subjects of two timelines

2014-15 Tracing Data						2013-14 Baseline Data					
Variable	N	Mean	SD	Min	Max	Variable	N	Mean	SD	Min	Max
Chinese	9,879	68.19	15.52	0	98.33	Chinese	10,067	67.02	14.66	0.67	110
Math	9,880	63.13	26.15	0	108.33	Math	10,067	65.55	24.12	0.83	117
English	9,879	61.27	24.43	0	106	English	10,069	70.00	22.11	3	103.33

Table 3.5 provided a comparison between two sets of academic achievements, the 2014-15 tracing data and the 2013-14 baseline data, in terms of the mean, standard deviation, minimum, and maximum values for three subjects: Chinese, Math, and English. The number of observations (N) for each variable was about 188, smaller in the 2014-15 dataset than in the 2013-14 dataset. The data suggested that the mean scores for Math (Mean =65.55, SD=24.12) and English (Mean=70, SD=22.11) were higher in the 2013-14 baseline data compared to the 2014-15 tracing Data (Math: Mean =63.13, SD=26.15; English: Mean=71.27, SD=24.43), while the mean score for Chinese was slightly Higher in the 2014-15 Tracing Data (68.18 to 67.02). The standard deviations and ranges also differed between the two data sets for each variable. The two datasets had different sample sizes and ranges for each variable, but there were some similarities in the means and standard deviations.

Table 3.6 showed the means and standard deviations of three variables (Chinese, English, and Math) for Agricultural and Non-agricultural. From the 2013-14 to 2014-15 school years, the mean scores for Chinese and Math were generally higher, but the English scores were much lower for both groups. In a T-test, the means of both groups decreased significantly, 10 points for the agricultural group and 7 points for the non-agricultural group. In the 2013-14 dataset, the mean differences between the agricultural and non-agricultural groups were 3.35, 7.47, and 7.06, statistically significant with t = 11.36, 16.73, 14.48, and $p < 0.01$. In the 2014-15 dataset, the mean differences between the agricultural and non-agricultural groups were 3.17, 10.67, and 6.44, statistically significant with t = 10.09, 21.67, 12.02, and $p < 0.01$. Overall, it appeared that students in the non-agricultural area had better academic performance than those in the agricultural area, particularly in English and Math, and there was an improvement in performance in both areas for the Chinese subject. However, it's important to note that various factors may influence these differences and should be interpreted cautiously.

Table 3.6

The descriptive statistics of two timeline scores of agricultural and non-agricultural

Agricultural				Non-agricultural			
2014-15 tracing line dataset							
Variable	Obs	Mean	SD	Variable	Obs	Mean	SD
Chinese	4,994	66.95	16.30	Chinese	4,354	70.12	13.71
English	4,994	56.53	23.94	English	4,354	67.20	23.50
Math	4,995	60.48	26.71	Math	4,354	66.92	24.79
2013-14 baseline dataset							
Chinese	4,928	65.68	14.95	Chinese	4,509	69.03	13.57
English	4,930	66.78	22.59	English	4,508	74.25	20.58
Math	4,928	62.50	24.36	Math	4,508	69.56	22.90

Tables 3.7 and 3.8 presented data on items of parental involvement in both 2014-15 and 2013-14 datasets after adjustment, with means, standard deviations, and scales for both student and parent surveys. The data were divided into two sets of variables: regulation (1-6) and discussion (1-4), as well as with (1-3) and expect (1-4). Compared to Table 3.4 and Table 3.5, the sample sizes for Table 3.8 and Table 3.9 increased, and the same sizes between item groups decreased. The variations of the sample sizes didn't change the means of the variables.

Focusing on the regulation variables (1-6), we could observe that the means for student and parent data were similar. The standard deviations for the student data were slightly larger than for the parent data, which suggested more significant variability in the student's responses. Comparing the student and parent data, we found that only the mean for "regulation1" was much higher for students (2.45) than for parents (2.36) in Table 3.8 and for students (2.53) than for parents (2.41) in Table 3.6 . All other regulations were similar in the distribution in both tables, which meant that the children and parents had similar feeling levels about the strictness of the children's behaviors.

Comparing the student and parent data in both tables for the "discussion" items, we can see that the mean scores for the parent surveys were generally higher than the student surveys. This suggested that parents perceived themselves as more involved in communication with their children about school-related topics than the students perceived their parents to be. For the "with" items, which assessed parental involvement level in activities with their children, we can see that the mean scores were higher for the parent surveys than the student surveys. This suggested that parents believed they were more

involved in these activities than their children believed they were. Comparing the student and parent data of Table 3.7 and Table 3.8 for the expectation items, we can see that the mean scores for the parent surveys were generally higher than the student surveys. This suggested that parents had higher expectations for their children's academic performance and behavior than the children thought of themselves.

Overall, we can see that for datasets 2014-15 and 2013-14, there were some small differences between the perceptions of parents and students regarding parental involvement in their education and living, with parents generally reporting higher levels of involvement than their children, especially in the parents' perception about the communication, companion with children, and expectation on the future of their children.

Table 3.7

The descriptive statistics of parental involvement items in the 2014-15 dataset after adjustment

Items of Parental Involvement in 2014-15 dataset after adjustment											
Student Survey						Parent Survey					
Variable	N	Mean	SD	Min	Max	Variable	N	Mean	SD	Min	Max
regulation1	9,897	2.45	0.56	1	3	pregulation1	9,697	2.36	0.52	1	3
regulation2	9,897	2.27	0.59	1	3	pregulation2	9,697	2.26	0.56	1	3
regulation3	9,897	2.10	0.66	1	3	pregulation3	9,697	2.21	0.62	1	3
regulation4	9,897	2.03	0.65	1	3	pregulation4	9,697	2.11	0.61	1	3
regulation5	9,897	2.50	0.62	1	3	pregulation5	9,697	2.55	0.56	1	3
regulation6	9,897	2.25	0.66	1	3	pregulation6	9,697	2.33	0.58	1	3
discussion1	9,896	2.00	0.60	1	3	pdiscussion1	9,688	2.23	0.60	1	3
discussion2	9,896	1.89	0.64	1	3	pdiscussion2	9,688	2.19	0.63	1	3
discussion3	9,896	1.93	0.67	1	3	pdiscussion3	9,688	2.24	0.64	1	3
discussion4	9,896	1.83	0.69	1	3	pdiscussion4	9,688	2.19	0.68	1	3
with1	9,891	5.44	1.19	1	6	pwith1	9,729	5.59	1.00	1	6
with2	9,891	2.32	1.21	1	6	pwith2	9,729	2.07	1.06	1	6
with3	9,891	2.22	1.31	1	6	pwith3	9,729	2.11	1.19	1	6
expect1	9,894	2.86	0.88	1	4	pexpect1	9,735	3.02	0.85	1	4
expect2	9,894	2.98	0.77	1	4	pexpect2	9,735	3.20	0.66	1	4
expect3	9,894	2.71	1.19	1	4	pexpect3	9,735	3.02	0.95	1	4
expect4	9,894	3.06	0.71	1	4	pexpect4	9,735	3.17	0.69	1	4

Note: Regulation 1-6 is the A2001- A2006 from the student survey in Table 2. Pregulation1-6 were the A1701 -6 in Table 2. Discussion 1-4 and pdiscussion 1-4 are A2101a-A2104b from parents and A2601-4 in Table 3.4. With1-3 and pwith1-3 are A24-A26 and A11-A13 in Table 3.4. Expect1-4 and Pexpect1-4 are A27-A30 and w2bc06, A29, A30, and A32 in Table 2.

Table 3.8

The descriptive statistics of parental involvement items in the 2013-14 dataset after adjustment

Items of Parental Involvement in 2013-14 dataset after adjustment											
Student survey						Parent survey					
Variable	N	Mean	SD	Min	Max	Variable	N	Mean	SD	Min	Max
regulation1	10,244	2.53	0.55	1	3	pregulation1	9,997	2.41	0.53	1	3
regulation2	10,244	2.38	0.60	1	3	pregulation2	9,997	2.33	0.60	1	3
regulation3	10,244	2.13	0.72	1	3	pregulation3	9,997	2.23	0.65	1	3
regulation4	10,244	2.13	0.70	1	3	pregulation4	9,997	2.18	0.65	1	3
regulation5	10,244	2.63	0.60	1	3	pregulation5	9,997	2.66	0.54	1	3
regulation6	10,244	2.40	0.66	1	3	pregulation6	9,997	2.42	0.58	1	3
discussion1	10,233	1.95	0.62	1	3	pdisscuss1	9,944	2.30	0.60	1	3
discussion2	10,233	1.84	0.67	1	3	pdisscuss2	9,944	2.24	0.63	1	3
discussion3	10,233	1.93	0.71	1	3	pdisscuss3	9,944	2.35	0.64	1	3
discussion4	10,233	1.83	0.73	1	3	pdisscuss4	9,944	2.31	0.67	1	3
with1	10,204	5.55	1.12	1	6	pwith1	9,922	5.65	0.94	1	6
with2	10,204	2.35	1.46	1	6	pwith2	9,922	2.18	1.30	1	6
with3	10,204	2.41	1.55	1	6	pwith3	9,922	2.23	1.38	1	6
expect1	10,267	2.91	0.88	1	4	pexpect1	10,070	3.09	0.83	1	4
expect2	10,267	3.06	0.77	1	4	pexpect2	10,070	3.28	0.65	1	4
expect3	10,267	2.62	1.19	1	4	pexpect3	10,070	3.15	0.96	1	4
expect4	10,267	3.21	0.70	1	4	pexpect4	10,070	3.30	0.67	1	4

Note: Regulation1-6 is the B2301- B2308 from the student survey in Table 3.3. Pregulation1-6 were the A801- A808 in Table 3.3. Discussion1-4 and pdiscussion1-4 are B24a1 - B24b5 from parents and A1401- A1405 in Table 3.5. With1-3 and pwith1-3 are B2801, B2805, B2806 / A1701, A1705, A1706 in Table 3.3. Expect1-4 and Pexpect1-4 are B30, B31, B33, B35 / C11, A18, A19, A21 in Table 3.3.

Table 3.9

The descriptive statistics of student self-engagement items in both datasets after adjustment

Items in Student Self-engagement after Data Adjustment											
2013-14 student survey						2014-15 student survey					
Variable	N	Mean	SD	Min	Max	Variable	N	Mean	SD	Min	Max
teacher1	10,194	2.74	0.89	1	4	teacher1	9,896	2.46	0.94	1	4
teacher2	10,194	2.77	0.88	1	4	teacher2	9,896	2.54	0.91	1	4
teacher3	10,194	2.85	0.89	1	4	teacher3	9,896	2.56	0.95	1	4
teacher4	10,194	2.47	0.94	1	4	teacher4	9,896	2.34	0.96	1	4
teacher5	10,194	2.52	0.92	1	4	teacher5	9,896	2.42	0.94	1	4
teacher6	10,194	2.54	0.94	1	4	teacher6	9,896	2.37	0.96	1	4
peer1	10,203	3.26	0.83	1	4	peer1	9,895	3.29	0.77	1	4
peer2	10,203	3.14	0.89	1	4	peer2	9,895	3.11	0.89	1	4
peer3	10,203	2.77	1.03	1	4	peer3	9,895	2.84	0.98	1	4
peer4	10,203	2.96	0.94	1	4	peer4	9,895	2.95	0.90	1	4
peer5	10,203	3.39	0.85	1	4	peer5	9,895	3.23	0.91	1	4
peer6	10,203	3.54	0.84	1	4	peer6	9,895	3.41	0.91	1	4
study1	10,138	3.72	1.28	1	6	study1	9,894	3.40	1.03	1	6
study2	10,138	1.93	1.18	1	6	study2	9,894	1.73	0.95	1	6
study3	10,138	1.59	1.06	1	6	study3	9,894	1.66	1.11	1	6
leisure1	10,138	2.61	1.23	1	6	leisure1	9,894	2.58	1.24	1	6
leisure2	10,138	2.12	1.21	1	6	leisure2	9,894	2.36	1.31	1	6

Note: Teacher1-6 in 2013-14 Student Survey refer to variables C1304 to C1309 in Table 3.6 . Teachers 1- 6 in the 2014-15 Student Survey refer to B504 to B509 in Table 3.6 . Peer 1-6 in the 2013-14 Student Survey refers to variables C1706 to C1712 in Table 3.6 . Peer 1-6 in the 2014-15 Student Survey refers to variables B605 to B610 in Table 3.6 . Study1-3 and leisure1-2 in the 2013-14 Student Survey are combined with variables b14a1 to b15f2 on weekdays and B14b1 to B16f1 on weekends in Table 3.6 . Study1-3 and leisure1-2 in the 2014-15 Student Survey are combined with variables B7a-f on weekdays and B08a-f on weekends in Table 3.6 .

Table 3.9 presented the descriptive statistics for the variables related to student self-engagement after data adjustment from the 2013-14 and 2014-15 student surveys. The variables include ratings for six different teachers (teacher1-teacher6), six different peers (peer1-peer6), three different study habits (study1-study3), and two different leisure activities (leisure1 and leisure2). The table showed the number of respondents (N), mean, standard deviation (SD), and scale values for each variable in both survey years. Compared to Table 3.4, the number of observations increased, the item numbers decreased, and the mean and variations of the variables changed little. During the school years, the number of observations decreased from over 10,000 to about 9,894.

Upon comparison, there were changes in the variables' means and standard deviations between the two school years. In the 2014-15 school year, the mean ratings for teachers, peers, and self-engagement activities were generally lower than in the 2013-14 school year, suggesting a potential decrease in student self-engagement. Additionally, some variables showed a greater mean and standard deviation change than others, indicating possible differences in student engagement factors across the two school years. Only two variables, peer3 ("I often take part in school/class activities") and study3 ("How much time on average a week did you spend on taking cram school courses related to schoolwork"), had higher means in the second school year. The changes of these two groups of items in the two datasets were very similar.

Summary of Data Descriptive Statistics

There were several key differences when comparing the data from different time points and perspectives (parents/students). In terms of parental involvement, the parent

survey data indicated a decrease in the average score for almost all items related to parental involvement from 2013-14 to 2014-15 from the parent perspective as the students entered a higher level grade. This included items such as the level of strictness with children's behavior, communicating with children, companionship with children, and the expectation for children's future. From the student perspective, there was also a decrease in the average score for almost all items related to parental involvement from 2013-14 to 2014-15.

When we compared the item means of parent involvement from students to parents, there was a slight discrepancy between parent and student ratings of parent involvement, with students rating parent involvement slightly lower than parents themselves, except that parents cared and were strict with students about their homework, examination, school behavior (regulation1, regulation2), and the out school activities in both 2013-14 to 2014-15 school years. That means parents were stricter with their children than the children thought their parents were, and parents believed they had more time with children, but children thought their parents didn't.

In terms of student self-engagement, the data from the student surveys showed a decrease in the average score for most items related to self-engagement from 2013-14 to 2014-15. This included items related to engagement with teachers, peers, and academic activities.

The data suggested slight differences in parental involvement and student self-engagement between the two time points and perspectives, but changing patterns were similar. It was important to note that the data from the two perspectives may not always

align across time or from different perspectives and may provide additional insights into the same issue.

Chapter Four: Results

The results were presented to answer all the research questions addressed in the design. The presentation followed the sequential designs of the research questions from the beginning of EFA and CFA to the SEM. The software used here was Mplus Version 8.

The Construct of Parent Involvement

In this section, the results answered the questions about the construct of parent involvement and the invariant tests from the students' VS parents' perspectives and two-time points of 2013-14 VS 2014-15 school years. When building the latent constructs of parental involvement, the 2014-15 dataset was split in half. Half of the data was applied to do EFA, and the other half would be used for the confirmative analysis later.

EFA Results of Parental Involvement

The exploratory factor analysis was conducted on half of the 2014-15 dataset of 4918 participants using maximum likelihood estimation and oblique rotation. The assumptions of 3, 4, and 5 factors were applied to the estimations, and the comparisons among these three were in the aspects of model fit indicators, correlation coefficients of factors, and coefficients of item variables. The Tables presenting the results of 3 and 5 factors were attached in Appendix I, including Tables a, b, and c. The four-factor model results were in Tables 4.1 and 4.2.

Based on the estimation results, the three-factor model was not a good fit for the data, as one of the correlations between the factors was only 0.03 and not statistically significant (see Table b in Appendix I). The result suggested that the three-factor model did not fully capture the relationships among the variables in the dataset. Compared to the four-factor, the five-factor model, although the fit indices improved with the five-factor model, had a low correlation of 0.05 between the two factors (see Table b in Appendix I). Moreover, the additional factor only emerged from one cut-off from the four-factor model. Thus, the four-factor model was a more parsimonious choice despite compromising somewhat on the fit indices.

The analysis revealed four factors with eigenvalues of 5.19, 2.07, 1.59, and 1.26 (see Diagram 1 in Appendix I). Factor loadings above 0.20 were considered meaningful and retained for interpretation. The first factor, labeled 'Discipline', included high loadings from variables related to parental regulations on their children. The second factor, labeled 'Communication', included high loadings from variables related to school and living discussions between parents and children. The third factor, labeled 'Companion', included high loadings from variables related to after-school activities that parents and children do together. The fourth factor, labeled 'Aspiration', included high loadings from variables related to the expectations that parents aspirate their children's schooling outcome and future (see Table 4.1). The model fit indices were chi-square = 2929.79, CFI = 0.94, TLI = 0.93, RMSEA = 0.07, and SRMR= 0.048, indicating reasonable fit.

Table 4.1 displayed the factor loadings of the latent construct of parental involvement, with four sub-factors identified as Discipline, Communication, Companion, and Aspiration. The table showed the factor loadings for each indicator variable on the corresponding factor. For example, indicator variables REGULATION1 to REGULATION6 had significant factor loadings on the Discipline factor, ranging from 0.48 to 0.82. Similarly, WITH1 to WITH3 had significant loadings on the Companion factor, ranging from 0.21 to 0.84. Indicator variables EXPECT1 to EXPECT4 had significant loadings on the Aspiration factor, ranging from 0.35 to 0.75. Finally, DISCUSSION1-4 had significant loadings on both Communication factors, ranging from 0.71 to 0.91. All the loadings were significant at the 5% level.

Table 4.1

The factor standard loadings of the latent construct of parental involvement from EFA for half of the 2014-15 student dataset

Variables	Discipline	Communication	Companion	Aspiration
REGULATION1	0.51*			
REGULATION2	0.52*			
REGULATION3	0.48*			
REGULATION4	0.55*			
REGULATION5	0.82*			
REGULATION6	0.76*			
WITH1			0.21*	
WITH2			0.81*	
WITH3			0.84*	
EXPECT4				0.35*
EXPECT1				0.62*
EXPECT3				0.42*
EXPECT2				0.75*
DISCUSSION1		0.86*		
DISCUSSION2		0.91*		
DISCUSSION3		0.82*		
DISCUSSION4		0.71*		

Note: * significant at 5% level.

Table 4.2

The correlation coefficients of the factors of parental involvement for half of the 2014-15 student dataset

	Discipline	Communication	Companion	Aspiration
Discipline	1			
Communication	0.43*	1		
Companion	0.51*	0.25*	1	
Aspiration	0.41*	0.45*	0.38*	1

Note: * significant at 5% level.

Table 4.2 displayed the correlation coefficients among the four factors of parental involvement: Discipline, communication, Companion, and Aspiration. Each cell in the table represented the correlation coefficient between two factors, with the diagonal showing the correlation of each factor with itself, which was always 1. The correlation coefficient between Discipline and Communication was 0.43. The correlation coefficient between Discipline and Companion was 0.51, while the correlation coefficient between Companion and Communication was 0.25. The correlation coefficient between Aspiration and Communication was 0.45, while the correlation coefficient between Aspiration and Companion was 0.38. All of these correlations were significant at the 5% level.

Overall, the two tables provided essential information about the strength of the relationship between each indicator variable and its corresponding factor and the interrelationships among the factors of parental involvement, which can help better understand the overall construct of parental involvement.

CFA Results of Parental Involvement

The confirmatory factor analysis (CFA) results indicated a good model fit for the proposed four-factor model of parental involvement with the other half of the 2014-15 dataset. All factor standard loadings were statistically significant with $p < 0.01$ and high, ranging from 0.43 to 0.85. The standardized factor loadings suggested that Discipline, Communication, Companion, and Aspiration factors account for 53%, 69%, 18%, and 41% of the variance in the corresponding observed variables, respectively. The chi-square test was significant, which was expected for large sample sizes. The model fit

indices such as CFI=0.94, TLI=0.93, RMSEA=0.071, and SRMR=0.048 were within the acceptable range, indicating good model fit. Furthermore, the modification indices did not suggest significant cross-loadings or residual correlations, indicating that the proposed model is appropriate for the data. These findings provided evidence for the validity and reliability of this sample's four-factor model of parental involvement.

Table 4.3 showed the results of the confirmatory factor analysis (CFA) conducted on the latent construct of parental involvement with the other half of the 2014-15 dataset. The table reported the standardized factor loadings for each observed variable in the model and the factor correlations. The observed variables were grouped into four factors: Discipline, Communication, Companion, and Aspiration. For Discipline, all six items (REGULATION1-6) were significantly loaded on the factor, with estimates ranging from 0.58 to 0.72. For Communication, all four items (DISCUSSION1-4) were also significantly loaded on the factor, with estimates ranging from 0.74 to 0.85. For Companion, all three items (WITH1-3) were significantly loaded on the factor, with estimates ranging from 0.43 to 0.88. For Aspiration, all four items (EXPECT1-4) were significantly loaded on the factor, with estimates ranging from 0.49 to 0.69. The correlations between factors were also presented in the table. Communication had a moderate correlation with both Discipline (0.55) and Aspiration (0.50) and a weaker correlation with Companion (0.41). Companion weakly correlated with Discipline (0.22) and Aspiration (0.40). Aspiration had a moderate correlation with Discipline (0.47), a moderate to strong correlation with Communication (0.50), and a moderate correlation with Companion (0.40).

Table 4.3

The factors standard loadings and correlations of the latent construct of parental involvement from CFA for the other half of the 2014-15 student dataset

Variable	Estimate	S.E.	P-Value
DISCIPLINE BY			
REGULATION1	0.72	0.011	<0.01
REGULATION2	0.72	0.01	<0.01
REGULATION3	0.61	0.013	<0.01
REGULATION4	0.58	0.013	<0.01
REGULATION5	0.64	0.011	<0.01
REGULATION6	0.61	0.011	<0.01
COMMUNICATION BY			
DISCUSSION1	0.83	0.007	<0.01
DISCUSSION2	0.85	0.007	<0.01
DISCUSSION3	0.81	0.008	<0.01
DISCUSSION4	0.74	0.01	<0.01
COMPANION BY			
WITH1	0.43	0.018	<0.01
WITH2	0.88	0.014	<0.01
WITH3	0.82	0.014	<0.01
ASPIRATION BY			
EXPECT4	0.64	0.016	<0.01
EXPECT1	0.56	0.015	<0.01
EXPECT3	0.49	0.017	<0.01
EXPECT2	0.69	0.013	<0.01
COMMUNICATION WITH			
DISCIPLINE	0.55	0.014	<0.01
COMPANION WITH			
DISCIPLINE	0.22	0.018	<0.01
COMMUNICATION	0.41	0.016	<0.01
ASPIRATION WITH			
DISCIPLINE	0.47	0.016	<0.01
COMMUNICATION	0.50	0.016	<0.01
COMPANION	0.40	0.017	<0.01

The results suggested that the CFA model fitted the data well, with all factor loadings and correlations being significant at 0.05. Figure 3.3 presented the CFA diagram of the underlying structure of the latent variables and their corresponding measured indicators based on the loadings and correlations from Table 4.3.

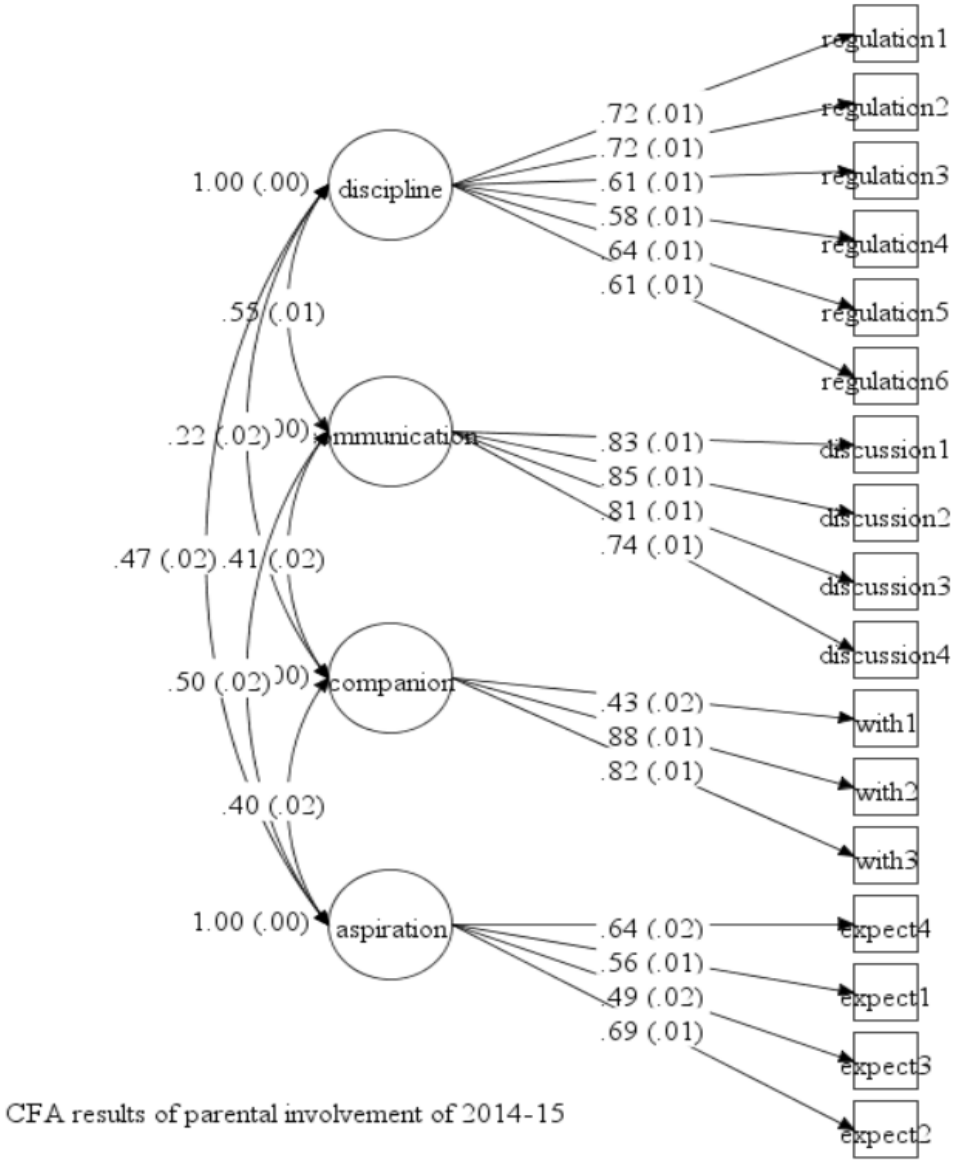

Figure 4.1. The CFA diagram of parental involvement of the 2014-15 student dataset

Summary of Construct Building for Parental Involvement

The exploratory factor analysis (EFA) showed that the four-factor model of parental involvement (Discipline, Communication, Companion, and Aspiration) was the best fit for the data. The four factors accounted for 62.53% of the total variance. The confirmatory factor analysis (CFA) further validated the four-factor model of parental involvement, with all standardized factor loadings being significant at the 0.01 level. The correlation matrix indicated that the four factors were moderately intercorrelated, with Communication having the strongest association with Companion and Aspiration. The goodness-of-fit indices of the CFA also indicated that the four-factor model had a good fit to the data. The results suggested that the four-factor model of parental involvement was a valid and reliable construct for measuring parental involvement in the studied population.

Invariant Test of the Construct of Parent Involvement

There are three levels of invariant test: configure, metric, and scalar invariance. When running a configure invariance model, the factor structure is assumed to be the same across both groups. Next, metric invariance is constrained with the factor loadings to be equal across both groups. Then, the test for scalar invariance is by constraining both the factor loadings and intercepts to be equal across both groups.

The highest level of invariant test of a scalar invariance test was conducted in this study to test whether the factor structure of the measurement model is invariant across students and parents. The test involved comparing the model fit indices of the unconstrained model, where all parameters are freely estimated across groups, and the

constrained model, where the loadings, intercepts, and residual variances are constrained to be equal across groups.

Invariant Test of Parent Involvement from Students' and Parents' Perspectives

The results of the scalar invariance test in Table 4.4 showed that the constrained model had a relatively good fit, with a chi-square value of 10175.45 with 244 degrees of freedom, RMSEA = 0.06, CFI = 0.96, TLI = 0.95, and SRMR= 0.051. This suggested that the factor structure of the measurement model was invariant across the groups being compared. The construct of student and parent has no significant difference for the 2014-2015 dataset.

Table 4.4

The Invariant Test Model fit from Students' and Parents' Perspectives for 2014-15 dataset

$N_{Student}$ = 9903 N_{Parent} = 9743	Model fit
df	244
chi2	10175.45
p > chi2	< 0.01
RMSEA	0.06
CFI	0.96
TLI	0.95
SRMR	0.051

Additionally, Table 4.5 showed the estimates, standard errors, estimate-to-standard error ratios, and p-values for each factor item for the student and parent groups. The estimates represented the strength of the relationship between each item and its corresponding latent factor, while the standard errors indicated the level of uncertainty in

the estimates. The estimate-to-standard error ratios indicated the reliability of the estimates, with higher ratios suggesting more reliable estimates. All the estimated loadings were statistically significant with $p < 0.01$, and the loadings and correlations of the two groups had no significant difference. The diagram of the two groups' structure was in Appendix I (Diagram 2).

Overall, the results suggested no significant difference in the factor structure between the student and parent groups, indicating that the measurement model was invariant across the parents and students.

Table 4.5

Structure, the loadings, and the correlations of the latent construct of parental involvement for groups of parents and students for the 2014-15 dataset

STUDENT					PARENT				
	Loading	S.E	Est./S.E	P		Loading	S.E.	Est./S.E	P
DISCIPLINE BY					DISCIPLINE BY				
REGULATION1	0.73	0.01	85.43	<0.01	REGULATION1	0.70	0.01	84.72	<0.01
REGULATION2	0.73	0.01	92.03	<0.01	REGULATION2	0.78	0.01	118.60	<0.01
REGULATION3	0.61	0.01	67.26	<0.01	REGULATION3	0.73	0.01	103.14	<0.01
REGULATION4	0.58	0.01	61.31	<0.01	REGULATION4	0.65	0.01	83.56	<0.01
REGULATION5	0.73	0.01	94.54	<0.01	REGULATION5	0.78	0.01	112.72	<0.01
REGULATION6	0.74	0.01	98.66	<0.01	REGULATION6	0.77	0.01	113.33	<0.01
COMMUNICATION BY					COMMUNICATION BY				
DISCUSSION1	0.85	0.01	171.64	<0.01	DISCUSSION1	0.87	0.00	210.60	<0.01
DISCUSSION2	0.88	0.00	199.71	<0.01	DISCUSSION2	0.90	0.00	257.20	<0.01
DISCUSSION3	0.82	0.01	164.80	<0.01	DISCUSSION3	0.87	0.00	213.36	<0.01
DISCUSSION4	0.75	0.01	120.45	<0.01	DISCUSSION4	0.82	0.01	164.74	<0.01
COMPANION BY					COMPANION BY				
WITH1	0.43	0.01	30.84	<0.01	WITH1	0.41	0.02	26.30	<0.01
WITH2	0.84	0.01	90.12	<0.01	WITH2	0.83	0.01	80.57	<0.01
WITH3	0.86	0.01	90.88	<0.01	WITH3	0.85	0.01	81.77	<0.01
ASPIRATION BY					ASPIRATION BY				
EXPECT1	0.56	0.01	50.77	<0.01	EXPECT1	0.47	0.01	37.29	<0.01
EXPECT2	0.70	0.01	66.37	<0.01	EXPECT2	0.69	0.01	57.02	<0.01
EXPECT3	0.47	0.01	38.01	<0.01	EXPECT3	0.39	0.01	28.93	<0.01
EXPECT4	0.65	0.01	54.79	<0.01	EXPECT4	0.66	0.01	50.93	<0.01
DISCIPLINE WITH					DISCIPLINE WITH				
COMMUNICATION	0.50	0.01	69.65	<0.01	COMMUNICATION	0.50	0.01	69.65	<0.01
COMPANION	0.21	0.01	24.37	<0.01	COMPANION	0.21	0.01	24.37	<0.01
ASPIRATION	0.42	0.01	47.74	<0.01	ASPIRATION	0.42	0.01	47.74	<0.01
COMMUNICATION WITH					COMMUNICATION WITH				
COMPANION	0.43	0.01	56.82	<0.01	COMPANION	0.43	0.01	56.82	<0.01
ASPIRATION	0.47	0.01	55.73	<0.01	ASPIRATION	0.47	0.01	55.73	<0.01
ASPIRATION WITH					ASPIRATION WITH				
COMPANION	0.36	0.01	30.65	<0.01	COMPANION	0.31	0.01	23.11	<0.01

Note: The number of student IDs is 10,750. The group of students has 9903 students, and the group of parents has 9743 parents.

Invariant Test of Parent Involvement from Two-time Points

Similarly, the highest level of invariant test of a scalar invariance test was conducted to test whether the factor structure of the measurement model was invariant across the two time points of the 2013-14 baseline and 2014-15 tracing line. The test involved comparing the model fit indices of the unconstrained model, where all parameters were freely estimated across groups, and the constrained model, where the loadings, intercepts, and residual variances were constrained to be equal across groups.

Table 4.6

The Invariant Test Model fit For Parent Involvement for 2013-14 to 2014-15 dataset

$N_{2014\text{-}15}$ = 9432 $N_{2013\text{-}14}$ = 10271	Model fit
df	244
chi2	10017.24
p > chi2	< 0.01
RMSEA	0.06
CFI	0.95
TLI	0.94
SRMR	0.05

The results of the scalar invariance test showed that the constrained model had a relatively good fit, with a chi-square value of 10017.24 with 244 degrees of freedom, RMSEA = 0.06, CFI = 0.95, TLI = 0.94, and SRMR= 0.051. The factor loadings of the baseline group (2014-2015) and the tracing group (2013-2014) and the correlations among the factors were also reported in Table 4.7 . The results suggested that the factor structure of the measurement model was invariant across the groups being compared in two-time datasets.

Table 4.7

The structure, loadings, and correlations of the latent construct of parental involvement for the 2013-14 baseline and 2014-15 tracing line

2014-15 Tracing line					2013-14 Baseline				
	Loading	S.E.	Est. /S.E	P		Loading	S.E	Est. /S.E	P
DISCIPLINE BY					DISCIPLINE BY				
REGULATION1	0.73	0.01	84.44	<0.01	REGULATION1	0.66	0.01	68.07	<0.01
REGULATION2	0.73	0.01	90.85	<0.01	REGULATION2	0.65	0.01	69.71	<0.01
REGULATION3	0.61	0.01	65.24	<0.01	REGULATION3	0.58	0.01	58.71	<0.01
REGULATION4	0.58	0.01	59.52	<0.01	REGULATION4	0.57	0.01	57.92	<0.01
REGULATION5	0.72	0.01	91.72	<0.01	REGULATION5	0.70	0.01	75.89	<0.01
REGULATION6	0.73	0.01	95.61	<0.01	REGULATION6	0.72	0.01	84.22	<0.01
COMMUNICATION BY					COMMUNICATION BY				
DISCUSSION1	0.85	0.01	172.95	<0.01	DISCUSSION1	0.77	0.01	114.64	<0.01
DISCUSSION2	0.88	0.00	198.32	<0.01	DISCUSSION2	0.81	0.01	131.18	<0.01
DISCUSSION3	0.82	0.01	163.62	<0.01	DISCUSSION3	0.78	0.01	123.02	<0.01
DISCUSSION4	0.75	0.01	119.13	<0.01	DISCUSSION4	0.65	0.01	78.73	<0.01
COMPANION BY					COMPANION BY				
WITH1	0.43	0.01	30.11	<0.01	WITH1	0.40	0.02	27.38	<0.01
WITH2	0.83	0.01	87.05	<0.01	WITH2	0.89	0.01	119.78	<0.01
WITH3	0.87	0.01	88.21	<0.01	WITH3	0.92	0.01	121.56	<0.01
ASPIRATION BY					ASPIRATION BY				
EXPECT1	0.55	0.01	48.74	<0.01	EXPECT1	0.51	0.01	44.97	<0.01
EXPECT2	0.69	0.01	64.01	<0.01	EXPECT2	0.67	0.01	60.77	<0.01
EXPECT3	0.47	0.01	36.99	<0.01	EXPECT3	0.45	0.01	34.69	<0.01
EXPECT4	0.64	0.01	52.70	<0.01	EXPECT4	0.61	0.01	49.32	<0.01
DISCIPLINE WITH					DISCIPLINE WITH				
COMMUNICATION	0.48	0.01	61.79	<0.01	COMMUNICATION	0.48	0.01	61.79	<0.01
COMPANION	0.22	0.01	25.36	<0.01	COMPANION	0.22	0.01	25.36	<0.01
ASPIRATION	0.46	0.01	52.65	<0.01	ASPIRATION	0.46	0.01	52.65	<0.01
COMMUNICATION WITH					COMMUNICATION WITH				
COMPANION	0.43	0.01	54.92	<0.01	COMPANION	0.43	0.01	54.92	<0.01
ASPIRATION	0.46	0.01	53.63	<0.01	ASPIRATION	0.46	0.01	53.63	<0.01
ASPIRATION WITH					ASPIRATION WITH				
COMPANION	0.37	0.01	29.65	<0.01	COMPANION	0.39	0.01	31.23	<0.01

Note: The number of student I.D.s is 10279. Group tracing has 9432 students, and group baseline has 10271 students.

Additionally, Table 4.7 showed the estimates, standard errors, estimate-to-standard error ratios, and p-values for each factor item for the baseline and tracing line time points. The estimates represented the strength of the relationship between each item and its corresponding latent factor, while the standard errors indicated the level of uncertainty in the estimates. The estimate-to-standard error ratios indicated the reliability of the estimates, and all the correlations had high ratios above 0.4. All the estimated loadings were statistically significant with $P < 0.01$, and the loadings and correlations of the two groups had no significant differences. The diagram of the two groups' structure was in Appendix I (Diagram 3).

Overall, the results suggested no significant difference in the factor structure between the 2013-14 baseline and 2014-15 tracing line, indicating that the measurement model was invariant across the two time points.

Summary of Invariant Tests of Parent Involvement

Based on the exploratory factor analysis, the data showed a good fit for a four-factor model, suggesting that the items measure parental involvement in four distinct constructs. The four factors are Discipline, Communication, Companion, and Aspiration. The confirmatory factor analysis confirmed the four-factor model and demonstrated a good fit with the data. The results proved that the questionnaire's items accurately measured the four constructs they intended to measure. The invariant tests were conducted to investigate whether the items in the questionnaire functioned differently across different groups (e.g., parents and students; two-time points of 2013-14 school year and 2014-15 school year). The results of the invariant test showed that none of the

items demonstrated significant differences, suggesting that the questionnaire is measuring the same constructs consistently across different groups and the two school years. Overall, the results of the EFA, CFA, and invariant tests suggest that the questionnaire was a reliable and valid measure of the four constructs of interest.

The Construct of Student Self-engagement

In this part, the results answered the questions about the construct of student self-engagement and the invariant tests from the two-time points of the 2013-14 and 2014-15 school years. When building the latent constructs of student self-engagement, the 2014-15 dataset was split into half and half. Half of the data was applied to do EFA, and the other half would be kept to do the confirmative analysis later. The datasets were applied only from the student perspective for the student construct. In the students' questionnaires, they were requested to answer some of the same questions for baseline 2013-14 and tracing lines 2014-15.

EFA Results of Student Self-engagement Construct

The exploratory factor analysis was conducted on half of the 2014-15 dataset of 4983 participants using maximum likelihood estimation and oblique rotation. The assumption of 3 and 4 factors of all 19 items were applied to the estimations. The model fit indices of four factors were chi-square = 5746.9, CFI = 0.94, TLI = 0.89, RMSEA = 0.12, and SRMR= 0.06, indicating reasonable fit. The model loadings of 4 factors and coefficient item variables were presented in Table d and Table e in Appendix I.

The results of EFA showed that four factors can explain the latent construct of student self-engagement. The loadings of the items and correlation coefficients were

presented in Table d and Table e in Appendix I. Each factor indicated the strength of the relationship between the item and the factor. Factor 1 had high loadings from six items related to teachers, indicating that this factor reflected students' engagement with teachers. Factor 2 included three items related to peer interaction, suggesting that this factor represents students' engagement with peers. Factor 3 included three items related to studying, implying that this factor represented students' engagement with studying. Finally, Factor 4 included two items related to leisure activities, indicating that this factor reflected students' engagement with leisure activities. However, when it came to the correlations of the factors, there were no significant relationships between factor 2, factor 3, and factor 4 (see Table e in Appendix I) with coefficients of 0.026 and -0.025, which were too small to keep.

Then, the two leisure items were deleted from the analysis, and the EFA was carried out again with a three-factor analysis. The model fit indices were chi-square = 3733.09, CFI = 0.95, TLI = 0.91, RMSEA = 0.12, and SRMR= 0.048, indicating a better reasonable fit. Teacher's Attitude, School life, and Study Engagement were named for the three factors. Tables 4.8 and 4.9 presented the model loadings of factors and coefficient item variables.

Table 4.8 showed the standard loadings of the three-factor model of the latent construct of student self-engagement from EFA. Teacher's Attitude, School Life, and Study Engagement were the three factors. The items with high factor loadings on Teacher's Attitude were from 0.73 to 0.97. The items with high factor loadings on School Life were from 0.55 to 0.82. The items with high factor loadings on Study Engagement

were from 0.29 to 0.72. All the loadings were statistically significant at a 5% level in two tails. Table 4.9 showed the correlation coefficients of the three factors of student self-engagement. The highest correlation was between Teacher's Attitude and School Life (0.53), followed by the correlation between School Life and Study Engagement (0.17), and the lowest correlation was between Teacher's Attitude and Study Engagement (0.38). All the correlations were statistically significant at a 5% level in two tails.

Table 4.8

The factors standard loadings of the three-factor model of the latent construct of student self-engagement from EFA for half of the 2014-15 Student dataset

Items	Teacher's Attitude	School Life	Study Engagement
TEACHER1	0.80*		
TEACHER2	0.80*		
TEACHER3	0.73*		
TEACHER4	0.95*		
TEACHER5	0.97*		
TEACHER6	0.93*		
PEER1		0.71*	
PEER2		0.72*	
PEER3		0.55*	
PEER4		0.82*	
PEER5		0.77*	
PEER6		0.79*	
STUDY1			0.29*
STUDY2			0.69*
STUDY3			0.72*

Note: * significant at 5% level.

Table 4.9

The correlation coefficients of the three factors of student self–engagement for half of the 2014-15 Student dataset

Correlations	Teacher's Attitude	School Life	Study Engagement
Teacher's Attitude	1		
School Life	0.53*	1	
Study Engagement	0.38*	0.17*	1

Note: * significant at 5% level.

Overall, the EFA results suggested that student self-engagement could be represented by Teacher's Attitude, School Life, and Study Engagement. Teacher's Attitude and School Life were moderately correlated, while the correlation between Teacher's Attitude and Study Engagement was slightly higher.

CFA Results of Student Self-engagement

The CFA results showed that the three-factor model of student self-engagement had an acceptable fit to the data. All factor standard loadings were statistically significant with $p<0.01$. The standardized factor loadings suggested that Teacher's Attitude, School Life, and Study Engagement factors account for 51%, 51%, and 18% of the variance in the corresponding observed variables, respectively. The Chi-square test was significant, but this was expected for large sample sizes of 4893, and the model fit indices such as CFI=0.92, TLI=0.91, RMSEA=0.11, and SRMR=0.06 were within the acceptable range, indicating a good model fit. Furthermore, the modification indices did not suggest significant cross-loadings or residual correlations, indicating that the proposed model was appropriate for the data. These findings provided evidence for the validity and reliability of this sample's three-factor model of student self-engagement.

Table 4.10 presented the standardized loadings and correlations of the three-factor construct of student self-engagement. The standardized loadings for the items measuring Teacher's Attitude ranged from 0.71 to 0.88; for the items measuring School Life, ranged from 0.42 to 0.78; and for the items measuring Study Engagement, ranged from 0.43 to 0.82. All factor loadings were statistically significant ($p < 0.01$). The correlations between Teacher's Attitude and School Life and Teacher's Attitude and Study Engagement were positive and statistically significant ($p < 0.01$), indicating that students with more positive attitudes toward their teachers were also more engaged in School Life and study. Similarly, the correlation between School Life and Study Engagement was positive and statistically significant ($p < 0.01$), indicating that students who were more engaged in School Life were also more engaged in their studies. These results suggested that the three-factor model of student self-engagement was a valid and reliable measure of student engagement in the study context.

Figure 4.2 presented the FA diagram of the underlying structure of the latent variables and their corresponding measured indicators based on the loadings and correlations from Table 4.10.

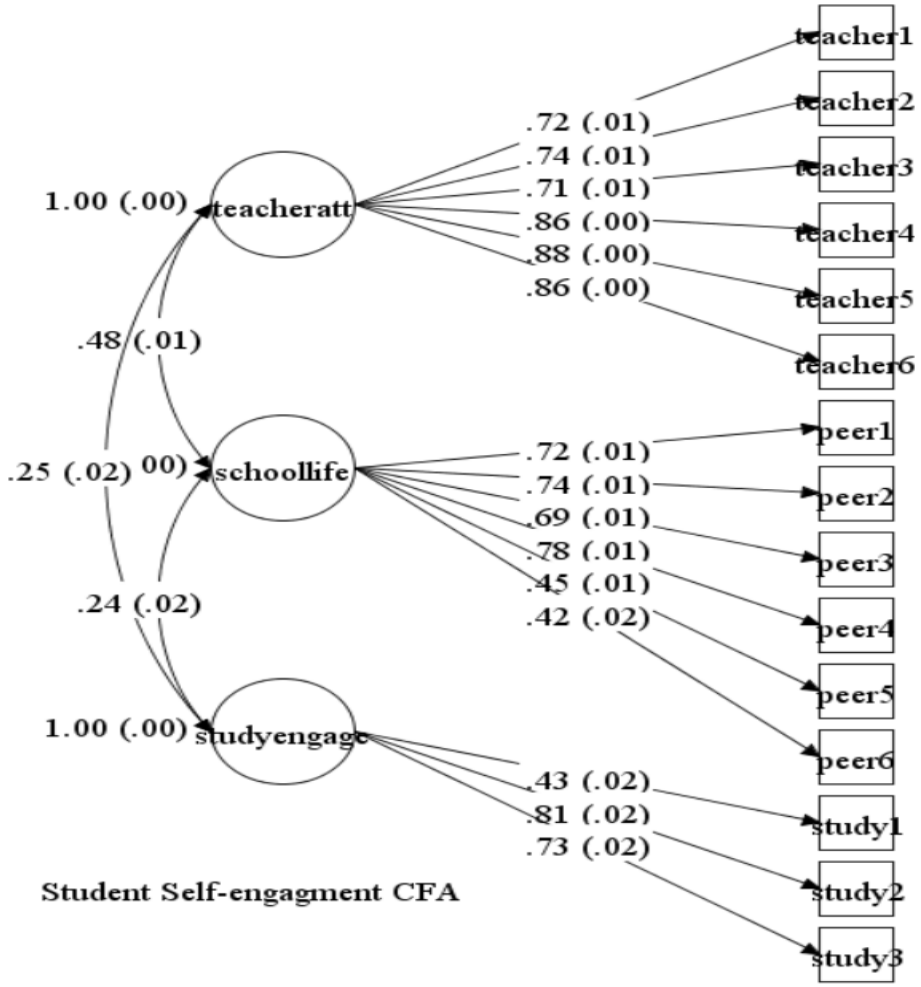

Figure 4.2. The diagram of the latent construct of student self-engagement from CFA for the 2014-15 student dataset

Table 4.10

The loadings and correlations of the construct of student self-engagement from CFA result for the other half of the 2014-15 student dataset

Variables	Estimate	S.E.	P-Value
Teacher's Attitude BY			
TEACHER1	0.72	0.01	<0.01
TEACHER2	0.75	0.01	<0.01
TEACHER3	0.71	0.01	<0.01
TEACHER4	0.86	0.00	<0.01
TEACHER5	0.88	0.00	<0.01
TEACHER6	0.86	0.00	<0.01
School Life BY			
PEER1	0.72	0.01	<0.01
PEER2	0.75	0.01	<0.01
PEER3	0.69	0.01	<0.01
PEER4	0.78	0.01	<0.01
PEER5	0.45	0.02	<0.01
PEER6	0.42	0.02	<0.01
Study Engagement BY			
STUDY1	0.43	0.02	<0.01
STUDY2	0.82	0.02	<0.01
STUDY3	0.73	0.02	<0.01
School Life WITH			
Teacher's Attitude	0.48	0.01	<0.01
Study Engagement WITH			
Teacher's Attitude	0.25	0.02	<0.01
School Life	0.25	0.02	<0.01

Summary of the Construct Building of Student Self-engagement

The student self-engagement construct's exploratory factor analysis yielded a three-factor model comprising Teacher's Attitude, School Life, and Study Engagement as its components. The standardized factor loadings of the items showed that all the items had significant loadings on their respective factors. The inter-correlations among the

factors were moderate to high. The same construct's confirmatory factor analysis confirmed the three-factor model. The standardized factor loadings of the items were significant and moderate to high on their respective factors. The model fit indices indicated acceptable goodness-of-fit, suggesting that the three-factor model fitted the data well. Overall, the results from both EFA and CFA suggested that the construct of student self-engagement can be explained by Teacher's Attitude, School Life, and Study Engagement. These findings had implications for educational interventions and programs to promote student self-engagement from three aspects: teachers, peers, and themselves in schools.

Invariant Test of Student Self-engagement from Two-time Points

Table 4.11

The Invariant Test Model Fit for Student Self-engagement for 2013-14 to 2014-15 dataset

$N_{2014\text{-}15}$ = 9430 $N_{2013\text{-}14}$ = 10266	Model fit
df	183
chi2	15297.21
p > chi2	< 0.01
RMSEA	0.09
CFI	0.95
TLI	0.95
SRMR	0.058

The scalar invariant test was conducted to test whether the factor structure of the measurement model of student self-engagement was invariant across two time points of the 2013-14 baseline and 2014-15 tracing line. The test involved comparing the model fit indices of the unconstrained model, where all parameters were freely estimated across

groups, and the constrained model, where the loadings, intercepts, and residual variances were constrained to be equal across groups.

The analysis results of the invariant test of two-time points of student self-engagement showed that the CFA model had a good fit, with a chi-square value of 15297.21 with 183 degrees of freedom, RMSEA = 0.09, CFI = 0.95, TLI = 0.95, and SRMR= 0.058. The factor loadings of the baseline group (2014-2015) and the tracing group (2013-2014) and the correlations among the factors were also reported in Table 4.12. The indicators suggested that the factor structure of the measurement model was invariant across the time points being compared.

The factor loadings showed that Teacher's Attitude, School Life, and Study Engagement were all significant predictors of student self-engagement in both groups. Specifically, all six Teacher's Attitudes had strong positive relationships with items about how students felt about the teacher's attitude, with factor loadings ranging from 0.77 to 0.87. School Life of peer relationships were also significant predictors, with factor loadings ranging from 0.48 to 0.80 in baseline and for School Life and 0.45 to 0.74 in tracing-line for peer relationships. Study Engagement was a significant predictor in both groups, with factor loadings ranging from 0.24 to 0.70 in the baseline group and 0.36 to 0.90 in the tracing group.

Only in the Study Engagement factor were there slight differences (loadings of Study1 are from 0.24 to 0.36; loadings of Study2 are from 0.7 to 0.9). This variance could be due to various factors such as changes in teaching methods, curriculum, or personal circumstances of the students. Most importantly, in the 2013-14 baseline, the

original data of Study Engagement was actual time spent in the study (when we carried out the analysis, the actual time was transferred into the scale level). In the 2014-15 tracing line, the data was scale level. The loading differences may come from the scale transition from time to scale level.

Generally, the invariant test revealed no significant differences in student self-engagement between the two time points. It suggested that student self-engagement remained consistent over time, indicating that the construct was stable and reliable. Overall, the results suggested that Teacher's Attitude, School Life, and Study Engagement were all significant predictors of student self-engagement and that student self-engagement remained consistent over this period.

Summary of Invariant Test of Student Self-engagement

The exploratory factor analysis (EFA) results indicated that the student self-engagement construct had three underlying factors: Teacher's Attitude, School Life, and Study Engagement. The confirmatory factor analysis (CFA) results showed that the three-factor model fit the data well. All of the factor loadings were significant. The invariant analysis test suggested that the Study Engagement factor slightly differed in item loadings between the two time points. However, overall, the student self-engagement construct was found to be consistent across the two time points. Overall, the results suggested that the student self-engagement construct can be measured using the three underlying factors of Teacher's Attitude, School Life, and Study Engagement. The construct was consistent over periods in our datasets.

Table 4.12

The structure, loadings, and correlations of the latent construct of student self-engagement 2013-14 baseline and 2014-15 tracing line

Group Baseline (2014-2015)					Group Tracing line (2013-2014)				
Variable	Loading	S.E.	Est. /S.E	P	Variable	Loading	S.E.	Est. /S.E	P
Teacher's Attitude BY					Teacher's Attitude BY				
TEACHER1	0.79	0.004	198.47	<0.01	TEACHER1	0.76	0.005	159.13	<0.01
TEACHER2	0.82	0.004	225.77	<0.01	TEACHER2	0.78	0.004	174.35	<0.01
TEACHER3	0.77	0.004	179.59	<0.01	TEACHER3	0.74	0.005	148.24	<0.01
TEACHER4	0.84	0.003	267.31	<0.01	TEACHER4	0.86	0.003	296.38	<0.01
TEACHER5	0.87	0.003	311.54	<0.01	TEACHER5	0.88	0.003	325.37	<0.01
TEACHER6	0.84	0.003	267.38	<0.01	TEACHER6	0.86	0.003	279.16	<0.01
School Life BY					School Life BY				
PEER1	0.68	0.008	89.07	<0.01	PEER1	0.74	0.007	103.69	<0.01
PEER2	0.71	0.007	98.48	<0.01	PEER2	0.74	0.007	104.86	<0.01
PEER3	0.70	0.008	92.17	<0.01	PEER3	0.70	0.008	90.95	<0.01
PEER4	0.80	0.006	124.57	<0.01	PEER4	0.83	0.006	131.86	<0.01
PEER5	0.53	0.010	53.10	<0.01	PEER5	0.51	0.01	50.95	<0.01
PEER6	0.48	0.011	42.99	<0.01	PEER6	0.45	0.011	40.79	<0.01
Study Engagement BY					Study Engagement BY				
STUDY1	0.24	0.015	15.60	<0.01	STUDY1	0.36	0.014	26.23	<0.01
STUDY2	0.70	0.025	27.61	<0.01	STUDY2	0.90	0.022	40.90	<0.01
STUDY3	0.70	0.026	27.29	<0.01	STUDY3	0.70	0.018	39.34	<0.01
Teacher's Attitude WITH					Teacher's Attitude WITH				
School Life	0.48	0.006	77.85	<0.01	School Life	0.48	0.006	77.85	<0.01
Study Engagement	0.18	0.009	18.53	<0.01	Study Engagement	0.18	0.009	18.53	<0.01
School Life WITH					School Life WITH				
Study Engagement	0.16	0.01	16.45	<0.01	Study Engagement	0.16	0.01	16.45	<0.01

Note: The number of student IDs is 10279. Group tracing has 9430 students, and group baseline has Study Engagement 10266 students.

SEM Analysis on Academic Achievement

The structural equation model (SEM) analysis examined the relationships between Discipline, Communication, Companion, and Aspiration and their effects on students' academic scores in the three main subjects of Chinese, Math, and English. The model included three mediator variables: Teacher's Attitude, School Life, and Study Engagement. The paths among these relationships were in Figure 4.3 (the academic score in this diagram using English as an example).

The academic scores of the three main subjects were standardized with a mean of 0 and a variance of 1. The skewness of standardized Math, English, and Chinese were -0.16, -0.32, and -1.25, indicating the normality of the data. The four latent factors of parental involvement were correlated, and all the paths start from parental involvement through student self-engagement to academic achievement. The model fit indices for the three subjects were presented in Table 4.13 .

Table 4.13

Model fit indices for standardized Math, Chinese, and English in SEM

N=5036	Math Model	Chinese Model	English Model
df	471	471	471
chi2	10893.38	11008.58	11011.43
p > chi2	< 0.01	< 0.01	< 0.01
RMSEA	0.066	0.067	0.067
CFI	0.91	0.091	0.91
TLI	0.90	0.90	0.90
SRMR	0.054	0.054	0.054

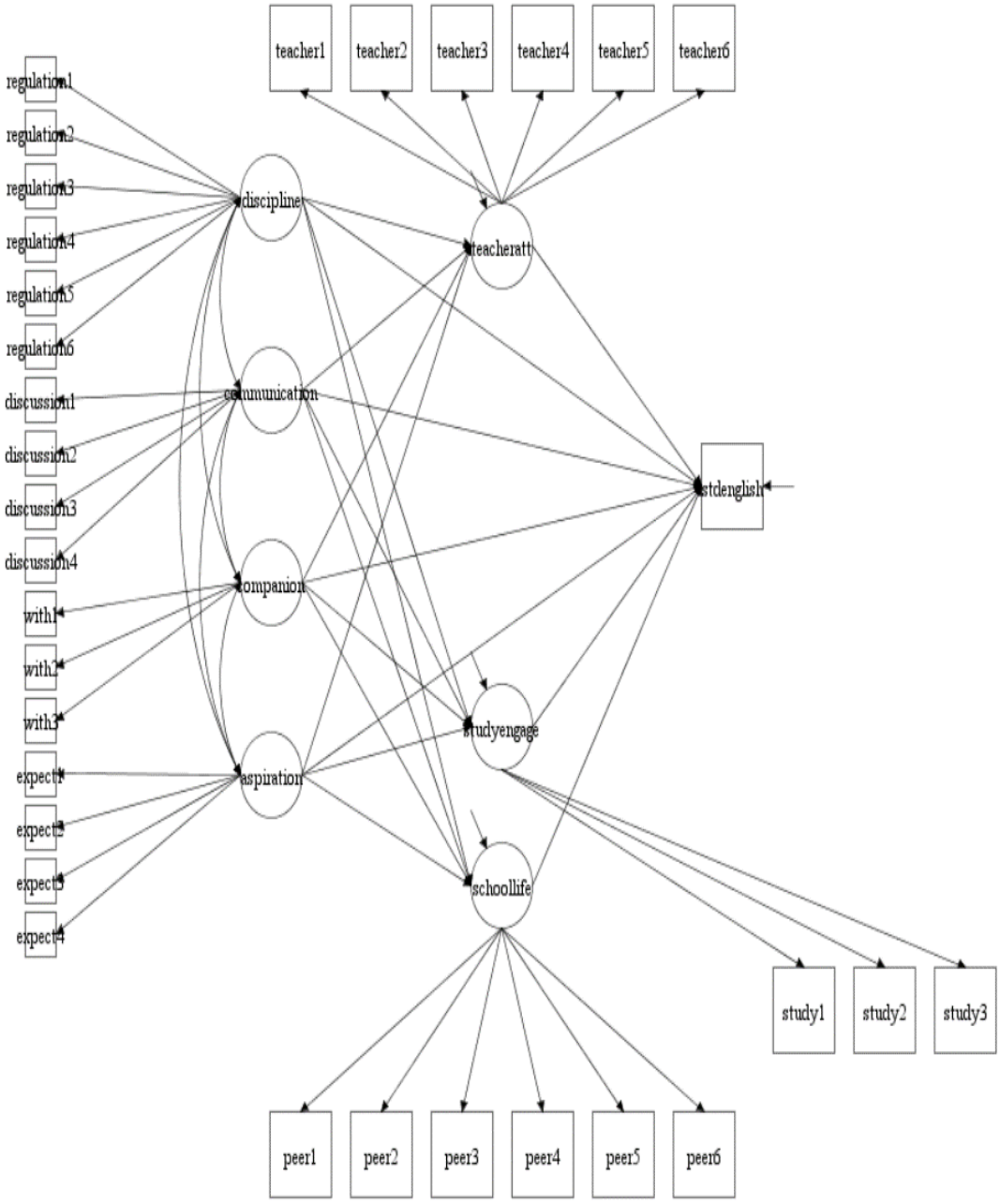

Figure 4.3. The basic structural equation model with path analysis (Here only Model English Figure because Model Math and Chinese are the same)

The SEM for the three subjects showed a good fit, with high chi-square (χ2) values ($p < 0.01$), indicating a significant but acceptable discrepancy between the observed and model-predicted data. The model had 471 degrees of freedom, suggesting a reasonable number of free parameters. The RMSEAs were about 0.07, indicating a close fit between the model and the observed data. The CFI and TLI were above 0.90, indicating a relatively good fit. The SRMR was 0.05, suggesting a slight discrepancy between the observed covariance matrix and the model-implied covariance matrix. All three SEMs (Math, Chinese, and English) showed good model fit, as indicated by the significant but acceptable χ^2 values, low RMSEA values, and reasonable CFI, TLI, and SRMR values. These results indicated that the proposed models adequately capture the relationships among the variables and explain the observed data for each subject. The effect sizes of the structural equations were presented in Table 4.14 .

Table 4.14 presented the impacts or associations of different factors on standardized scores in Math, English, and Chinese. It contained various estimates, standard errors, and p-values for all latent variables variables in three different subject areas: Math, English, and Chinese.

To provide an interpretation of the SEM results from the paths provided, we need to explain three effect sizes: direct effects, indirect effects, and total effects. A direct effect represented the direct influence of one variable on another variable in the model, holding all other variables constant (Bollen, 1987). It indicated the strength and direction of the relationship between two variables without considering any intermediate variables. Path coefficients represented direct effects in the structural model. In our model

examining the relationship between parental involvement and academic scores, the direct effect would represent the direct impact of parental involvement on academic scores, independent of any other variables.

An indirect effect represented the influence of one variable on another variable that operates through one or more intermediate variables. It captured the indirect pathway or mediated relationship between variables (Bollen, 1987). Indirect effects were calculated by multiplying the path coefficients along the indirect pathway. In the context of the previous example, an indirect effect would represent the influence of parental involvement on academic scores that was mediated through student engagement. It reflected the impact of parental involvement on academic scores that was not directly transmitted but instead mediated through student engagement factors.

The total effect combined both the direct and indirect effects between variables. It represented the total influence of one variable on another, considering both the direct pathway and any indirect pathways through intermediate variables (Bollen, 1987). It was the sum of the direct and indirect effects. In the example, the total effect of parental involvement on academic scores would reflect the overall impact, including both the direct and indirect influences mediated through student engagement.

Table 4.14

The effect sizes of structural equations of SEM in three subjects

Math Model				English Model				Chinese Model			
	Estimate	S.E.	P		Estimate	S.E.	P		Estimate	S.E.	p
Teacher's Attitude				Teacher's Attitude				Teacher's Attitude			
Discipline	-0.44	0.06	<0.01	Discipline	-0.44	0.06	<0.01	Discipline	-0.44	0.06	<0.01
Communication	-0.01	0.04	0.77	Communication	-0.01	0.04	0.79	Communication	-0.01	0.04	0.88
Companion	-0.32	0.05	<0.01	Companion	-0.32	0.05	<0.01	Companion	-0.32	0.05	<0.01
Aspiration	1.07	0.07	<0.01	Aspiration	1.07	0.07	<0.01	Aspiration	1.08	0.07	<0.01
School Life				School Life				School Life			
Discipline	-0.60	0.07	<0.01	Discipline	-0.60	0.07	<0.01	Discipline	-0.61	0.07	<0.01
Communication	-0.08	0.05	0.1	Communication	-0.08	0.05	0.10	Communication	-0.07	0.05	0.13
Companion	-0.33	0.06	<0.01	Companion	-0.33	0.06	<0.01	Companion	-0.33	0.06	<0.01
Aspiration	1.33	0.10	<0.01	Aspiration	1.33	0.10	<0.01	Aspiration	1.33	0.10	<0.01
Study Engagement				Study Engagement				Study Engagement			
Discipline	0.19	0.04	<0.01	Discipline	0.19	0.04	<0.01	Discipline	0.19	0.04	<0.01
Communication	-0.07	0.03	0.01	Communication	-0.07	0.03	0.01	Communication	-0.07	0.03	0.01
Companion	0.32	0.03	<0.01	Companion	0.33	0.03	<0.01	Companion	0.33	0.03	<0.01
Aspiration	0.23	0.05	<0.01	Aspiration	0.23	0.05	<0.01	Aspiration	0.23	0.05	<0.01
Std Math				Std English				Std Chinese			
Discipline	-2.25	0.36	<0.01	Discipline	-2.25	0.36	<0.01	Discipline	-1.97	0.33	<0.01
Communication	-0.44	0.16	<0.01	Communication	-0.48	0.16	<0.01	Communication	-0.40	0.14	<0.01
Companion	-1.40	0.26	<0.01	Companion	-1.31	0.26	<0.01	Companion	-1.25	0.23	<0.01
Aspiration	4.79	0.61	<0.01	Aspiration	4.78	0.60	<0.01	Aspiration	4.27	0.55	<0.01
Teacher's Attitude	-0.78	0.09	<0.01	Teacher's Attitude	-0.77	0.09	<0.01	Teacher's Attitude	-0.68	0.08	<0.01
School Life	-1.26	0.20	<0.01	School Life	-1.26	0.20	<0.01	School Life	-1.09	0.18	<0.01
Study Engagement	-0.12	0.04	<0.01	Study Engagement	-0.04	0.04	0.38	Study Engagement	-0.08	0.04	0.047
Residual variances				Residual variances				Residual variances			
Std Math	-1.29			Std English	-1.36			Std Chinese	-0.85		
Teacher's Attitude	0.60	0.02	<0.01	Teacher's Attitude	0.60	0.02	<0.01	Teacher's Attitude	0.60	0.02	<0.01
School Life	0.44	0.04	<0.01	School Life	0.44	0.04	<0.01	School Life	0.44	0.04	<0.01
Study Engagement	0.68	0.02	<0.01	Study Engagement	0.68	0.02	<0.01	Study Engagement	0.68	0.02	<0.01

Direct Effects

Based on our model design, the direct effects were coefficients from the paths of Discipline, Communication, Companion, and Aspiration on students' academic achievements. Based on the results of Table 4.14 , all the factors of parental involvement had significant effects on students' Math, English, and Chinese scores with $p < 0.01$. All the factors of student engagement had negative effects on academic scores.

On Math:

- *Parental involvement factors:*

Discipline: There was a significant negative direct effect of Discipline on Math. The estimate was -2.25, indicating that an increase in Discipline level was associated with a decrease of 2.25 standard deviations in Math performance.

Communication: The estimate was -0.44, suggesting that an increase in Communication level was associated with a decrease of 0.44 standard deviations in Math performance.

Companion: The estimate was -1.40, indicating that an increase in Companion level was associated with a decrease of 1.4 standard deviations in Math performance.

Aspiration: Aspiration had a significant positive direct effect on Math, and the effect sizes were enormous. The estimate was 4.79, suggesting that an increase in

Aspiration level was associated with an increase of 4.79 standard deviations in Math performance.

- *Student engagement factors:*

Teacher's Attitude: The standardized estimate was -0.78 with $p < 0.01$, indicating one higher level of Teacher's Attitude decreased of 0.78 standard deviations in Math performance.

School Life: The standardized estimate was -1.26 with $p < 0.0$, indicating one higher level of School Life decreased of 1.26 standard deviations in Math performance.

Study Engagement: The standardized estimate was -0.12 with $p = 0.003$, indicating one higher level of Study Engagement decreased of 0.12 standard deviations in Math performance.

On English:

- *Parental involvement factors:*

Discipline: There was a significant negative direct effect of Discipline level on English. The estimate was -2.25, indicating that an increase in Discipline level was associated with a decrease of 2.25 standard deviations in English performance.

Communication: The estimate was -0.48, suggesting that an increase in Communication level was associated with a decrease of 0.48 standard deviations in English performance.

Companion: The estimate was -1.31, indicating that an increase in Companion level was associated with a decrease of 1.31 standard deviations in English performance.

Aspiration: There was a significant positive direct effect of Aspiration on English. The estimate was 4.78, suggesting that an increase in Aspiration level was associated with an increase of 4.78 standard deviations in English performance.

- *Student engagement factors:*

Teacher's Attitude: The standardized estimate was -0.77 with $p < 0.01$, indicating one higher level of Teacher's Attitude decreased of 0.77 standard deviations in English performance.

School Life: The standardized estimate was -1.26 with $p < 0.01$, indicating one higher level of School Life decreased of 1.26 standard deviations in English performance.

Study Engagement: The standardized estimate was -0.04, which was insignificant with $p = 0.38$, indicating that Study Engagement level had no significant effect on English performance.

On Chinese:

- Parental involvement factors:

Discipline: The estimate was -1.97, indicating that an increase in Discipline level was associated with a decrease of 1.97 standard deviations in Chinese performance.

Communication: The estimate was -0.40, suggesting that an increase in Communication level was associated with a decrease of 0.4 standard deviations in Chinese performance.

Companion: The estimate was -1.25, indicating that an increase in Companion level was associated with a decrease of 1.25 standard deviations in Chinese performance.

Aspiration: Aspiration level had a significant positive direct effect size on Chinese scores. The estimate was 4.27, suggesting that an increase in Aspiration level was associated with an increase of 4.27 standard deviations in Chinese performance.

- Student engagement factors:

Teacher's Attitude: The standardized estimate was -0.68 with $p < 0.01$, indicating one higher level of Teacher's Attitude decreased of 0.68 standard deviations in Chinese performance.

School Life: The standardized estimate was -1.09 with $p < 0.01$, indicating one higher level of School Life decreased of 1.09 standard deviations in Chinese performance.

Study Engagement: The standardized estimate was -0.08 with $p = 0.047$, indicating one higher level of School Life decreased of 0.08 standard deviations in Chinese performance.

In summary, the direct effects of Discipline, Communication, and Companion from parental involvement significantly negatively affected Math, English, and Chinese. Only Aspiration had a significant positive effect on Math, English, and Chinese, indicating that higher levels of Aspiration were associated with better performance in these subjects. And the effect sizes of Aspiration were much bigger than the other three factors in parental involvement. All the factors of student self-engagement negatively affected academic scores, except the Study Engagement level, which had no significant effect on English performance.

Indirect Effects

The indirect effects of Discipline, Communication, Companion, and Aspiration on academic achievements were through the mediator variables (e.g., Teacher's Attitude, School Life, and Study Engagement). The loadings and correlations of all latent factors were significant, $p < 0.01$. For three different subjects, the loadings and correlations had no changes (see Table f in Appendix).

Table 4.14 showed the path effect sizes of parental involvement on student self-engagement. Specifically, Discipline had a significant negative effect with $P < 0.01$ on Teacher's Attitude in all three subjects. The estimates were the same as -0.44 for Math, English, and Chinese, indicating that an increase in Discipline level was associated with a decrease in Teacher's Attitude. The relationship between Communication and Teacher's Attitude had a non-significant negative and close to zero (-0.01) effect size in all three subjects, indicating that changes in Communication did not significantly impact Teacher's Attitude. The p-values were 0.77 (Math), 0.79 (English), and 0.88 (Chinese). Communication between parents and students did not impact the students' feelings about the teachers' attitudes. Companion significantly negatively affected Teacher's Attitude in any of the three subjects with effect sizes of -0.32 and $P < 0.01$. More companionship with students decreased the positive attitudes of teachers. In all three subjects, Aspiration significantly positively affected Teacher's Attitude. The estimates were 1.07 (Math), 1.07 (English), and 1.08 (Chinese), indicating that an increase in Aspiration was associated with an increase in Teacher's Attitude. The effect sizes of Aspiration were much bigger than all other factors from parental involvement.

Discipline significantly negatively affected School Life in all three subjects with $P < 0.01$. The estimates were about -0.60 for three subjects, indicating that an increase in Discipline level was associated with a decrease in positive feelings about School Life. The relationship between Communication and School Life was non-significant in all three subjects. The estimates for Communication were close to zero (-0.08 and -0.07), and the p-values were 0.1 (Math), 0.10 (English), and 0.13 (Chinese), suggesting a lack of statistical significance. Communication between parents and students did not impact students' feelings about school life. Companion significantly negatively affected School Life in any of the three subjects with $P < 0.01$. The estimates for Companion were -0.33. Parents' companionship with students decreased the positive attitudes toward school life. Aspiration significantly positively affected School Life in all three subjects with $P < 0.01$. The estimates were 1.33, much bigger than other factors' effect sizes, indicating that an increase in Aspiration was associated with an increase in School Life.

Discipline had a significant positive effect on Study Engagement in all three subjects with $P <0.01$. The estimates for Discipline were 0.19, indicating that an increase in Discipline level was associated with an increase in Study Engagement. Communication also significantly negatively affected Study Engagement in all three subjects. The estimates for Communication were -0.07, indicating that an increase in Communication was associated with a decrease in Study Engagement. The p-values for all three subjects were 0.01, suggesting a highly significant relationship. Companion had a significant positive effect on Study Engagement in all three subjects with $P <0.01$. The estimates for Companion were 0.32 and 0.33, indicating that an increase in Companion

level was associated with an increase in Study Engagement. Aspiration had a significant positive effect on Study Engagement in all three subjects with $P < 0.01$. The estimates for Aspiration were 0.23, indicating that an increase in Aspiration was associated with an increase in Study Engagement.

In summary, the results of the SEM analysis showed that Discipline, Companion, and Aspiration significantly affect Teacher's Attitude, School Life, and Study Engagement in all three subjects (Math, English, and Chinese). Communication only had a significant effect on Study Engagement. Higher levels of Discipline, Companion, and Communication were associated with lower levels of Teacher Attitude and School Life. Higher levels of Discipline and Companion were associated with higher Study Engagement, while higher levels of Communication were associated with lower Study Engagement. A higher level of Aspiration was associated with a higher level of all the factors of student's self-engagement.

We can obtain a clear picture of those latent factors. All these latent factors had a consistent and notable impact across various subjects. Effective Communication with students may contribute to higher levels of study engagement. Strict discipline and less companionable relationships with students may lead to less favorable attitudes toward study and school life. A structured and supportive environment, characterized by discipline and companionship, can enhance students' engagement in their studies. Students with parents’ greater aspirations tend to have more positive attitudes towards teachers and school life and higher levels of engagement in their studies.

Based on the effect sizes of the factors, the indirect effect sizes of the four factors of parental involvement on the student's academic scores in the three subjects can be calculated by multiplying the path coefficients along the indirect pathway. The calculation process was in Appendix II.

On Math, the indirect effects of Discipline, Communication, Companion, and Aspiration are 1.08, 0.1, 0.63, and -2.54. The Indirect effects of Discipline, Communication, Companion, and Aspiration on English were 1.09, 0.11, 0.65, and -2.51. The Indirect Effects of Discipline, Communication, Companion, and Aspiration on Chinese are 0.95, 0.09, 0.55, and -2.21. These results were presented in Table 4.15 .

Total Effects

The total effect of parental involvement on academic scores would sum the direct influence and any indirect influence mediated through student engagement. Mathematically, it summarized each latent factor's direct and indirect effects from parental involvement. Table 4.15 presented the direct, indirect, and total effects of the factors of parental involvement on the three subjects of Math, English, and Chinese.

Table 4.15

The direct, indirect, and total effect sizes of parental involvement on three subjects

	Math Model			English Model			Chinese Model		
Parental involvement	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Discipline	-2.25*	1.08	-1.17	-2.25*	1.09	-1.16	-1.97*	0.95	-1.02
Communication	-0.44*	0.1	-0.34	-0.48*	0.11	-0.37	-0.4*	0.09	-0.31
Companion	-1.4*	0.63	-0.77	-1.31*	0.65	-0.66	-1.25*	0.55	-0.7
Aspiration	4.79*	-2.54	2.25	4.78*	-2.51	2.27	4.27*	-2.21	2.06

Note: * refers to a significant level of $P < 0.01$.

From Table 4.15 , across the three subjects of Math, English, and Chinese, the factors of parental involvement had similar patterns of direct, indirect, and total effects. The direct effects had opposite effect directions with indirect effects. The direction of total effects was the same as direct effects.

For Math, the effect sizes of parental involvement factors (Discipline, Communication, companion, and Aspiration) ranged from -2.25 to 4.79 for the direct effects, 1.08 to -2.54 for the total effects, and -1.17 to 2.25 for the total effects. These effect sizes indicated that parental involvement had both negative and positive impacts on Math performance, with the largest positive effect observed for the direct effect of Aspiration. For English, the effect sizes of parental involvement factors on English ranged from -2.25 to 4.78 for the direct effects, 1.09 to -2.49 for the indirect effects, and -1.16 to 2.29 for the total effects. Like Math, the effect sizes varied across parental involvement factors, indicating negative and positive impacts on English performance. The largest positive effect was observed for the direct effect of Aspiration. For Chinese, the effect sizes of parental involvement factors ranged from -1.97 to 4.27 for the direct effects, 0.95 to -2.21 for the indirect effects, and -1.02 to 2.06 for the total effects. Similarly, parental involvement factors had both negative and positive impacts on Chinese performance, with the most considerable positive effect observed for the direct effect of Aspiration.

For all three subjects, the total effects of Discipline, Communication, and Companion were negative, and indirect effects were positive. That meant a higher level of Discipline, Communication, and Companion finally had lower academic scores for all

three subjects. Only the factor of Aspiration had positive effects on students' academic scores with higher effect sizes. Greater Aspiration levels had higher Math, English, and Chinese scores.

Summary of Basic SEM

In summary, the patterns suggested that certain parent involvement factors, such as Discipline, Companion, and Communication, consistently negatively affected academic performance across all three subjects. Despite the positive indirect effect, the overall impact remained negative, as the negative direct effect held more strength. On the other hand, a variable such as Aspiration exhibited a direct positive impact, though its indirect effects may manifest as negative. The factors of Discipline and Aspiration had the strongest effect sizes, but Discipline was negative, and Aspiration was positive.

These findings highlighted the complex nature of parent involvement and its influence on academic outcomes, indicating the importance of considering both direct and indirect pathways when examining the relationship between parent involvement and academic achievement.

SEM Analysis on Academic Achievement by Adding Hukou

The structural equation model (SEM) analysis was conducted to examine the relationships between parental involvement and students' academic achievements by adding the indicator of Hukou to find the differences between the agricultural and non-agricultural of parents and students. The diagram combined the conceptual model (see Figure 3.1) and the path diagram (see Figure 4.3). The four latent factors of parental involvement and student self-engagement to academic achievements and the path from

parental involvement to students' self-engagement were kept the same. For the three subjects, the loadings of all the factors have no changes (see Table g in Appendix I). The model fit indices for the three subjects were presented in Table 4.16 .

Table 4.16

Model fit indices for standardized Math, Chinese, and English by adding Hukou

N=4781	Math Model	Chinese Model	English Model
df	505	505	505
chi2	22629.64	22699.92	22714.81
p > chi2	< 0.01	< 0.01	< 0.01
RMSEA	0.096	0.096	0.096
CFI	0.802	0.803	0.801
TLI	0.780	0.781	0.779
SRMR	0.101	0.101	0.102

After adding the indicator of Hukou, the SEM for the three subjects showed moderate fit, with high chi-square (χ^2) values ($p < 0.01$), but they were reasonable because of the big sample size and degrees of freedom. The model had 505 degrees of freedom for all three main subjects, suggesting a reasonable number of free parameters. The RMSEAs were about 0.096, indicating a moderate fit between the model and the observed data. The CFI and TLI were about 0.8, indicating a relatively mediocre fit. The SRMR was 0.01, suggesting a moderate discrepancy between the observed covariance matrix and the model-implied covariance matrix. In summary, after adding the Hukou indicator variable to the SEM models for standardized Math, Chinese, and English scores, the overall model fit was moderately good but acceptable.

Table 4.17 presented the results of the structural model of the three main subjects of math, Chinese, and English by adding the indicator of Hukou. The results were

separated into three parts: the direct effects of parental involvement factors (Discipline, Communication, Companion, and Aspiration) on the factors of self-engagement (Teacher's Attitude, School Life, and Study Engagement), the direct effects of parental involvement factors, student self-engagement factors on students' academic scores, and Hukou's effects on parental involvement and students' academic scores.

Table 4.17

The results of the SEM of the three main subjects by adding the indicator of Hukou

Math Model				**Chinese Model**				**English Model**			
Variable	Estimate	S.E.	P	Variable	Estimate	S.E.	P	Variable	Estimate	S.E.	P
Teacher's Attitude ON				Teacher's Attitude ON				Teacher's Attitude ON			
Discipline	0.29	0.01	< 0.01	Discipline	0.29	0.01	< 0.01	Discipline	0.29	0.01	< 0.01
Communication	0.33	0.01	< 0.01	Communication	0.33	0.01	< 0.01	Communication	0.33	0.01	< 0.01
Companion	0.24	0.02	< 0.01	Companion	0.24	0.02	< 0.01	Companion	0.24	0.02	< 0.01
Aspiration	0.40	0.01	< 0.01	Aspiration	0.40	0.01	< 0.01	Aspiration	0.40	0.01	< 0.01
School Life ON				School Life ON				School Life ON			
Discipline	0.28	0.02	< 0.01	Discipline	0.28	0.02	< 0.01	Discipline	0.28	0.02	< 0.01
Communication	0.34	0.01	< 0.01	Communication	0.34	0.01	< 0.01	Communication	0.34	0.01	< 0.01
Companion	0.32	0.02	< 0.01	Companion	0.32	0.02	< 0.01	Companion	0.32	0.02	< 0.01
Aspiration	0.45	0.01	< 0.01	Aspiration	0.45	0.02	< 0.01	Aspiration	0.45	0.01	< 0.01
Study Engagement ON				Study Engagement ON				Study Engagement ON			
Discipline	0.33	0.02	< 0.01	Discipline	0.33	0.02	< 0.01	Discipline	0.33	0.02	< 0.01
Communication	0.22	0.02	< 0.01	Communication	0.22	0.02	< 0.01	Communication	0.22	0.02	< 0.01
Companion	0.37	0.02	< 0.01	Companion	0.37	0.02	< 0.01	Companion	0.37	0.02	< 0.01
Aspiration	0.19	0.02	< 0.01	Aspiration	0.19	0.02	< 0.01	Aspiration	0.19	0.02	< 0.01
Discipline ON				Discipline ON				Discipline ON			
Hukou	0.02	0.02	0.13	Hukou	0.02	0.02	0.14	Hukou	0.02	0.02	0.14
Communication ON				Communication ON				Communication ON			
Hukou	-0.03	0.02	0.06	Hukou	-0.03	0.02	0.06	Hukou	-0.03	0.02	0.06
Companion ON				Companion ON				Companion ON			
Hukou	-0.38	0.01	< 0.01	Hukou	-0.38	0.01	< 0.01	Hukou	-0.38	0.01	< 0.01
Aspiration ON				Aspiration ON				Aspiration ON			
Hukou	-0.04	0.02	0.03	Hukou	-0.04	0.02	0.03	Hukou	-0.04	0.02	0.03
Std Math ON				Std Chinese ON				Std English ON			
Discipline	0.42	0.03	< 0.01	Discipline	0.45	0.03	< 0.01	Discipline	0.44	0.03	< 0.01
Communication	0.48	0.04	< 0.01	Communication	0.46	0.04	< 0.01	Communication	0.50	0.04	< 0.01
Companion	0.46	0.04	< 0.01	Companion	0.44	0.03	< 0.01	Companion	0.54	0.03	< 0.01
Aspiration	0.89	0.04	< 0.01	Aspiration	0.86	0.04	< 0.01	Aspiration	0.95	0.04	< 0.01
Teacher's Attitude	-0.34	0.03	< 0.01	Teacher's Attitude	-0.32	0.03	< 0.01	Teacher's Attitude	-0.36	0.03	< 0.01
School Life	-0.39	0.04	< 0.01	School Life	-0.36	0.04	< 0.01	School Life	-0.43	0.04	< 0.01
Study Engagement	-0.19	0.03	< 0.01	Study Engagement	-0.16	0.03	< 0.01	Study Engagement	-0.13	0.03	< 0.01
Hukou	-0.01	0.02	0.41	Hukou	0.01	0.02	0.72	Hukou	-0.08	0.02	< 0.01

The Effects of Parental Involvement on Student Self-engagement

For Math, Chinese, and English, all the factors of parental involvement had positive and significant effects on Teacher's Attitude in both Chinese and English subjects. The estimates and significance levels were consistent across the three subjects, indicating that parental involvement factors positively and significantly impacted Teacher's Attitude similarly in all subjects when keeping the Hukou constant.

Specifically, Discipline level had a positive and significant effect on Teacher's Attitude with effect sizes of 0.29 and $p < 0.01$, indicating that higher levels of parental Discipline contributed to a more positive Teacher's Attitude toward student study engagement in three subjects. Communication also had a positive and significant effect on Teacher's Attitude, with effect sizes of estimate 0.33 and $p < 0.01$, suggesting that effective Communication from parents positively influenced teacher's attitudes toward student study engagement for all three subjects. Companion showed a positive and significant effect on Teacher's Attitude with effect sizes of 0.24 and $p < 0.01$, indicating that having a supportive companion positively affected teacher's attitude toward student study engagement. Aspiration had a positive and significant effect on Teacher's Attitude, with effect sizes of 0.40 and $p < 0.01$, implying that higher levels of parental Aspiration contributed to a more positive teacher's attitude toward student study engagement. Aspiration had the biggest effect size of the four factors.

Similarly, for the three subjects, the estimates for School Life of effect sizes were identical (0.28 for Discipline, 0.34 for Communication, 0.32 for Companion, and 0.45 for Aspiration), and the p-values were all less than 0.01, indicating significant positive

relationships between parental involvement constructs and students' feelings of School Life. For Study Engagmen, in all scenarios (Math, Chinese, and English), the estimates of effect sizes were the same for each construct (0.33 for Discipline, 0.22 for Communication, 0.37 for Companion, and 0.19 for Aspiration). However, in all cases, the p-values were less than 0.01, indicating a statistically significant relationship between parental involvement constructs and Study Engagement within the context of each subject.

Overall, the results suggested that parental involvement factors played an important role in influencing Teacher's Attitude, School Life, and Study Engagement in Math, Chinese, and English if the students had the same Hukou status. Parents who provided higher discipline Levels, effective communication, supportive companionship, and high aspirations contributed to more positive student self-engagement, in which Aspiration had higher effect sizes on Teacher's Attitude and School Life.

The Effects of Hukou on the Parental Involvement Factors

For the parental involvement factor of Discipline, the Hukou indicator had a non-significant effect on Discipline in math with an estimate of 0.02 and $p = 0.13$, Chinese with an estimate of 0.02 and $p = 0.14$, and English with an estimate of 0.02 and $p = 0.14$. It suggested that the Hukou indicator did not significantly impact parental Discipline across these subjects when families had no differences in Hukou. For the parental involvement factor of Communication, the Hukou indicator had no statistically significant effect on Communication in all three subjects, with estimates of -0.03 and $p =$

0.06. It implied that the Hukou indicator did not significantly impact parental Communication across these subjects.

For the parental involvement factor of Companion, the Hukou indicator had a significant negative effect on Companion in Math, Chinese, and English, with estimates of -0.38 and $p < 0.01$. It indicated that the Hukou indicator had a statistically significant negative impact on parental Companion, suggesting that students from agricultural backgrounds tended to have lower levels of parental Companion than those from non-agricultural backgrounds.

For the parental involvement factor of Aspiration, the Hukou indicator had a significant negative effect on Aspiration in all three subjects, with estimates of -0.04 and $p = 0.0.3$. It suggested that the Hukou indicator had a statistically significant impact on parental Aspiration, indicating that students from agricultural backgrounds may have slightly lower levels of parental Aspiration compared to those from non-agricultural backgrounds. However, the effect sizes were much lower than the effects from Parental Companion.

In summary, the Hukou indicator significantly impacted parental Companion and Aspiration in math, Chinese, and English. However, it did not have a statistically significant effect on parental Discipline and Communication. These findings indicated that the agricultural and non-agricultural background, represented by the Hukou indicator, shaped parental involvement in students' academic pursuits, specifically in terms of Companion and Aspiration. The students with agricultural Hukou had lower Aspiration and Companion levels than their parents.

The Effects of Parental Involvement, Student Self-engagement, and Hukou on Students' Academic Scores

For the subject of Math, parental involvement factors, including Discipline, Communication, Companion, and Aspiration, had a significant positive effect on standardized academic scores with effect sizes of 0.42, 0.48, 0.46, 0.89, and $p < 0.01$. Higher levels of parental involvement in these aspects were associated with better performance in Math. Student self-engagement factors, such as teacher's attitude, school life, and study engagement, had a statistically significant negative effect on standardized Math scores with effect sizes of -0.34, -0.39, -0.19, and $p < 0.01$. Higher levels of teacher's attitude, positive experiences in school life, and higher study engagement were associated with lower Math scores. Hukou, the agricultural and non-agricultural background indicator, did not significantly affect Math scores with $p = -0.41$.

For the subject of Chinese, similar to Math, parental involvement factors had a significant positive effect on standardized academic scores in Chinese with effect sizes of 0.45, 0.46, 0.44, 0.86, and $p < 0.01$. Stronger parental involvement in these areas was associated with higher Chinese scores. Student self-engagement factors also had a statistically significant negative effect on Chinese scores with effect sizes of -0.32, -0.36, -0.16, and $p < 0.01$. Higher levels of teacher's attitude, positive school life experiences, and higher study engagement were associated with lower Chinese scores. Hukou did not significantly affect Chinese scores with $p = 0.72$.

Regarding English, parental involvement factors significantly positively affected standardized academic scores with effect sizes of 0.44, 0.50, 0.54, 0.95, and $p < 0.01$.

Greater parental involvement in these aspects was associated with higher English scores. Student self-engagement factors negatively impacted English performance with effect sizes of -0.36, -0.43, -0.13 with all $p < 0.01$. A positive teacher's attitude, a positive school life experience, and higher study engagement contributed to lower English scores. Notably, Hukou significantly negatively affected English scores with an effect size of -0.08 and $p < 0.01$. Students with an agricultural background (Hukou = 1) tended to have lower English scores than non-agricultural families.

In summary, parental involvement factors, student self-engagement factors, and Hukou had varying effects on students' standardized academic scores across the three subjects. Parental involvement consistently positively impacted Math, Chinese, and English scores, while student self-engagement factors also played a significant negative role in all three subjects. The factor of Aspiration contributed the most significant positive share and most petite negative effect sizes. The influence of Hukou differed across subjects, with a significant negative effect observed only in English.

Direct Effects

Based on our model design, the direct effects were coefficients from the paths of parental involvement factors (Discipline, Communication, Companion, and Aspiration) and Hukou on students' academic achievements. Based on the results of Table 4.17 , all the aspects of parental involvement had significant effects on students' Math, English, and Chinese scores with $p < 0.01$. Hukou only had significant effects on English. All student engagement factors significantly negatively affected academic scores with $p < 0.01$. The direct effects of Discipline, Communication, Companion, and Aspiration

factors on math were 0.42, 0.48, 0.46, and 0.89. The direct effects of Discipline, Communication, Companion, and Aspiration factors on Chinese were 0.45, 0.46, 0.44, and 0.86. The direct effects of Discipline, Communication, Companion, and Aspiration factors on English were 0.44, 0.50, 0.54, and 0.95.

Indirect Effects

Based on the effect sizes of the factors, the indirect effect sizes of the four factors of parental involvement and Hukou on the students' academic scores in the three subjects could be calculated by multiplying the path coefficients along the indirect pathway. The calculation process was in Appendix II.

In math, the indirect effects of Discipline, Communication, Companion, Aspiration, and Hukou were -0.27, -0.29, -0.28, -0.35, and -0.22. The Indirect effects of Discipline, Communication, Companion, Aspiration, and Hukou on English were -0.25, -0.26, -0.25, -0.32, and -0.21. The indirect effects of Discipline, Communication, Companion, Aspiration, and Hukou on Chinese were -0.27, -0.29, -0.27, -0.36, and -0.25. These results were presented in Table 4.18 .

Total Effects

The total effect of parental involvement on academic scores after adding the indicator of Hukou would sum the direct influence and any indirect influence mediated through student engagement. Mathematically, it summarized each latent factor's direct and indirect effects from parental involvement. Table 4.18 presented the direct, indirect, and total effects of the factors of parental involvement and Hukou.

Table 4.18 showed the following findings regarding the direct, indirect, and total effects of parental involvement factors and Hukou on the three main subjects (Math, Chinese, and English). For direct Effects, parental involvement factors (Discipline, Communication, Companion, and Aspiration) positively affected all three subjects. It suggested that higher levels of parental involvement in these factors were associated with higher academic scores in the respective subjects. The factor of Aspiration always had the most immense effect size among the four factors. Hukou had negative direct effects on all three subjects, indicating that having an agricultural Hukou status was associated with lower academic scores. The effect sizes of Hukou's direct effects on the subjects were relatively small. The effect sizes for Hukou in Math, Chinese, and English were -0.01, 0.01, and -0.08, respectively. These effect sizes suggested Hukou had a relatively weak direct impact on academic scores.

Table 4.18

The direct, indirect, and total effects of the factors of parental involvement and Hukou

Variable	Math Model			Chinese Model			English Model		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Discipline	0.42*	-0.27	0.15	0.45*	-0.25	0.2	0.44*	-0.27	0.17
Communication	0.48*	-0.29	0.19	0.46*	-0.26	0.2	0.50*	-0.29	0.21
Companion	0.46*	-0.28	0.18	0.44*	-0.25	0.19	0.54*	-0.27	0.27
Aspiration	0.89*	-0.35	0.54	0.86*	-0.32	0.54	0.95*	-0.36	0.59
Hukou	-0.01	-0.22	-0.23	0.01	-0.21	-0.2	-0.08*	-0.25	-0.3

Note: * refers to a significant level with $P < 0.01$. Hukou on Math and Chinese with P =0.41 and 0.72

For indirect effects, parental involvement factors on the subjects were primarily negative. It suggested parental involvement factors or pathways through these students'

self-engagement factors may indirectly affect academic performance. The indirect effects of Hukou on the subjects were also negative, indicating that Hukou status indirectly impacted academic scores through the mediators of parental involvement. The absolute effect sizes of the indirect effects of Hukou on the subjects were also negative but generally more prominent than the indirect effects of parental involvement factors in Chinese and English.

The total effects, which combined both the direct and indirect effects, provided an overall assessment of the impact of parental involvement factors and Hukou on academic performance. The total effects of parental involvement factors on the subjects were generally positive, indicating that the positive direct effects outweighed the adverse indirect effects. The factor of Aspiration had the biggest effect size of 0.54,0.54, and 0.59 in Math, Chinese, and English, contributing shares of 50%, 47%, and 47%. The total effects of Hukou on the subjects remained negative, suggesting that the detrimental direct and indirect effects of Hukou outweighed any potential positive effects. Especially in English, the Hukou indicator contributed 50% more than in Chinese and Math.

Overall, parental involvement factors positively affected academic performance in Math, Chinese, and English. However, the indirect effects of these factors were negative, indicating that the mediators of students' self-engagement negatively influenced the relationship between parental involvement and academic performance. Additionally, Hukou had negative direct and indirect effects on the three subjects, suggesting that it might harm academic achievement through indirect effects of parental involvement.

Among the three subjects, the indicator had the most enormous effect on English, more than on math and Chinese.

Summary of SEM by Adding Hukou

From the perspective of parental involvement, including the Hukou indicator in the structural equations provided valuable insights into its influence on academic performance in Math, Chinese, and English. The findings suggested that parental involvement factors, such as Discipline, Communication, Companion, and Aspiration, significantly affected students' scores in these subjects, indicating that active parental engagement positively contributed to academic achievement. Furthermore, the indirect effects of parental involvement factors through student self-engagement factors (Teacher's Attitude, School Life, and Study Engagement) were significant and negative. It implied that when parents exhibited higher levels of Discipline, Communication, companionship, and Aspiration, it fostered a more negative student self-engagement, leading to compromised academic performance.

Interestingly, the indirect effects of Hukou on the subjects through parental involvement factors were also significant and negative. It suggested that the socio-demographic factor of Hukou indirectly influenced academic scores by affecting parental involvement. It indicated that students from different Hukou backgrounds may experience varying levels of parental involvement, subsequently impacting their self-engagement and educational outcomes. The institution of Hukou, especially for agricultural families, had a bigger adverse impact on students' academic achievement.

Overall, these findings emphasized the crucial role of parental involvement in shaping students' academic performance. They highlighted the importance of fostering a supportive and engaged parenting environment characterized by Discipline, effective Communication, Companion, and high Aspirations, especially for Aspiration. Additionally, they underlined the significance of considering socio-demographic factors, such as Hukou, in understanding the indirect influences on parental involvement and student achievement in Math, Chinese, and English. The big difference between the agricultural and non-agricultural shaped the parent's involvement very much.

Compare the Variations Before and After Adding the Indicator of Hukou

Upon comparing Table 4.15 and Table 4.18 , it was evident that the inclusion of the Hukou variable had brought about notable changes in the results regarding the factors of parental involvement in the three main subjects: Math, English, and Chinese.

Direct Effects

For direct effects, in Table 4.15 , the direct effects of parental involvement factors on Math, English, and Chinese exhibited negative and positive values, indicating a mixed impact (Discipline, Communication, and Companion are negative, Aspiration is positive). In Table 4.18 , with the inclusion of Hukou, the direct effects of parental involvement factors became consistently positive for all three subjects. This suggested that parental involvement, encompassing Discipline, Communication, companionship, and Aspiration, positively influenced academic performance controlling for Hukou. There were some implications.

Hukou as a moderator: The consistent positive direct effects of parental involvement on academic performance when controlling for Hukou indicated that the presence of Hukou, or the household registration system in China, moderated the relationship. In other words, the impact of parental involvement on academic performance varied depending on whether a student had a rural or urban Hukou.

Equalizing influence: One possible implication was that Hukou might equalize parental involvement's impact on academic performance between rural and urban students. It suggested that, in the absence of Hukou as a control variable, there were variations in how parental involvement affected academic performance for students with different Hukou statuses. The students in urban areas were in an environment with too much competition, which pushed parents to involve more resources. On the other hand, students in rural areas lacked quality educational resources, which led to adverse in obtaining better academic outcomes.

Reducing disparities: Hukou was associated with disparities in access to education and other opportunities in China, particularly between urban and rural areas. By controlling for Hukou, the analysis may account for some of the disparities due to this registration system. This suggested that parental involvement benefited all students, irrespective of their Hukou status, and can help reduce the educational gap between urban and rural students.

In summary, the change in the direct effects of parental involvement from mixed to consistently positive when controlling for Hukou implied that Hukou moderated the impact of parental involvement on academic performance. This had important

implications for understanding the role of parental involvement in mitigating educational disparities and improving outcomes for all students, regardless of their Hukou status.

Indirect Effects

For indirect effects, in Table 4.15 , the indirect effects of parental involvement factors on Math, English, and Chinese varied in magnitude and direction (Discipline, Communication, and Companion were positive, and Aspiration was negative). When Hukou was included as a control variable in Table 4.18 , the indirect effects of parental involvement factors became consistently negative for all three subjects. This suggested that the presence of Hukou modified the relationships between parental involvement and academic performance through indirect pathways in a way that resulted in a net negative impact.

The implication here was that Hukou played a moderating role in how parental involvement affected academic performance indirectly. Hukou-related factors may introduce complexities or disparities into the relationship, leading to more consistently negative indirect effects. The negative indirect effects in Table 4.18 may be related to Hukou-related disparities in access to resources, opportunities, and educational quality. Students with rural Hukou might face more obstacles or disadvantages that influence the indirect effects of parental involvement in a negative way.

Total Effects

For total effects, in Table 4.15 , the total effects of parental involvement factors on Math, English, and Chinese exhibited a mix of positive and negative values (Discipline, Communication, and Companion were negative, Aspiration was positive). In

Table 4.18 , when Hukou was included as a control variable, the overall influence of parental involvement on the academic performance of three subjects was positive. In other words, parental involvement was generally associated with improved academic performance across subjects.

However, the magnitudes of the total effect sizes were smaller than Table 4.15 , suggesting that including Hukou had moderated the overall impact of parental involvement on academic performance. While parental involvement was generally associated with improved academic performance, including Hukou as a control variable moderates the overall impact. This suggested that Hukou-related factors introduced complexities or disparities that influenced how parental involvement affected academic performance.

Summary of the Comparison

In summary, the inclusion of the Hukou variable in the analysis influenced the results regarding the factors of parental involvement in Math, English, and Chinese. Hukou itself only significantly impacted the subject of English scores. Hukou was a moderating factor that influenced the impact of parental involvement on academic performance. Parental involvement had a more consistent and positive impact on academic performance, regardless of a student's Hukou status. It helped reduce disparities in educational outcomes associated with Hukou. However, Hukou-related disparities might weaken the strength of the relationship. Hukou-related disparities introduced complexities into the relationship, resulting in negative indirect effects. Various factors,

such as those from school, peers, and students' engagement, affected by Hukou mediated the influence of parental involvement on academic performance.

Potential Explanation

The inclusion of the Hukou variable (differentiating between agricultural and non-agricultural backgrounds) in the analysis of parental involvement can introduce changes in the relationship between parental involvement and academic performance for several potential reasons:

Socioeconomic factors: Hukou is a household registration system in China that often reflects the rural-urban divide. Agricultural Hukou typically corresponds to rural areas, while non-agricultural Hukou corresponds to urban areas. These regions can differ significantly in terms of socioeconomic resources, educational opportunities, and access to educational support. Therefore, the inclusion of Hukou as an indicator variable can capture these underlying socioeconomic disparities, which may influence the relationship between parental involvement and academic performance.

Resource allocation: Agricultural Hukou households might have limited access to educational resources compared to non-agricultural Hukou households. This disparity in resource allocation, such as quality of schools, availability of extracurricular activities, or access to tutoring services, can affect the extent and effectiveness of parental involvement in supporting their children's academic performance. As a result, the impact of parental involvement on academic performance may differ between agricultural and non-agricultural Hukou households.

Cultural and environmental differences: Agricultural and non-agricultural Hukou households may also differ in cultural norms, values, and environmental factors that shape parental involvement practices. For example, rural areas may have stronger traditional values emphasizing Discipline and obedience, while urban areas may prioritize academic achievement and broader skill development. These cultural and environmental differences can influence how parents engage with their children's education and the specific aspects of parental involvement that are deemed important or effective.

Parental occupation and time constraints: Hukou status can be associated with parents' occupation and employment patterns. Agricultural Hukou households were more likely to be engaged in agricultural or rural-based occupations, which may involve demanding physical work and time-intensive responsibilities. This can limit parents' available time and energy to actively participate in their children's education and engage in supportive activities. In contrast, non-agricultural Hukou households may have more flexible work arrangements and opportunities for parental involvement.

Overall, including Hukou as an indicator variable provided insights into the contextual factors and disparities within the population under study. By accounting for the influence of Hukou, the changes observed in the relationship between parental involvement and academic performance highlighted the complex interplay between socioeconomic factors, resource allocation, cultural influences, and parental constraints that shape the educational outcomes of students.

Conclusion

In conclusion, the findings discussed above shed light on the relationship between parental involvement and academic performance, with the additional consideration of the Hukou variable. The results highlighted the significant impact of parental involvement factors, such as Discipline, Communication, Companion, and Aspiration, on students' academic performance in the three main subjects: Math, Chinese, and English.

The findings indicated that higher levels of parental involvement, characterized by parenting discipline, effective communication, supportive companionship, and aspirational goals, were associated with improved children's academic performance across all three subjects. These direct effects emphasized the importance of parental engagement in fostering a positive learning environment and providing the necessary support for their children's educational development. Of all the four factors of parental involvement, Aspiration emerged as the most influential and positively significant factor, consistently demonstrating the largest effect size on academic scores across subjects, underscoring its pivotal role in driving student success, despite where the students lived and what kind of Hukou they had.

Furthermore, the Hukou variable revealed variations in the relationship between parental involvement and academic performance. The findings suggested that the influence of parental involvement on academic performance can be influenced by socioeconomic factors, resource allocation disparities, cultural and environmental differences, as well as parental occupation and time constraints associated with the Hukou status. Hukou moderated academic achievements through these factors.

These findings highlighted the complex interplay between parental involvement, Hukou status, and academic performance. They emphasized the need for targeted interventions and policies that addressed the specific challenges faced by different socioeconomic backgrounds and promoted equitable access to educational resources and support for all students.

Overall, the findings underscored the critical role of parental involvement in students' academic success and emphasized the importance of understanding contextual factors, such as Hukou status, to develop comprehensive strategies for promoting educational attainment and reducing educational disparities. This study also emphasized the importance of addressing Hukou-related disparities and promoting parental involvement to enhance academic outcomes, contributing to more equitable educational experiences for all students.

Chapter Five: Discussion

The sample data tested the hypotheses in this study. The research questions answered all the questions in the current study. The results confirmed the latent constructs of parental involvement were valid and reliable. There was no difference in the latent construct of parental involvement between the parent's and child's perspectives consistent with Fan (2001), in which the sample data was carried out by the National Education Longitudinal Study of 1988 in the U.S. The latent constructs of the student's self-engagement were also valid and reliable. Parental involvement was a potent driver of children's academic success, with Aspiration consistently yielding the most significant positive effects across subjects. However, introducing Hukou as a control variable added a layer of complexity to this relationship. Hukou's moderating influence was evident in parental involvement's more uniform and positive impact, yet it also introduced negative indirect pathways. For all the factors of parent involvement, Hukou compromised the positive effects of each one. Hukou made the gap between the rural and urban significant. Our findings underscored the crucial need to address Hukou-related educational disparities and promote parental involvement to mitigate these disparities and enhance academic outcomes.

Some research issues still need further investigation to clarify the ambiguity about the substitution of HuKou for the family's socioeconomic status and the construct of

student self-engagement. In the following discussion, I explored these findings in detail, offered practical recommendations for educators and policymakers, acknowledged study limitations, and charted future research directions for a more equitable and enriched educational landscape for all students.

Research Question 1: The Major Dimensions of Parental Involvement and Student Self-engagement

Definition and Operationalization of Constructs

We acknowledged that parental involvement and student self-engagement were broad concepts, and our survey questions were not specifically tailored to investigate these complex issues. However, the questionnaire did capture activities both at home and at school, as noted in prior research (Jeynes, 2011). The challenge we faced was adapting these broad constructs to fit the constraints of our survey instrument. Drawing from relevant literature (Hill & Taylor, 2004; Jeynes, 2011; Castro et al., 2015), which highlighted the importance of parental involvement, and studies indicating the influence of parental and student factors on children's self-regulated learning (Cheung & Pomerantz, 2012; Wang & Cai, 2017), we justified our decision to focus on parental involvement and student self-engagement. These constructs were supported by theoretical frameworks in the literature.

Determining specific latent variables from the item questions depended on the content of the survey questions themselves. Factors such as Discipline, Communication, Companion, and Aspiration for parental involvement, and Teacher's Attitude, School Life, and Study Engagement for student self-engagement were derived directly from the

survey questions (see Appendix III: Survey Questions). While our questionnaire may not have directly targeted these constructs, we made efforts to align our measurement approach with established dimensions identified in the literature. This approach allowed us to explore aspects of parental involvement and student self-engagement within the scope of our study, despite the limitations inherent in our survey design.

Validity and Reliability of Constructs

For the construct-building process, the validity and reliability requirements were satisfied. For the EFA of parental involvement with half sample data, the results compared the three, four, and five-factor models, the four-factor model fit of RMSEA = 0.07 and SRMR= 0.048. All the correlations with items were statistically significant with $p < 0.05$ (See Tables 4.1 and 4.2). The CFA model with another half of the sample confirmed the construct of parental involvement with RMSEA=0.071 and SRMR=0.048. All the factor loading and intercorrelation were significant (see Table 4.3). The four factors accounted for 62.53% of the total variance.

For the EFA of student self-engagement with half sample data, the results compared the two, three, and four-factor model, the three-factor model fit of RMSEA = 0.12 and SRMR= 0.06. All the correlations with items were statistically significant with $p < 0.05$ (see Tables 4.8 and 4.9). The CFA model with another half of the sample confirmed the construct of parental involvement with RMSEA=0.11 and SRMR=0.06. All the factor loading and intercorrelation were significant (see Table 4.10). The three factors accounted for 52.5% of the total variance.

Comparisons with Existing Models

The paper by Castro et al. (2015) discussed the impact of various types of parental involvement on students' academic achievement. The paper included a meta-analysis of 37 studies and examined the effect sizes of different types of parental involvement, such as communication with children about school, homework supervision, and parental expectations. The paper by Boonk et al. (2018) reviewed the literature on the relationship between parental involvement and academic achievement. It categorized parental involvement into home-based and school-based activities and discussed how these relate to academic outcomes. Even the existing papers called for a unified framework to better understand parental involvement's impact. our study contributed to fortifying the important factors of communication, parental expectations, and supervision from parents.

And we also provided a more nuanced understanding of their interrelated dynamics in educational contexts. Jeynes (2011) explored related themes within the Chinese cultural and educational context, particularly focusing on factors that contribute to the resilience of academically gifted students. The study suggested that while parent support variables, such as parental communications and trust, were important, they did not exhibit predictive effects over and above personal constructs. So, there were no unified factors. The factors depended on how the questions were designed, but all the directions were pointed to the big categories of parental involvement.

Example: Excluding the Leisure Items in Student Self-engagement Constructs

There were four item questions to ask questions about the frequency of leisure activities after school in the surveys. They were the time students spent on TV, surfing on the internet or playing video games, visiting museums, zoos, and science museums, and going out to watch movies, shows, and sports games. B9 (B1701) and B10 (B1702) were not in Table 3.2 because these items were level variables different from other time scale items. After the adjustment of the time scale items variables into the level scale variable, since the scale measurement was different, they were still not included in the main content investigation. They were put into the discussion to see any differences (See Table E in Appendix IV).

When all these items were put into the EFA analysis in addition to Table 3.9 , Table F in Appendix IV presented the results by setting factors as 4 in STATA. The software gave a neat latent structure of the four factors. However, the results were different when the techniques presented the correlations among these four factors. The fourth factor had weak correlations with other factors of 0.02 and -0.05 (see Table F in Appendix IV). They were too weak to show any meaningful explanation about this factor.

From Table F and Table G, even the correlation coefficients seemed to have four factors, but the combination of other indicators didn't confirm such dimensionality. So, the four factors model was taken place by the three factors model, which was established in the Results section. The three-factor model was more appropriate. The results in the main content had no change about including the leisure factor.

Research Question 2: The Cross-Validation and Stability of Constructs of Parental Involvement and Student Self-engagement

To address the stability and cross-validation of the identified constructs across different samples or time points, I conducted analyses to assess the consistency of factor structures and latent variables. Specifically, I examined whether the same factors emerged consistently in two independent samples and longitudinal data.

For the parental involvement construct, in this study, through invariant test analyses conducted separately for each sample (parent vs. student) and two-time points (2013-14 baseline vs 2014-15 tracing line), I sought to ascertain whether the factor structure remained consistent across diverse groups (RMSEA= 0.06, CFI=0.96, TLI= 0.95) or over time (RMSEA=0.06, CFI=0.95, TLI=0.94). Our findings revealed robust evidence supporting the stability of the identified constructs across various samples and time points (see Table 4.3 and Table 4.5). Furthermore, supplementary analyses, such as measurement invariance tests, were conducted to bolster the validity of our findings. By examining whether the factor loadings and item intercepts remained invariant across different samples or time points, (see Table 4.4 and Table 4.6), I found that the underlying constructs were consistently measured regardless of variations in sample characteristics or data collection periods.

For the student self-engagement construct, I found that for the same group of students, the two-time points constructs were also stable and consistent with RMSEA = 0.09, CFI = 0.95, TLI = 0.95, and SRMR= 0.058. The measurement invariance tests also

supported there the factor loadings and item intercepts remained invariant across two time points (see Table 4.12).

Building upon the robustness of our findings regarding the stability and cross-validation of the constructs of parental involvement and student self-engagement, our study provided valuable insights for researchers, educators, and policymakers alike. The consistency of factor structures and latent variables across diverse samples and time points underscored the reliability and generalizability of our measurement models. These results offered confidence in the validity of our constructs and provided a solid foundation for future research endeavors aimed at further elucidating the complexities of parental involvement and student self-engagement in educational settings.

Research Question 3: The Roles of Parental Involvement and Students' Self-engagement on Students' Academic Achievement in SEM

Interpretation of Patterns

Our study found that certain parental involvement factors, such as Discipline, Companion, and Communication, consistently negatively impact academic performance across all three subjects (see Table 4.15), with the direct effect outweighing any positive indirect effects, while variables like Aspiration exhibited a direct positive impact despite potential negative indirect effects, indicating a nuanced relationship between parental involvement and academic achievement. This result was consistent with the role of aspiration from parents (Jeynes, 2011; Castro et al., 2015; Boonk et al., 2018). Positive associations were found between parental expectations and child achievement, both concurrently and longitudinally. These associations persisted even after controlling for

socioeconomic status. This effect could be explained as parental positive educational expectations being transmitted to their children. Parents encouraged active participation in children's learning. Parent's positive expectations shaped children's beliefs about their abilities and developed children's academic self-concept. And parents would provide more and better educational resources.

On the other hand, many other activities that parents did to help their children, such as regulations or restrictions, help with homework, or school-home communication played complex roles in the children's development (Li, 2018; Jeynes, 2011; Zong et al., 2018). The direction could be positive or negative. Homework supervision and tutoring may not be as important as we assumed to help children. And some research even found that if parents enjoyed their leisure time also could contribute a positive effect on the children's school grades (Wang & Cai, 2017). Our study also confirmed that some factors such as communication, companionship, and regulation may not had positive effects on children's academic achievement. And in our investigation, all these three actors had negative effects.

Across the three individual subjects of Math, English, and Chinese, these patterns remained consistent (refer to Table 4.15), with the factor of expectation consistently exerting a positive influence, while the other three factors demonstrated negative effects. Notably, the factor of expectation exhibited the largest effect sizes across all three subjects, highlighting its significant impact.

The patterns of these results depended on many other factors that could moderate the effects between the parents' involvement and the student's academic, such as the age

or grade of the children (Boonk et al., 2018), parents' characteristics (Jeynes, 2011), family Social-economic status (Seginer, 2006), and other specific factors around children. The racial/ethnic characteristics (Hill et al., 2004) and cultural characteristics (Cheung & Pomerantz, 2011) also played a significant role in children's development, which were discussed in the following parts.

Role of Direct and Indirect Effects

The presence of positive direct effects of parental expectations on academic outcomes, alongside negative indirect effects in Table 4.14 , suggested a nuanced relationship between parental involvement factors and student achievement. Conversely, the negative direct effects of other factors, such as Discipline, Companion, and Communication, were counteracted by positive indirect effects through student self-engagement.

One potential explanation for these findings was the differential impact of parental expectations versus other forms of parental involvement on student motivation and self-regulation. While parental expectations may directly motivate students to strive for academic success, excessive pressure or unrealistic expectations may inadvertently undermine student well-being and intrinsic motivation, leading to negative indirect effects on academic performance. Conversely, factors like Discipline, Companion, and Communication may initially exert negative direct effects on academic outcomes, but positive indirect effects through student self-engagement suggest that they may foster important skills and behaviors conducive to academic success, such as self-discipline, social support, and effective communication.

In the context of Chinese educational background, high expectations of children were natural (Qi & Du, 2020). These findings underscored the importance of considering both the direct and indirect pathways through which parental involvement influences academic outcomes. Interventions aimed at promoting positive parental involvement should focus not only on enhancing parental expectations but also on fostering supportive and nurturing family environments that facilitate student self-engagement and autonomy. Strategies that promote effective communication, positive parent-child relationships, and a balanced approach to parental expectations can help mitigate the negative indirect effects associated with excessive parental pressure while maximizing the positive impact of parental involvement on student motivation and academic achievement.

Research Question 4: The Institutional Arrangement of Hukou and Other Factors on the Gap in Students' Academic Achievement

The institutional arrangement of Hukou and its impact on students' academic achievement has been extensively studied in the context of China's educational system. Research by Wang & Cai (2017) highlighted how Hukou restrictions contribute to educational inequities, particularly for migrant children, by limiting their access to quality education in urban areas. Similarly, studies by Qi (2018) emphasized the role of Hukou status in perpetuating disparities in educational opportunities and outcomes between rural and urban students. My study confirmed these findings.

After adding Hukou, the factor of Aspiration still kept a significant impact on children’s academic achievements and contributed the biggest effect size (see Table 4.18). The other three factors of Communication, Companion, and Discipline turned

from negative to positive. The effect sizes were also statistically significant. These results meant that controlled for the Hukou status, all factors of parental involvement contributed positive impact on children's development. Specifically, for the subject of English, all of the factors including Hukou have the biggest effect sizes. And Hukou had negative statistically negative effects on children's scores. These results fortified the moderation influences of Hukou.

To address the gap in academic achievement associated with institutional arrangements like Hukou, researchers discussed other factors, such as family SES, and parents' education level, related to Hukou in the context of China (Chen et al., 2019; Ma et al., 2018). I also gathered the information from the data and discussed these factors.

The Family's SES, Hukou, and Student's Academic Scores

The family's SES was a crucial determinant of parental involvement, as evidenced by previous studies (Singh et al., 1995; Seginer, 2006; Jeynes, 2011). SES played a pivotal role in shaping the extent to which parents can allocate resources and effort to support their children's development. It can directly influence educational outcomes while acting as a potential mediator in the relationship between family SES and children's achievement in subjects like Chinese and math (Zhang et al., 2020). As Seginer (2006) argued, social classes, ethnic or religious affiliations, and individuals residing in specific regions or communities were part of a broader macro-system that indirectly impacted children's school performance. SES represented a composite indicator that amalgamated family wealth, parental occupations, and parental educational levels. Each component of SES exerted distinct direct effects on students' mathematical achievements, often

mediated by parental expectations (Long & Pang, 2016), which was consistent with this study.

In this study, I focused primarily on capturing Hukou as a key variable rather than delving into the family SES because the data didn't supply specific information about family income and assets. This approach was deliberate, driven by the premise that Hukou could effectively serve as a proxy for certain aspects of SES. Hukou impacted people and led a multifaceted set of factor allocations, including disparities in educational resources, regional socioeconomic conditions, and access to opportunities. By concentrating on Hukou, we aimed to explore how these dimensions were intricately woven into the relationship between parental involvement and academic performance. This decision was rooted in the understanding that Hukou, as a macro-level variable, could provide valuable insights into the impact of broader social structures on students' educational outcomes, offering an alternative perspective on the role of SES in shaping academic achievement within the context of this study.

The Family's SES Factors with Children's Academic Scores

I incorporated socioeconomic factors, such as parents' educational levels and occupations, into the investigation to assess their consistency with the results obtained previously. This expanded analysis aimed to provide a more comprehensive understanding of how socioeconomic status influences academic outcomes. By examining specific elements of SES, we gained insights into the complex interplay between parental involvement, socioeconomic status, and student achievement. It's a significant way to validate and strengthen the consistency of the results, contributing to a

richer and more detailed understanding of the complex interplay between parental involvement, socioeconomic status, and student achievement.

The correlation coefficients of these variables, along with Hukou status and academic scores, were calculated to explore their relationships. Descriptive statistics and coefficient sizes were presented in Tables A and B in Appendix IV. There were strong positive correlations between the scores in different subjects. This suggested that students who perform well in one subject tend to perform well in the others. It showed that educational factors (parents' education) had stronger positive correlations with subject scores compared to occupation. At the same time, Hukou status was negatively correlated with subject scores, especially for English, indicating that it may be associated with lower academic performance. Furthermore, there was a high positive correlation between parents' occupational scores and a similar trend observed in parents' education levels. This implied that, concerning occupations or education, parents demonstrated a consistent pattern of mutual strength and achievement through collaboration.

Hukou Status with Parents' Occupation and Educational Level

The analysis results in Table B of Appendix IV revealed negative correlations between parental socioeconomic factors, including occupation and education levels, and Hukou status. The correlation coefficient between father's occupation and Hukou is negative and significant suggesting that individuals with rural Hukou status may have fathers with less economically advantaged or prestigious occupations, potentially leading to lower academic performance for their children. Similarly, the correlation between mother's occupation and Hukou was also negative, reinforcing the notion that individuals

with rural Hukou status may have mothers with less economically advantageous occupations, which could also be linked to lower academic performance for their children.

Moreover, the analysis found strong significant and negative correlations between parental education levels and Hukou status, respectively, indicating that individuals with rural Hukou status tended to have parents with lower levels of education. Lower parental education levels were often associated with various socioeconomic disadvantages. Overall, these findings underscore the impact of parental socioeconomic status, as reflected by occupation and education levels, on students' academic outcomes, particularly in the context of Hukou status in China.

Hukou and the Family's SES

Table B in Appendix IV also showed correlations between subject scores and demographic variables, including Hukou. Hukou correlates negatively with subject scores, indicating that students with rural Hukou tended to have lower academic performance in Math, English, and Chinese. These correlations collectively suggested that Hukou was related to parental factors associated with socioeconomic status, such as occupation and education. Students with rural Hukou were more likely to have parents with lower-status occupations and lower levels of education. This implied that Hukou may be used as a proxy for socioeconomic status, as it was associated with educational and occupational opportunities, which play a critical role in determining an individual's socioeconomic standing.

While Hukou was not a direct measure of socioeconomic status, but rather a proxy for socioeconomic disparities. The Hukou system in China has historically been linked with unequal resource distribution, where urban Hukou holders typically have better access to education, healthcare, and employment opportunities, leading to improved socioeconomic conditions. This system segregates individuals into urban and rural categories, with urban areas offering superior job prospects, educational opportunities, and welfare benefits compared to rural areas. Educational opportunities in urban regions are often better funded and offer superior facilities, potentially leading to higher socioeconomic status for students with urban Hukou. Additionally, urban Hukou holders may benefit from greater occupational mobility and access to higher-paying jobs. While Hukou status serves as a strong indicator of socioeconomic disparities, it interacts with other factors such as parental education, occupation, income, and family background to perpetuate socioeconomic inequalities in China. In essence, while Hukou status reflects socioeconomic status to some extent, it is just one facet of the broader socioeconomic landscape in the country.

The Effects of Demographic Variables on Students' Academic Scores

Table C in Appendix IV presented the results of a regression analysis of parents' demographic variables on students' academic scores in three subjects: Chinese, English, and Math. Notably, while the mother's occupation had a significant positive influence on English scores, it did not significantly predict Chinese scores and had no notable impact on Math scores. Conversely, the father's occupation consistently demonstrated a positive and statistically significant relationship with academic scores across all subjects,

indicating that a higher father's occupation status was associated with higher academic performance. Moreover, parental education levels emerged as significant predictors of academic achievement, with both mothers' and father's education positively and highly significantly related to academic scores across all three subjects. These results underscore the crucial role of parental socioeconomic factors in shaping students' academic outcomes, highlighting the importance of considering both mother's and father's educational backgrounds in understanding academic performance.

Additionally, the analysis revealed mixed findings regarding the influence of Hukou status on academic scores. While Hukou status did not significantly predict Chinese scores and Math scores, it had a pronounced negative impact on English scores. A more negative Hukou status was associated with significantly lower English scores, suggesting that students with less advantageous Hukou status faced academic challenges in English. These findings emphasized the nuanced interplay between socioeconomic factors, such as parental occupation and education, and institutional arrangements like Hukou status in shaping students' academic success across different subjects

Combine Parents' Occupation and Education in a Complex Indicator

Since the results of parents' occupation and education had various and different perspectives on children's three subjects, the following composed both parents' occupation and education as one family dimension to find how they interact with Hukou. Variables reflecting parental education and occupational status were reduced into a single index using principal component analysis (PCA) as family status score (because of lack of family wealth, it can't be called SES). The regression results of Hukou, family status

score, and the cross-effects were presented in Table D in Appendix IV. Family status scores consistently positively influenced academic performance across all subjects. Hukou had a negative impact on English scores but was not significant in Chinese or Math. The interaction between Hukou and family status was significant in English and Math, suggesting that the influence of Hukou on academic performance was contingent on family status. The results were consistent with the literature that higher SES positively correlated with higher academic scores (Zhang et al., 2020) and that Hukou may contribute significantly to it through moderating. Even in this study, there was no specific information about the family's wealth, but the parents' occupation and education were also the most important indicators of family SES.

Summary of Parents' Features, Hukou, and Students' Academic Achievement

In summary, I underscored the influential role of parental education, particularly from both the mother and father, emphasizing their substantial impact as significant positive predictors of academic performance across all three subjects. The father's occupation also emerged as a noteworthy contributor to student success. While the mother's occupation showed a marginal positive influence on English, its significance was not observed in the context of Chinese and Math. Additionally, the analysis revealed that Hukou's status negatively impacted English, aligning with SEM results. Notably, the family status score, an indicator combined with parents' education and occupation, consistently positively influenced academic performance across all subjects. Hukou negatively impacted English scores but lacks significance in Chinese or Math. The interaction between Hukou and family status was significant in English and Math,

indicating that the influence of Hukou on academic performance was contingent on family status. These nuanced findings highlighted the multifaceted nature of parental factors and Hukou status in shaping student academic outcomes, providing a comprehensive understanding of the complex interplay between familial and societal influences on educational achievement.

Methodology Contributions

This study proposed a comprehensive methodology to investigate an educational problem within a specific cultural context. The process integrated several statistical methods and models to analyze a large national dataset. Particularly, it offered approaches that enhance the rigidity and applicability for future research as the references in similar topics.

Standardized Guideline

The proposed approach provided a structured and standardized guideline for researchers to follow when exploring relationships or effects among variables underlying sets of item questions in large datasets. Some actual method challenges need to be addressed in each stage or phase. And how to solve these problems in this study could supply valuable references for future researchers.

Once the research questions and objectives were defined, the data preparation phase involved designing the data collection instrument or survey, selecting the sample, collecting the data, and checking the data for accuracy and completeness. After the data were prepared, the methodology included constructing latent factors through exploratory and confirmatory factor analysis (EFA and CFA). Additionally, statistical consistency and

stability were tested from different perspectives and time points to verify the validity and reliability of the latent constructs. The final step of the methodology involved a complex structural analysis to examine causal connections between latent structures.

Overall, the methodology in this investigation made several contributions to the social, education, and psychology fields. It provided a generalized guideline for what and how for researchers to follow when exploring relationships or effects among variables underlying sets of item questions in large datasets. Several statistical methods and models were integrated. It demonstrates, step by step, the potential problems that may arise at each stage and how to technically solve these problems for each method. After all, this study could support reliable and adequate sources and literature for other researchers to refer to.

Data Mining and Missing Value Adjustment

Before estimation applications, this phase addressed sample size, distribution, normality, outliers, and missing data issues. The study carefully presented the assessment and evaluation of the previously mentioned issues about the data's appropriateness before conducting the following procedure. Since the dataset applied in this study was a nationwide secondary and not designed for this topic, there were some inevitable problems, such as different sample sizes of variables, missing values, and inconsistency. This study carried out data mining, adjustment of missing values, and modifying data for analysis.

For example, the educational and occupational levels needed to be rescaled in this study. It was important to carefully select appropriate categories to preserve meaningful

distinctions and minimize information loss based on the literature's common information. Various techniques for imputing missing values, such as mean imputation, regression imputation, or multiple imputation were applied in this research. The rationale behind converting continuous variables into categorical variables, such as simplifying the interpretation or data consistency of the sample during time points, was considered and maintained. For the academic scores, because of standards from schools and districts, raw scores need adjustments and standardization to ensure consistency and comparability across different assessments, classrooms, and schools. Standardization procedures helped mitigate variations in assessment difficulty, grading practices, and educational contexts, enabling fair and accurate comparisons of student achievement.

Modeling Estimations

After the data preparation was finished, the methodology included constructing latent factors through EFA and CFA. Since the observed variables were categorical, a specific estimation technique called the polychoric correlation method was applied for model estimation in building the measurement model. This approach was designed to improve construct quality and statistical power when analyzing ordinal data. The factor estimation applied the standard "split-sample" approach in statistical EFA and CFA applications to construct the latent factors because of the large data sample size.

Additionally, statistical consistency and stability were tested from different perspectives and time points to verify the validity and reliability of the latent constructs. Specifically, the factor building followed a further investigation by adopting the views of

parents versus students and two timelines (baseline versus tracing timeline) to check the factor consistency and ensure reliability and validity through multi-group invariant tests.

The final step of the methodology involved a complex structural analysis to examine path connections between latent structures. As an essential tool in social, behavioral, and educational research, this study presents how the SEM enables researchers to test complex theoretical models, assess model fit, estimate direct and indirect effects, and handle missing data and measurement errors by adding more specific indicators.

Insurance of Validity and Reliability

Validity

To establish criterion validity, the study compared parental involvement measures to students' actual academic achievement across multiple subjects, aligning with the intended criteria for success set by schools and districts. This external validation provided evidence of the measures' validity in assessing the construct of parental involvement. The methodology employed both EFA and CFA to validate the underlying structure of parental involvement and student self-engagement constructs. The consistency of factor loadings across different samples and time points provided evidence of the constructs' construct validity.

Reliability

Reliability analyses, such as Cronbach's alpha, were conducted to assess the internal consistency of survey items measuring parental involvement and student self-engagement. The high internal consistency coefficients indicated the reliability of these

measures in capturing consistent patterns of responses within each construct. Test-retest reliability analyses were conducted to assess the stability of parental involvement and student self-engagement measures over time. The consistent responses obtained from participants across multiple administrations indicated the reliability of these measures over time intervals.

Overall, the methodology employed in this study demonstrated strong validity and reliability in assessing parental involvement and its impact on students' academic achievement. By employing rigorous validation procedures and ensuring consistency and stability in measurement, the study provided credible and trustworthy findings that contribute to our understanding of the complex relationship between parental involvement and student success.

Limitations of This Study

Certainly, every research study has limitations that should be acknowledged. Here are some potential limitations of this study:

Sampling Bias

Sampling bias is a critical consideration in the generalizability of our findings, as the sample of students and parents utilized in this study may not fully represent the diverse Chinese population. While extensive, the China Education Panel Survey for the Academic Years 2013-14 and 2014-15 might not encompass the wide range of cultural, socioeconomic, and regional variations present in China. Certain demographic groups' potential underrepresentation or overrepresentation could introduce distortions in our results. This limitation was especially pertinent given China's vast socio-economic and

cultural diversity. Consequently, caution should be exercised when extending the findings to the broader population, and future research should aim for more comprehensive and diverse sampling strategies to enhance the external validity of the results.

Hukou Variability

The dynamic nature of Hukou status, characterized by significant regional variations and potential policy changes over time, introduced a layer of complexity that may not be fully captured in our study. As a product of historical, political, and administrative factors, Hukou can exhibit diverse manifestations across different regions in China. Regional disparities in economic development, educational infrastructure, and policy implementations may result in distinct experiences for individuals with varying Hukou statuses. Furthermore, given the evolving nature of social and governmental policies, changes in Hukou regulations or related policies could impact its influence on educational outcomes. Therefore, while our study provides valuable insights into the relationship between parental involvement, Hukou, and academic performance, it is essential to recognize the potential temporal and spatial variations in Hukou dynamics that might not be fully addressed in our research. Future investigations should consider longitudinal and multi-regional approaches to provide a more comprehensive understanding of Hukou's nuanced influence.

Self-Reported Data

Relying on self-reported data from students and parents introduces potential challenges associated with response biases and inaccuracies that could impact the reliability and validity of our findings. The nature of self-reporting leaves room for

participants to provide responses that align with social expectations or perceived norms, leading to socially desirable reporting. Students and parents might, consciously or unconsciously, present themselves or their involvement in a manner they deem favorable, influencing the accuracy of the data. Additionally, the subjectivity inherent in self-reporting may introduce variations in interpretation and recall, further contributing to potential discrepancies. While self-reported data is a valuable source of information, particularly regarding perceptions and attitudes, researchers should be mindful of these inherent limitations and consider triangulating findings with objective measures or alternative data sources to enhance the robustness and credibility of the study.

Data Availability and Missing Data

The study acknowledged potential limitations related to the quality and availability of data, a common challenge in large-scale surveys. The presence of missing or incomplete data can impede the thoroughness of the analysis and may introduce biases if not addressed appropriately. Despite efforts to ensure comprehensive data collection, unforeseen circumstances or participant-related factors might contribute to data gaps. Moreover, the study may lack control over the data collection procedure, particularly in a nationwide survey involving numerous schools and participants. Variability in data quality across different regions or institutions could further complicate the analysis. Mitigation strategies, such as robust statistical techniques to handle missing data, would enhance the study's validity and provide a nuanced interpretation of the findings.

Causation vs. Correlation

While the study employs Structural Equation Modeling (SEM) to uncover correlations between variables, establishing definitive causation remains complex. The inherent challenge lies in the potential existence of unmeasured confounding variables that might influence the relationships under exploration. Despite SEM's capacity to model complex relationships and interactions, it cannot eliminate the possibility of external factors contributing to observed patterns. Variables not included in the model, such as cultural nuances or unexplored contextual elements, could impact the outcomes. The study recognizes the intricacies of causal inference and emphasizes the importance of cautious interpretation, acknowledging the potential limitations in drawing unequivocal causal conclusions within the research framework.

Cross-Sectional Data Application

Despite the presence of a two-time point dataset in this study, it's important to note that the analysis is still fundamentally cross-sectional in nature. While utilizing data from multiple time points adds a temporal dimension analysis, a valid longitudinal study systematically tracks the same subjects over an extended period. Using two-time points allows for exploring changes over time but may not capture the continuous and nuanced developmental processes that unfold across an academic journey.

Cross-sectional data provides a snapshot at a single time in SEM, capturing correlations among variables but lacking the temporal dimension necessary to establish causation or track changes over time. Academic performance is dynamic and influenced by evolving circumstances and developmental processes. The absence of longitudinal

data restricts the ability to infer causal relationships or discern how parental involvement and Hukou status may shape academic trajectories. While cross-sectional studies offer valuable insights, recognizing the inherent limitations in making temporal inferences is crucial for a nuanced interpretation of the study's findings within the broader context of academic development.

Socioeconomic Factors

Given its association with socioeconomic status (SES), incorporating Hukou into the study provides valuable insights. However, it's crucial to acknowledge that SES is a multidimensional construct encompassing various factors such as parental income, occupation, and education. As I discussed above, parents' other features significantly impact children. By focusing on Hukou alone, the study may not fully capture the intricate dimensions of SES that can affect academic outcomes. SES's comprehensive nature suggests that considering additional components could offer a more nuanced understanding of the complex interplay between socioeconomic factors and educational achievements. Therefore, while Hukou provides a lens into institutional disparities, it's essential to recognize its partial representation of the broader socioeconomic landscape influencing students' academic experiences.

Cultural Variations

Exploring the cultural dimensions within China is crucial, considering its vast diversity. While addressing parental involvement and academic performance, this study may encounter challenges in fully encapsulating the rich tapestry of cultural variations across regions and communities in China. Culture profoundly shapes parenting practices,

expectations, and the overall approach to education. Not to mention those institutions that are designed for different groups and cities, the study's findings might not comprehensively represent the intricate ways in which diverse cultural norms and values impact parental engagement. A more nuanced examination of these cultural variations could enhance the study's contextual relevance and contribute to a more thorough understanding of the dynamics between culture, parental involvement, and academic outcomes in the Chinese educational landscape.

Educational Environment and Other Factors

It's essential to acknowledge that while this study examines parental involvement and Hukou's impact on academic performance, it may not entirely encompass the breadth of variations in the educational environment. Variations between urban and rural schools, teaching quality discrepancies, and educational resource disparities could significantly influence academic outcomes. Urban and rural settings often present distinct challenges and opportunities for students, impacting their educational experiences. By recognizing and addressing these environmental variations, your study could offer a more comprehensive understanding of the contextual factors shaping academic achievement in diverse educational settings within China.

Several limitations need consideration in interpreting the findings of this study. Acknowledging these limitations in this study is essential to conducting rigorous research. Doing so demonstrates a thoughtful and critical approach to this research and helps readers and reviewers interpret your findings accurately.

A Brief Policy Implications

The policy implications of this study are twofold. Firstly, it underscores the importance of parental involvement in the educational and social development of children. This aspect emphasizes the need for policies that encourage and facilitate the active participation of parents in their children's lives. Secondly, it brings to light the need for reforms in the Hukou system. The Hukou system, as it currently stands, contributes to social and spatial stratification and poses challenges to human rights. Therefore, comprehensive reforms are necessary to mitigate these issues and promote social equity. These two components together provide a holistic approach to addressing the complex issues at hand.

Support Family and Parental Involvement

This research suggested that the practices of parental involvement had a significant positive influence on children's academic achievements. Even some research asserted that as the children grew older, parental involvement decreased, and the level of how much time and energy of parental involvement was associated with age (Hoover-Dempsey & Sandler, 1995; Green, et. al., 2007). Parents' participation in their children's education not only influenced academic results, but also impacted motivation to learn, focus, perseverance in tasks, understanding of vocabulary, and behavior in the classroom (Hoover-Dempsey et al.,2005). In addition to parents' direct involvement at home and in school, another significant aspect to consider was the parents' firm conviction and high aspirations for their children's academic success. Parents guided their children in a manner that encouraged the adoption of societal and educational objectives.

Policies could be implemented to develop and fund programs that educate parents about the importance of their involvement in their child's development. These programs could provide strategies and resources to help parents engage more effectively with their children. Several family education programs have been implemented in the U.S., Comprehensive Child Development Program, Even Start Family Literacy Program, and Head Start Family Service Centers. These programs emphasized parental involvement in learning often through empowerment strategies, preschool programs, and welfare programs. Policies encouraging employers to offer flexible work hours or work-from-home options could be beneficial. This would allow parents to spend more quality time with their children, thus contributing to their development. Hoover-Dempsey et al. (2005) presented a list of strategies that could be used to reinforce parental involvement and educational partnership with teachers which concentrated on topics like invitation and communication, empowerment of teachers and parents, school structure, and school policy. This could be an example as a reference. Schools could be encouraged to develop policies that foster stronger parent-teacher partnerships. Regular communication between parents and teachers can help align efforts at home and school toward the child's development.

Practical Steps for Parents

There are some practical steps for Parents. Spend quality time with your children. This could involve playing games, reading together, or simply talking about their day. This not only strengthens the parent-child bond but also contributes to the child's emotional and social development. Take an active interest in children's education. This

could involve helping with homework, attending parent-teacher meetings, and showing interest in their academic progress. Encourage children to participate in extracurricular activities. This can help them develop new skills, make friends, and explore their interests. Create a home environment that supports learning and development. This includes providing educational materials, fostering a love for learning, and offering emotional support and encouragement.

Hukou System Reform

In recent years, there have been discussions about further reforms to the Hukou system to make it more flexible and reduce the disparities it creates (Chan & Buckingham, 2008). Some reforms aim to improve rural residents' rights and access to services. Reforms have included efforts to make it easier for rural residents to obtain urban Hukou status, especially in smaller cities. However, Urban Hukou holders generally have better access to social services, including education, healthcare, and employment opportunities. Contrary to popular belief, the hukou system was not eliminated. Instead, responsibilities were transferred to local governments. This shift often resulted in increased difficulties for rural residents seeking permanent migration to cities, thereby perpetuating the divide between rural and urban areas. Despite the reforms, the hukou system continues to be a major factor in social and spatial inequality, leading to human rights concerns.

The reforms in the Hukou system that ensure a more equitable distribution of educational resources between rural and urban areas are important. This could involve policies prioritizing underprivileged regions regarding teacher allocation, infrastructure

development, and funding. Rural students have access to high-quality urban schools based on changes in the Hukou system. This change might involve revising enrollment policies or creating programs that enable students from different Hukou backgrounds to attend schools based on merit rather than residence status. Implementing financial assistance programs to support families with agricultural Hukou status is helpful. The policy could include scholarships, subsidies, or tuition waivers to alleviate the economic burden on families, ensuring that financial constraints do not hinder academic success compared to rural Hukou holders.

Efforts could be made to enhance the quality of education in both urban and rural areas. This could involve teacher training, curriculum development, and infrastructure improvement. Measures could also be taken to reduce the cost of education for families in rural Hukou. This could involve providing financial aid or scholarships. Programs could be implemented to raise educational aspirations among children in rural Hukou. This could involve career counseling, mentorship programs, and exposure to various career paths.

Future Study Direction

To overcome existing limitations, a future study could adopt a Hierarchical Linear Modeling (HLM) approach, providing a more nuanced understanding of academic performance disparities in China. HLM allows for examining factors at different levels, from individual characteristics to family and school influences. This approach could enhance the exploration of the Hukou system's impact, considering regional and school district variations. Examining the interaction between socioeconomic status, cultural

factors, and educational environments at different levels could offer a more comprehensive understanding of the complexities of academic outcomes.

An in-depth qualitative exploration is also applicable. Complementing quantitative findings with qualitative research into a mixed study to better understand the cultural and contextual factors influencing parental involvement and academic performance is meaningful. Interviews or focus groups with parents, students, and educators could provide valuable insights.

Additionally, incorporating longitudinal data collection methods could offer insights into the dynamic nature of parental involvement and its effects on academic achievement over time. By tracking changes in parental engagement and academic performance longitudinally, researchers can better understand the causal relationships between these variables and identify potential long-term effects.

Furthermore, exploring potential interventions or policy implications based on research findings could be valuable. By identifying effective strategies to enhance parental involvement and support academic success, policymakers and educators can work towards addressing academic disparities and promoting educational equity in China.

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Appendices

Appendix I: Supporting Results

Table a

The model fit indices of the three and five-factor models of parental involvement of 2014-15

N=4980	Three factors	Five factors
df	88	61
chi2	4970.61	933.14
p > chi2	< 0.01	< 0.01
RMSEA	0.11	0.05
CFI	0.91	0.98
TLI	0.86	0.96
SRMR	0.07	0.03

Table b

The correlations among three and five-factor models of parental involvement of 2014-15

Three-factor model				Five-factor model					
	Factor 1	Factor 2	Factor 3		Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	1			Factor 1	1				
Factor 2	0.40*	1		Factor 2	0.49*	1			
Factor 3	0.03	0.14*	1	Factor 3	0.42*	0.25*	1		
				Factor 4	0.26*	0.05*	0.43*	1	
				Factor 5	0.31*	0.19*	0.29*	0.23*	1

Note: * significant at 5% level.

Table c

The correlation coefficients of EFA estimations in three and five-factor models of parental involvement of 2014-15

	Three-Factor Model Correlations			Five-factor Model Correlations				
REGULATION1	0.663*			0.659*				
REGULATION2	0.607*			0.877*				
REGULATION3	0.477*			0.463*				
REGULATION4	0.523*			0.405*				
REGULATION5	0.746*				0.698*			
REGULATION6	0.684*				0.821*			
WITH1			0.261*			0.198*		
WITH2			0.654*			0.806*		
WITH3			0.712*			0.850*		
EXPECT4			0.316*				0.342*	
EXPECT1	0.398*		0.276*				0.628*	
EXPECT3	0.320*		0.209*				0.401*	
EXPECT2	0.385*		0.364*				0.767*	
DISCUSSION1		0.855*			0.853*			
DISCUSSION2		0.910*			0.900*			
DISCUSSION3		0.809*			0.809*			
DISCUSSION4		0.747*			0.712*			

Note: * significant at 5% level.

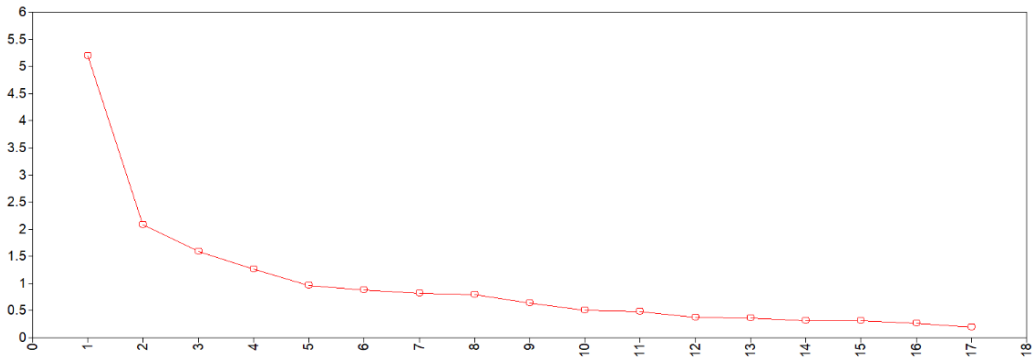

Diagram 1. The screen plot of the EFA of parental involvement of 2014-15 student survey

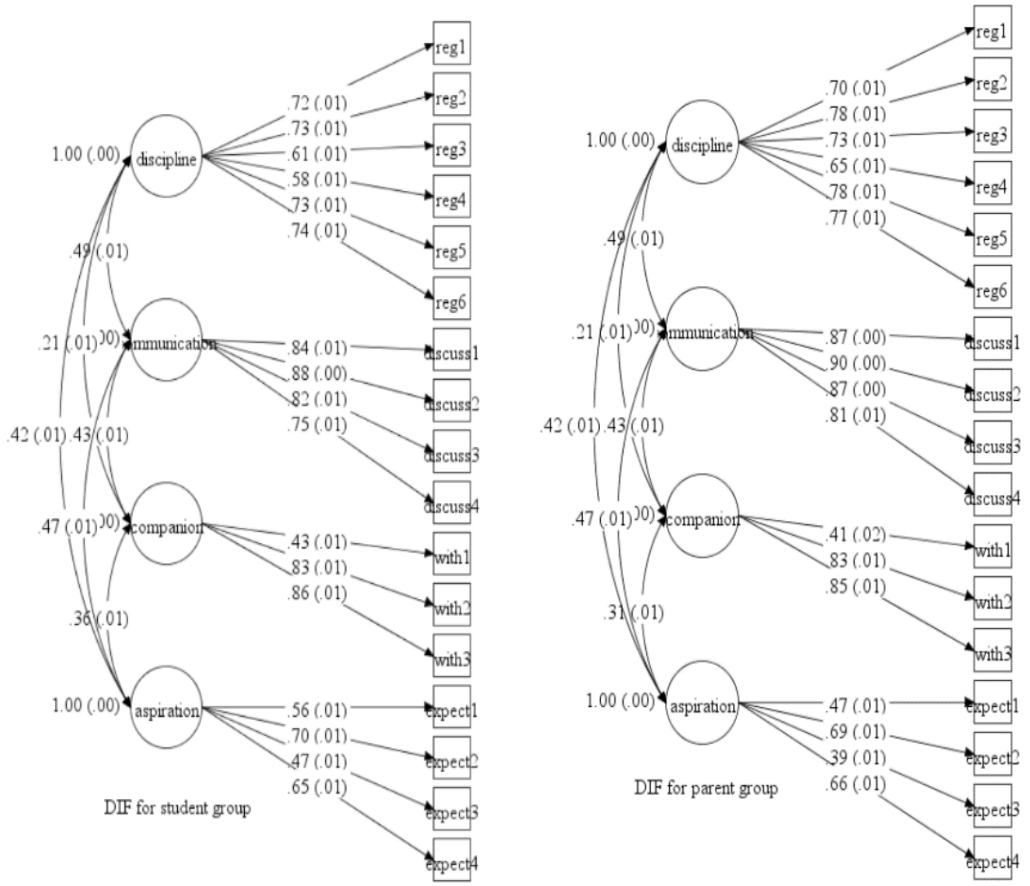

Diagram 2. The invariant test of parental involvement from student and parent perspectives of 2014-15 student dataset

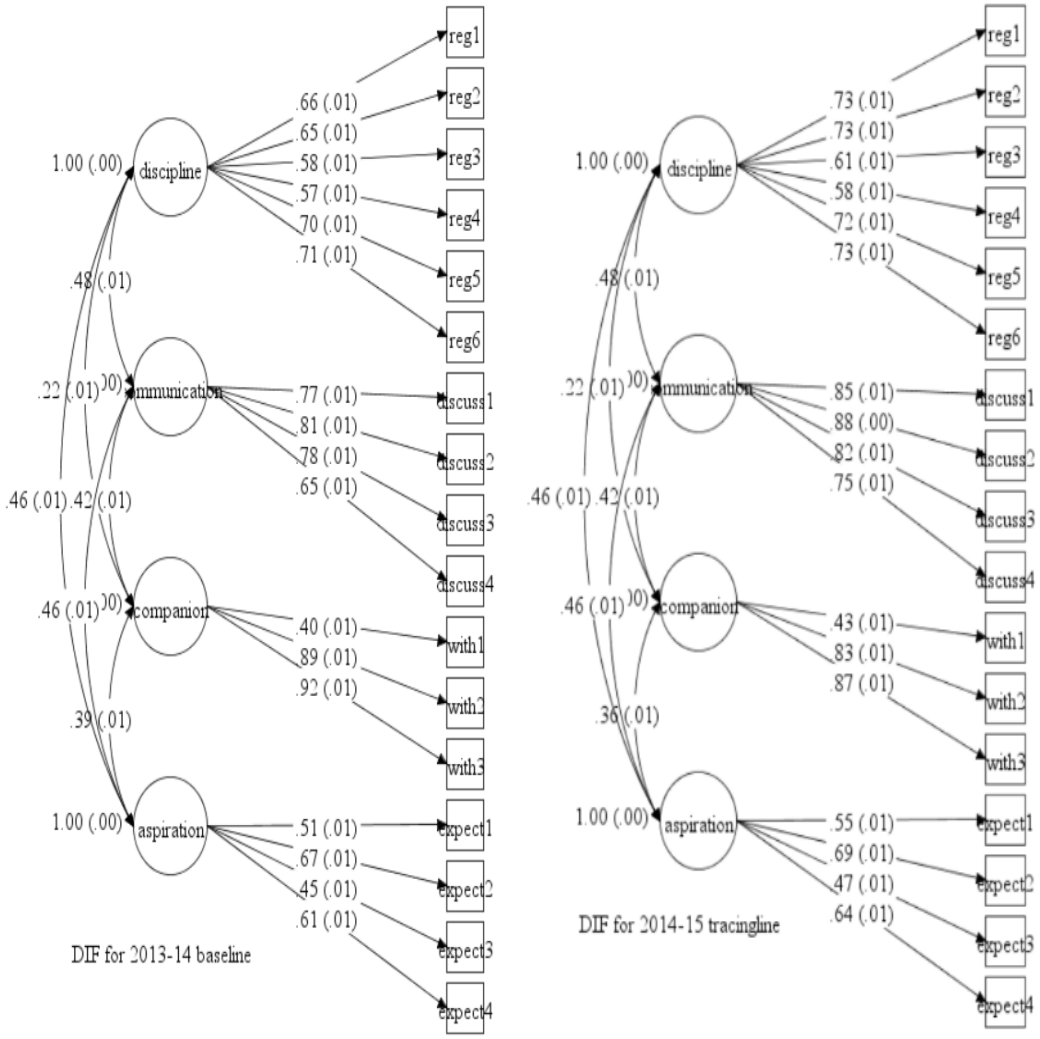

Diagram 3. The invariant test of parental involvement from perspectives of 2013 baseline and 2014-15 tracing line

Table d

The four factors standard loadings of the latent construct of student self-engagement from EFA

Item Variables	Factor1	Factor2	Factor3	Factor4
TEACHER1	0.79*			
TEACHER2	0.80*			
TEACHER3	0.73*			
TEACHER4	0.91*			
TEACHER5	0.93*			
TEACHER6	0.89*			
PEER1		0.64*		
PEER2		0.66*		
PEER3		0.50*		
PEER4		0.74*		
PEER5		0.64*		
PEER6		0.64*		
STUDY1			0.31*	
STUDY2			0.73*	
STUDY3			0.77*	
LEISURE1				0.55*
LEISURE2				0.62*

Note: * significant at 5% level.

Table e

The correlation coefficients of the four factors of student self–engagement

	Factor1	Factor2	Factor3	Factor4
Factor1	1			
Factor2	0.29*	1		
Factor3	0.29*	0.087*	1	
Factor4	-0.11*	0.026	-0.025	1

Note: * significant at 5% level.

Table f

The loadings and correlations of the latent constructs of both parental involvement and student self-engagement in SEM

	Math Model				**English Model**				**Chinese Model**		
Variable	**Estimate**	**S.E.**	**P**	**Variable**	**Estimate**	**S.E.**	**P**	**Variable**	**Estimate**	**S.E.**	**P**
Discipline By				Discipline By				Discipline By			
Regulation1	0.77	0.01	<0.01	Regulation1	0.77	0.01	<0.01	Regulation1	0.77	0.01	<0.01
Regulation2	0.72	0.01	<0.01	Regulation2	0.72	0.01	<0.01	Regulation2	0.72	0.01	<0.01
Regulation3	0.59	0.01	<0.01	Regulation3	0.59	0.01	<0.01	Regulation3	0.59	0.01	<0.01
Regulation4	0.56	0.01	<0.01	Regulation4	0.56	0.01	<0.01	Regulation4	0.56	0.01	<0.01
Regulation5	0.7	0.01	<0.01	Regulation5	0.69	0.01	<0.01	Regulation5	0.7	0.01	<0.01
Regulation6	0.7	0.01	<0.01	Regulation6	0.7	0.01	<0.01	Regulation6	0.7	0.01	<0.01
Communication	BY			Communication	BY			Communication	BY		
Discussion	0.82	0.01	<0.01	Discussion	0.82	0.01	<0.01	Discussion	0.82	0.01	<0.01
Discussion	0.85	0.01	<0.01	Discussion	0.85	0.01	<0.01	Discussion	0.85	0.01	<0.01
Discussion	0.81	0.01	<0.01	Discussion	0.81	0.01	<0.01	Discussion	0.81	0.01	<0.01
Discussion	0.75	0.01	<0.01	Discussion	0.75	0.01	<0.01	Discussion	0.75	0.01	<0.01
Companion	BY			Companion	BY			Companion	BY		
With1	0.47	0.02	<0.01	With1	0.47	0.02	<0.01	With1	0.47	0.02	<0.01
With2	0.85	0.01	<0.01	With2	0.84	0.01	<0.01	With2	0.85	0.01	<0.01
With3	0.87	0.01	<0.01	With3	0.87	0.01	<0.01	With3	0.87	0.01	<0.01
Teacher's Attitude	BY			Teacher's Attitude	BY			Teacher's Attitude	BY		
Teacher1	0.72	0.01	<0.01	Teacher1	0.72	0.01	<0.01	Teacher1	0.72	0.01	<0.01
Teacher2	0.75	0.01	<0.01	Teacher2	0.75	0.01	<0.01	Teacher2	0.75	0.01	<0.01
Teacher3	0.73	0.01	<0.01	Teacher3	0.73	0.01	<0.01	Teacher3	0.73	0.01	<0.01
Teacher4	0.86	0.004	<0.01	Teacher4	0.85	0.004	<0.01	Teacher4	0.85	0.004	<0.01
Teacher5	0.87	0.004	<0.01	Teacher5	0.87	0.004	<0.01	Teacher5	0.87	0.004	<0.01
Teacher6	0.86	0.004	<0.01	Teacher6	0.86	0.004	<0.01	Teacher6	0.86	0.004	<0.01

Continue on Table f

	Math Model				English Model				Chinese Model		
Variable	**Estimate**	**S.E.**	**P**	**Variable**	**Estimate**	**S.E.**	**P**	**Variable**	**Estimate**	**S.E.**	**P**
Aspiration	BY			Aspiration	BY			Aspiration	BY		
Expect1	0.42	0.01	<0.01	Expect1	0.42	0.01	<0.01	Expect1	0.42	0.01	<0.01
Expect2	0.51	0.01	<0.01	Expect2	0.51	0.01	<0.01	Expect2	0.51	0.01	<0.01
Expect3	0.36	0.02	<0.01	Expect3	0.36	0.02	<0.01	Expect3	0.36	0.02	<0.01
Expect4	0.55	0.01	<0.01	Expect4	0.55	0.01	<0.01	Expect4	0.55	0.01	<0.01
School Life	BY			School Life	BY			School Life	BY		
Peer1	0.7	0.01	<0.01	Peer1	0.7	0.01	<0.01	Peer1	0.7	0.01	<0.01
Peer2	0.72	0.01	<0.01	Peer2	0.72	0.01	<0.01	Peer2	0.72	0.01	<0.01
Peer3	0.7	0.01	<0.01	Peer3	0.7	0.01	<0.01	Peer3	0.7	0.01	<0.01
Peer4	0.78	0.01	<0.01	Peer4	0.78	0.01	<0.01	Peer4	0.78	0.01	<0.01
Peer5	0.49	0.02	<0.01	Peer5	0.49	0.02	<0.01	Peer5	0.48	0.02	<0.01
Peer6	0.43	0.02	<0.01	Peer6	0.44	0.02	<0.01	Peer6	0.43	0.02	<0.01
Study Engagement	BY			Study Engagement	BY			Study Engagement	BY		
Study1	0.53	0.02	<0.01	Study1	0.53	0.02	<0.01	Study1	0.53	0.02	<0.01
Study2	0.75	0.02	<0.01	Study2	0.75	0.02	<0.01	Study2	0.75	0.02	<0.01
Study3	0.72	0.02	<0.01	Study3	0.72	0.02	<0.01	Study3	0.72	0.02	<0.01
Communication	With			Communication	With			Communication	With		
Discipline	0.54	0.01	<0.01	Discipline	0.54	0.01	<0.01	Discipline	0.54	0.01	<0.01
Companion	With			Companion	With			Companion	With		
Discipline	0.21	0.02	<0.01	Discipline	0.21	0.02	<0.01	Discipline	0.21	0.02	<0.01
Communication	0.4	0.02	<0.01	Communication	0.4	0.02	<0.01	Communication	0.4	0.02	<0.01
Aspiration	With			Aspiration	With			Aspiration	With		
Discipline	0.74	0.02	<0.01	Discipline	0.74	0.02	<0.01	Discipline	0.74	0.02	<0.01
Communication	0.65	0.02	<0.01	Communication	0.65	0.02	<0.01	Communication	0.65	0.02	<0.01
Companion	0.6	0.02	<0.01	Companion	0.6	0.02	<0.01	Companion	0.6	0.02	<0.01

Table g

The loadings of the latent constructs and residual variances in SEM by adding the indicator Hukou

Math Model				Chinese Model				English Model			
Variable	**Estimate**	**S.E.**	**P**	**Variable**	**Estimate**	**S.E.**	**P**	**Variable**	**Estimate**	**S.E.**	**P**
Discipline				Discipline				Discipline			
Regulation1	0.74	0.01	<0.01	Regulation1	0.74	0.01	<0.01	Regulation1	0.74	0.01	<0.01
Regulation2	0.71	0.01	<0.01	Regulation2	0.71	0.01	<0.01	Regulation2	0.71	0.01	<0.01
Regulation3	0.57	0.01	<0.01	Regulation3	0.57	0.01	<0.01	Regulation3	0.57	0.01	<0.01
Regulation4	0.56	0.01	<0.01	Regulation4	0.56	0.01	<0.01	Regulation4	0.56	0.01	<0.01
Regulation5	0.75	0.01	<0.01	Regulation5	0.75	0.01	<0.01	Regulation5	0.75	0.01	<0.01
Regulation6	0.73	0.01	<0.01	Regulation6	0.73	0.01	<0.01	Regulation6	0.73	0.01	<0.01
Communication				Communication				Communication			
Discussion	0.82	0.01	<0.01	Discussion	0.82	0.01	<0.01	Discussion	0.82	0.01	<0.01
Discussion	0.86	0.01	<0.01	Discussion	0.86	0.01	<0.01	Discussion	0.86	0.01	<0.01
Discussion	0.82	0.01	<0.01	Discussion	0.82	0.01	<0.01	Discussion	0.82	0.01	<0.01
Discussion	0.74	0.01	<0.01	Discussion	0.74	0.01	<0.01	Discussion	0.74	0.01	<0.01
Companion				Companion				Companion			
With1	0.48	0.02	<0.01	With1	0.47	0.02	<0.01	With1	0.48	0.02	<0.01
With2	0.84	0.01	<0.01	With2	0.84	0.01	<0.01	With2	0.84	0.01	<0.01
With3	0.89	0.01	<0.01	With3	0.89	0.01	<0.01	With3	0.89	0.01	<0.01
Aspiration				Aspiration				Aspiration			
Expect1	0.58	0.02	<0.01	Expect1	0.59	0.02	<0.01	Expect1	0.58	0.02	<0.01
Expect2	0.68	0.02	<0.01	Expect2	0.69	0.02	<0.01	Expect2	0.69	0.01	<0.01
Expect3	0.45	0.02	<0.01	Expect3	0.45	0.02	<0.01	Expect3	0.45	0.02	<0.01
Expect4	0.66	0.02	<0.01	Expect4	0.64	0.02	<0.01	Expect4	0.66	0.02	<0.01

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Math Model				Chinese Model				English Model			
Variable	**Estimate**	**S.E.**	**P**	**Variable**	**Estimate**	**S.E.**	**P**	**Variable**	**Estimate**	**S.E.**	**P**
Teacher's Attitude				Teacher's Attitude				Teacher's Attitude			
Teacher1	0.73	0.01	<0.01	Teacher1	0.73	0.01	<0.01	Teacher1	0.73	0.01	<0.01
Teacher2	0.75	0.01	<0.01	Teacher2	0.75	0.01	<0.01	Teacher2	0.75	0.01	<0.01
Teacher3	0.73	0.01	<0.01	Teacher3	0.73	0.01	<0.01	Teacher3	0.74	0.01	<0.01
Teacher4	0.86	0.004	<0.01	Teacher4	0.85	0.01	<0.01	Teacher4	0.86	0.01	<0.01
Teacher5	0.87	0.004	<0.01	Teacher5	0.87	0	<0.01	Teacher5	0.87	0	<0.01
Teacher6	0.86	0.01	<0.01	Teacher6	0.86	0.01	<0.01	Teacher6	0.86	0	<0.01
School Life				School Life				School Life			
Peer1	0.7	0.01	<0.01	Peer1	0.7	0.01	<0.01	Peer1	0.7	0.01	<0.01
Peer2	0.72	0.01	<0.01	Peer2	0.72	0.01	<0.01	Peer2	0.72	0.01	<0.01
Peer3	0.71	0.01	<0.01	Peer3	0.71	0.01	<0.01	Peer3	0.71	0.01	<0.01
Peer4	0.78	0.01	<0.01	Peer4	0.78	0.01	<0.01	Peer4	0.78	0.01	<0.01
Peer5	0.48	0.02	<0.01	Peer5	0.48	0.02	<0.01	Peer5	0.48	0.02	<0.01
Peer6	0.43	0.02	<0.01	Peer6	0.43	0.02	<0.01	Peer6	0.43	0.02	<0.01
Study Engagement				Study Engagement				Study Engagement			
Study1	0.5	0.02	<0.01	Study1	0.51	0.02	<0.01	Study1	0.51	0.02	<0.01
Study2	0.76	0.02	<0.01	Study2	0.76	0.02	<0.01	Study2	0.76	0.02	<0.01
Study3	0.7	0.02	<0.01	Study3	0.7	0.02	<0.01	Study3	0.7	0.02	<0.01
Residual Variances				Residual Variances				Residual Variances			
Std Math	0.43	0.04	<0.01	Std Chinese	0.45	0.04	<0.01	Std English	0.29	0.04	<0.01
Discipline	1	0	<0.01	Discipline	1	0	<0.01	Discipline	1	0	<0.01
Communication	1	0	<0.01	Communication	1	0	<0.01	Communication	1	0	<0.01
Companion	0.86	0.01	<0.01	Companion	0.86	0.01	<0.01	Companion	0.86	0.01	<0.01
Aspiration	1	0	<0.01	Aspiration	1	0	<0.01	Aspiration	1	0	<0.01
Teacher's Attitude	0.59	0.02	<0.01	Teacher's Attitude	0.59	0.02	<0.01	Teacher's Attitude	0.59	0.02	<0.01
School Life	0.51	0.02	<0.01	School Life	0.51	0.02	<0.01	School Life	0.51	0.02	<0.01
Study Engagement	0.67	0.02	<0.01	Study Engagement	0.67	0.02	<0.01	Study Engagement	0.67	0.02	<0.01

Appendix II: The Computation of Indirect Effect

The Indirect Effect Calculations on Academic Achievement

On Math:

Indirect effects of Discipline on math:

Discipline -> Teacher's Attitude -> Math: (-0.44) * (-0.78) = 0.3432

Discipline -> School Life -> Math: (-0.60)* (-1.26) = 0.756

Discipline -> Study Engagement -> Math: 0.187 *(-0.12) = -0.02244

The total indirect effect size of Discipline on math is 0.3432+0.756-0.02244=1.08.

Indirect effects of Communication on math:

Communication -> Teacher's Attitude -> Math: -0.01 * -0.78 = 0.0078

Communication -> School Life -> Math: -0.08 * -1.26 = 0.1008

Communication -> Study Engagement -> Math: -0.072 * -0.12 = -0.00864

The total indirect effect size of Communication on math is 0.0078+0.1008-0.00864=0.1.

Indirect effects of companion on math:

Companion -> Teacher's Attitude -> Math: -0.32 * -0.78 = 0.2496

Companion -> School Life -> Math: -0.33 * -1.26 = 0.4158

Companion -> Study Engagement -> Math: 0.325 * -0.12 = -0.039

The total indirect effect size of companion on math is 0.2496+0.4158-0.039=0.63.

Indirect effects of Aspiration on math:

Aspiration -> Teacher's Attitude -> Math: 1.07 * -0.78 = -0.8358

Aspiration -> School Life -> Math: 1.33 * -1.26 = -1.6758

Aspiration -> Study Engagement -> Math: 0.229 * -0.12 = -0.02748

The total indirect effect size of Aspiration on math is -0.8358-1.6758-0.02748=-2.54.

On English:

Indirect effects of Discipline on English:

Discipline -> Teacher's Attitude -> English: -0.44 * -0.77 = 0.3388

Discipline -> School Life -> English: -0.60 * -1.26 = 0.756

Discipline -> Study Engagement -> English: 0.19 * -0.04 = -0.0076

The total indirect effect size of Discipline on English is 0.3388+0.756-0.0076=1.0872

Indirect effects of Communication on English:

Communication -> Teacher's Attitude -> English: -0.01 * -0.77 = 0.0077

Communication -> School Life -> English: -0.08 * -1.26 = 0.1008

Communication -> Study Engagement -> English: -0.07 * -0.04 = 0.0028

The total indirect effect size of Communication on English is 0077+0.1008+0.0028=0.11

Indirect effects of Companion on English:

Companion -> Teacher's Attitude -> English: -0.32 * -0.77 = 0.2464

Companion -> School Life -> English: -0.33 * -1.26 = 0.4158

Companion -> Study Engagement -> English: 0.33 * -0.04 = -0.0132

The total indirect effect size of Companion on English is 0.2464+0.4158-0.0132=0.649

Indirect effects of Aspiration on English:

Aspiration -> Teacher's Attitude -> English: 1.07 * -0.77 = -0.8239

Aspiration -> School Life -> English: 1.33 * -1.26 = -1.6758

Aspiration -> Study Engagement -> English: 0.23 * -0.04 = -0.0092

The total indirect effect size of Aspiration on English is -0.8239-1.6758-0.0092=-2.51

On Chinese:

Indirect effects of Discipline on Chinese:

Discipline -> Teacher's Attitude -> Chinese: -0.44 * -0.68 = 0.2992

Discipline -> School Life -> Chinese: -0.61 * -1.09 = 0.6669

Discipline -> Study Engagement -> Chinese: 0.19 * -0.08 = -0.0152

The total indirect effect size of Discipline on Chinese is 0.2992+0.6669-0.0152=0.95

Indirect effects of Communication on Chinese:

Communication -> Teacher's Attitude -> Chinese: -0.01 * -0.68 = 0.0068

Communication -> School Life -> Chinese: -0.07 * -1.09 = 0.0763

Communication -> Study Engagement -> Chinese: -0.07 * -0.08 = 0.0056

The total indirect effect size of Communication on Chinese is 0.0068+0.0763+0.0056=0.0887

Indirect effects of Companion on Chinese:

Companion -> Teacher's Attitude -> Chinese: -0.32 * -0.68 = 0.2176

Companion -> School Life -> Chinese: -0.33 * -1.09 = 0.3597

Companion -> Study Engagement -> Chinese: 0.33 * -0.08 = -0.0264

The total indirect effect size of Companion on Chinese is 0.2176+0.3597-0.0264=0.55

Indirect effects of Aspiration on Chinese:

Aspiration -> Teacher's Attitude -> Chinese: 1.08 * -0.68 = -0.7344

Aspiration -> School Life -> Chinese: 1.33 * -1.09 = -1.4527

Aspiration -> Study Engagement -> Chinese: 0.23 * -0.08 = -0.0184

The total indirect effect size of Companion on Chinese is -0.7344-1.4527-0.0184=-2.2055

The Indirect Effect Calculations on Academic Achievement by Adding Hukou

On Math:

Indirect effect of Discipline on Math:

Discipline -> Teacher's Attitude -> Math: 0.29 * -0.34 = -0.0986

Discipline -> School Life -> Math: 0.28 * -0.39 = -0.1092

Discipline -> Study Engagement -> Math: 0.33 * -0.19 = -0.0627

Total indirect effect of discipline on Math equals to -0.0986 + (-0.1092) + (-0.0627) = -0.2705

Indirect Effect of Communication on Math:

Communication -> Teacher's Attitude -> Math: 0.33 * -0.34 = -0.1122

Communication -> School Life -> Math: 0.34 * -0.39 = -0.1326

Communication -> Study Engagement -> Math: 0.22 * -0.19 = -0.0418

Total indirect effect of Communication on Math equals to -0.1122 + (-0.1326) + (-0.0418) = -0.2866

Indirect effect of Companion on Math:

Companion -> Teacher's Attitude -> Math: 0.24 * -0.34 = -0.0816

Companion -> School Life -> Math: 0.32 * -0.39 = -0.1248

Companion -> Study Engagement -> Math: 0.37 * -0.19 = -0.0703

Total indirect effect of Companion on Math equals to -0.0816 + (-0.1248) + (-0.0703) = -0.2767

Indirect effect of Aspiration on Math:

Aspiration -> Teacher's Attitude -> Math: 0.40 * -0.34 = -0.136

Aspiration -> School Life -> Math: 0.45 * -0.39 = -0.1755

Aspiration -> Study Engagement -> Math: 0.19 * -0.19 = -0.0361

Total indirect effect of Aspiration on Math equals to -0.136 + (-0.1755) + (-0.0361) = -0.3476

Indirect effect of Hukou on Math:

Hukou -> Discipline -> Math 0.02 * 0.42 = 0.0084

Hukou -> Communication -> Math -0.03 * 0.48 = -0.0144

Hukou -> Companion -> Math -0.38 * 0.46 = -0.1748

Hukou -> Aspiration -> Math -0.04 * 0.89 = -0.0356

The total indirect effect of Hukou through parental involvement on Math equals to 0.0084 + (-0.0144) + (-0.1748) + (-0.0356) = -0.2164.

On Chinese:

Indirect effect of Discipline on Chinese:

Discipline -> Teacher's Attitude -> Chinese: 0.29 * -0.32 = -0.0928

Discipline -> School Life -> Chinese: 0.28 * -0.36 = -0.1008

Discipline -> Study Engagement -> Chinese: 0.33 * -0.16 = -0.0528

The total indirect effect of Discipline on Chinese equals to -0.0928 + (-0.1008) + (-0.0528) = -0.2464.

Indirect effect of Communication on Chinese:

Communication -> Teacher's Attitude -> Chinese: 0.33 * -0.32 = -0.1056

Communication -> School Life -> Chinese: 0.34 * -0.36 = -0.1224

Communication -> Study Engagement -> Chinese: 0.22 * -0.16 = -0.0352

The total indirect effect of Communication on Chinese equals to -0.1056 + (-0.1224) + (-0.0352) = -0.2632.

Indirect effect of Companion on Chinese:

Companion -> Teacher's Attitude -> Chinese: 0.24 * -0.32 = -0.0768

Companion -> School Life -> Chinese: 0.32 * -0.36 = -0.1152

Companion -> Study Engagement -> Chinese: 0.37 * -0.16 = -0.0592

The total indirect effect of Companion on Chinese equals to -0.0768 + (-0.1152) + (-0.0592) = -0.2512.

Indirect effect of Aspiration on Chinese:

Aspiration -> Teacher's Attitude -> Chinese: 0.40 * -0.32 = -0.128

Aspiration -> School Life -> Chinese: 0.45 * -0.36 = -0.162

Aspiration -> Study Engagement -> Chinese: 0.19 * -0.16 = -0.0304

The total indirect effect of Aspiration on Chinese equals to -0.128 + (-0.162) + (-0.0304) = -0.3204.

Indirect effect of Hukou on Chinese:

Hukou -> Discipline -> Chinese: 0.02 * 0.45 = 0.009

Hukou -> Communication -> Chinese: -0.03 * 0.46 = -0.0138

Hukou -> Companion -> Chinese: -0.38 * 0.44 = -0.1672

Hukou -> Aspiration -> Chinese: -0.04 * 0.86 = -0.0344

The total indirect effect of Hukou on Chinese equals to 0.009 + (-0.0138) + (-0.1672) + (-0.0344) = -0.2064.

On English:

Indirect effect of Discipline on English:

Discipline -> Teacher's Attitude -> English 0.29 * -0.36 = -0.1044

Discipline -> School Life -> English 0.28 * -0.43 = -0.1204

Discipline -> Study Engagement -> English 0.33 * -0.13 = -0.0429

The total indirect effect of Discipline on English equals to -0.1044 + (-0.1204) + (-0.0429) = -0.2677.

Indirect effect of Communication on English:

Communication -> Teacher's Attitude -> English 0.33 * -0.36 = -0.1188

Communication -> School Life -> English 0.34 * -0.43 = -0.1462

Communication -> Study Engagement -> English 0.22 * -0.13 = -0.0286

The total indirect effect of Communication on English equals to -0.1188 + (-0.1462) + (-0.0286) = -0.2936.

Indirect effect of Companion on English:

Companion -> Teacher's Attitude -> English 0.24 * -0.36 = -0.0864

Companion -> School Life -> English 0.32 * -0.43 = -0.1376

Companion -> Study Engagement -> English 0.37 * -0.13 = -0.0481

The total indirect effect of Companion on English equals to -0.0864 + (-0.1376) + (-0.0481) = -0.2721.

Indirect effect of Aspiration on English:

Aspiration -> Teacher's Attitude -> English 0.40 * -0.36 = -0.144

Aspiration -> School Life -> English 0.45 * -0.43 = -0.1935

Aspiration -> Study Engagement -> English 0.19 * -0.13 = -0.0247

The total indirect effect of Aspiration on English equals to -0.144 + (-0.1935) + (-0.0247) = -0.3622.

Indirect effect of Hukou on English:

Hukou -> Discipline -> English 0.02 * 0.44 = 0.0088

Hukou -> Communication -> English -0.03 * 0.50 = -0.015

Hukou -> Companion -> English -0.38 * 0.54 = -0.2052

Hukou -> Aspiration -> English -0.04 * 0.95 = -0.038

The total indirect effect of Hukou on English equals to 0.0088 + (-0.015) + (-0.2052) + (-0.038) = -0.2494.

Appendix III: Survey Questions

Q1. Parental Involvement Items Question in CEPS Academic Year 2014-2015

Student Questionnaire

A20.Do your parents care and are they strict with you about the following?

	They don't care.	They do care about it, but are not strict.	They are very strict about it.
Your homework and examination	1	2	3
Your behavior at school	1	2	3
Whom you make friends with	1	2	3
Your dress style	1	2	3
Time you spend on the Internet	1	2	3
Time you spend on watching TV	1	2	3

A21.How often do your parents discuss the following with you?

	Your father			Your mother		
	Never	Sometimes	Often	Never	Sometimes	Often
Things happened at school	1	2	3	1	2	3
The relationship between you and your friends	1	2	3	1	2	3
The relationship between you and your teachers	1	2	3	1	2	3
Your worries and troubles	1	2	3	1	2	3

A24.How often do you have dinner with your parents?

1. Never 2.Once a year 3.Once every half year
4. Once a month 5.Once a week 6.More than once a week

A25. How often do you visit museums, zoos, science museums, etc. with your parents?

1. Never 2.Once a year 3.Once every half year
4. Once a month 5.Once a week 6.More than once a week

A26.How often do you go out to watch movies, shows, sports games, etc. with your parents?

1. Never 2.Once a year 3.Once every half year
4. Once a month 5.Once a week 6.More than once a week

A27.What is your parents' requirement on your academic record?

1. Being one of the top five of your class
2. Above the average
3. About the average
4. No special requirement

A28.What is the highest level of education your parents expect you to receive?

1. Drop out now
2. Graduate from junior high school
3. Go to technical secondary school or technical school
4. Go to vocational high school
5. Go to senior high school
6. Graduate from junior college
7. Get a bachelor degree
8. Get a Master degree
9. Get a Doctor degree
10. They don't care

A30. What kind of job do your parents *MOST* expect you to do in the future?

1. Government official, staff of public institutions, civil servant
2. Manager or administrator of enterprises/corporations
3. Scientist/engineer/doctor/programmer/pilot/spaceman
4. Teacher/lawyer/accountant/translator
5. Professional designer (such as costume, gardening, or advertisement designer)
6. Artistic performer (including writer/drawer/host/director/screenwriter)
7. Professional athlete
8. Technical worker (including driver/cook/maintenance staff)
9. Soldier/policeman
10. Medium service staff (including stewardess/nurse/barber/cosmetologist), or ordinary office staff
11. Self-employed (such as opening a store)
12. Other (Please specify: _____)
13. They don't care
14. Not clear

A32.Are your parents confident about your future?

1. Not confident at all
2. Not so confident
3. Somewhat confident
4. Very confident

Q2. Parental involvement items question in SEPS Academic Year 2013-2014 Student Questionnaire

B23. Do your parents care and are they strict with you about the following?

	They don't care.	They do care about it, but are not strict	They are very strict about it.
Your homework and examination	1	2	3
Your behavior at school	1	2	3
Whom you make friends with	1	2	3
Your dress style	1	2	3
Time you spend on the Internet	1	2	3
Time you spend on watching TV	1	2	3

B24. How often do your parents discuss the following with you?

	Your mother			Your father		
	Never	Sometimes	Often	Never	Sometimes	Often
Things happened at school	1	2	3	1	2	3
The relationship between you and your friends	1	2	3	1	2	3
The relationship between you and your teachers	1	2	3	1	2	3
Your worries and troubles	1	2	3	1	2	3

B28. How often do you do the following with your parents?

	Never	Once a year	Once every half year	Once a month	Once a week	More than once a week
Having dinner	1	2	3	4	5	6
Playing sports	1	2	3	4	5	6
Visiting museums, zoos, science museums, etc.	1	2	3	4	5	6
Going out to watch movies, shows, sports games, etc.	1	2	3	4	5	6

B30. What is your parents' requirement on your academic record?

1. Being one of the top five of your class
2. Above the average
3. About the average
4. No special requirement

B31. What is the highest level of education your parents expect you to receive?

1. Drop out now
2. Graduate from junior high school
3. Go to technical secondary school or technical school
4. Go to vocational high school
5. Go to senior high school
6. Graduate from junior college
7. Get a bachelor degree
8. Get a Master degree
9. Get a Doctor degree
10. They don't care

B33. What kind of job do your parents expect you to do in the future?

1. Government official, staff of public institutions, civil servant
2. Manager or administrator of enterprises/corporations
3. Scientist/engineer
4. Teacher/doctor/lawyer
5. Designer
6. Artistic performer/actor/host
7. Professional athlete
8. Technical worker (including driver)
9. Other (Please specify: _____)
10. They don't care
11. Not clear

B35. Are your parents confident in your future?

1. Not confident at all
2. Not so confident
3. Somewhat confident
4. Very confident

Q3. Parent involvement items questions in CEPS Academic Year 2014-2015 Parent Questionnaire

A17. Do you care and are you strict with this child about the following?

	I don't care.	I do care about it, but am not strict.	I'm very strict about it.
His/her homework and examination	1	2	3
His/her behavior at school	1	2	3
Whom he/she makes friends with	1	2	3
His/her dress style	1	2	3
Time he/she spends on the Internet	1	2	3
Time he/she spends on watching TV	1	2	3

A26. How often do you discuss the following with this child?

	Never	Sometimes	Often
Things happened at school	1	2	3
The relationship between he/she and his/her friends	1	2	3
The relationship between he/she and his/her teachers	1	2	3
his/her worries and troubles	1	2	3

A11. How often did parents have dinner with this child *IN THE PAST YEAR*?

1. Never
2. Once a year
3. Once every half year
4. Once a month
5. Once a week
6. More than once a week

A12. How often did parents visit museums, zoos, science museums, etc. with this child *IN THE PAST YEAR*?

1. Never
2. Once a year
3. Once every half year
4. Once a month
5. Once a week
6. More than once a week

A13. How often did parents go out to watch movies, shows, sports games, etc. with this child *IN THE PAST YEAR*?

1. Never
2. Once a year
3. Once every half year
4. Once a month
5. Once a week
6. More than once a week

C6. What is your requirement on this child's academic record?

1. Being one of the top five of his/her class
2. Above the average
3. About the average
4. No special requirement

A29. What is the highest level of education do you expect this child to receive?

1. Drop out now
2. Graduate from junior high school
3. Go to technical secondary school or technical school
4. Go to vocational high school
5. Go to senior high school
6. Graduate from junior college
7. Get a bachelor degree
8. Get a Master degree
9. Get a Doctor degree

A30. What kind of job do parents MOST expect this child to do in the future?

1. Government official, staff of public institutions, civil servant
2. Manager or administrator of enterprises/corporations
3. Scientist/engineer/programmer/pilot/spaceman
4. Teacher/doctor/lawyer/accountant/translator
5. Professional designer (such as costume, gardening, or advertisement designer)
6. Artistic performer (including writer/drawer/host/director/screenwriter)
7. Professional athlete
8. Technical worker (including driver/cook/maintenance staff)
9. Soldier/policeman
10. Medium service staff (including stewardess/nurse/barber/cosmetologist), or ordinary office staff
11. Self-employed (such as opening a store)
12. Other (Please specify: _____)
13. I don't care

A32. Are you confident in the future of this child?

1. Not confident at all
2. Not so confident
3. Somewhat confident
4. Very confident

Q4. Parental involvement items question in CEPS Academic Year 2013-2014 Parent Questionnaire

A8. Do you care and are you strict with this child about the following?

	I don't care.	I do care about it, but not strict.	I'm very strict about it.
His/her homework and examination	1	2	3
His/her behavior at school	1	2	3
Whom He/she make friends with	1	2	3
His/her dress style	1	2	3
Time he/she spends on the Internet	1	2	3
Time he/she spends on watching TV	1	2	3

A14. How often do you discuss the following with this child?

	Never	Sometimes	Often
Things happened at school	1	2	3
The relationship between he/she and his/her friends	1	2	3
The relationship between he/she and his/her teachers	1	2	3
his/her worries and troubles	1	2	3

A17. How often did the family members do the following together with this child over the last year?

	Never	Once a Year	Once every half year	Once a Month	Once a Week	More Than Once a Week
Having dinner	1	2	3	4	5	6
Visiting museums, zoos, science museums, etc.	1	2	3	4	5	6
Going out to watch movies, shows, sports games, etc.	1	2	3	4	5	6

C11. What is your requirement on this child's academic record?

1. Being one of the top five of his/her class
2. Above the average
3. About the average
4. No special requirement

A18. What is the highest level of education do you expect this child to receive?

1. Drop out now
2. Graduate from junior high school
3. Go to technical secondary school or technical school
4. Go to vocational high school
5. Go to senior high school
6. Graduate from junior college
7. Get a bachelor degree
8. Get a Master degree
9. Get a Doctor degree

A19. What kind of job do you expect this child to do in the future?

1. Government official, staff of public institutions, civil servant
2. Manager or administrator of enterprises/corporations
3. Scientist/engineer
4. Teacher/doctor/lawyer
5. Designer
6. Artistic performer/actor/host
7. Professional athlete
8. Technical worker (including driver)
9. Other (Please specify_____)
10. I don't care

A21. Are you confident in the future of this child?

1. Not confident at all
2. Not so confident
3. Somewhat confident
4. Very confident

Q5. Student self-engagement items question in CEPS Academic Year 2014-15

Student Questionnaire

B5. How much do you agree with each of the following statements about the main subjects?

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
My mathematics teacher always asks me to answer questions in class.	1	2	3	4
My Chinese teacher always asks me to answer questions in class.	1	2	3	4
My English teacher always asks me to answer questions in class.	1	2	3	4
My mathematics teacher always praises me.	1	2	3	4
My Chinese teacher always praises me.	1	2	3	4
My English teacher always praises me.	1	2	3	4

B6. How much do you agree with each of the following statements about your school life?

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
Most of my classmates are nice to me.	1	2	3	4
My class is in good atmosphere.	1	2	3	4
I often take part in school/class activities.	1	2	3	4
I feel close to people in this school.	1	2	3	4
I feel bored in this school.	1	2	3	4
I hope that I could transfer to another school.	1	2	3	4

B7.How much time *ON AVERAGE EVERYDAY* did you spend on the following extra-curricular activities *FROM MONDAY TO FRIDAY*?

Doing homework assigned by teacher:		
1. 0 hour	2. Less than 1 hour	3. About 1-2 hours
4. About 2-3 hours	5. About 3-4 hours	6. More than 4 hours
Doing homework assigned by parents or cram school:		
1. 0 hour	2. Less than 1 hour	3. About 1-2 hours
4. About 2-3 hours	5. About 3-4 hours	6. More than 4 hours
Taking cram school courses (related to schoolwork):		
1. 0 hour	2. Less than 1 hour	3. About 1-2 hours
4. About 2-3 hours	5. About 3-4 hours	6. More than 4 hours
Taking interest related courses (not related to schoolwork):		
1. 0 hour	2. Less than 1 hour	3. About 1-2 hours
4. About 2-3 hours	5. About 3-4 hours	6. More than 4 hours
Watching TV:		
1. 0 hour	2. Less than 1 hour	3. About 1-2 hours
4. About 2-3 hours	5. About 3-4 hours	6. More than 4 hours
Surfing on the Internet or playing video games:		
1. 0 hour	2. Less than 1 hour	3. About 1-2 hours
4. About 2-3 hours	5. About 3-4 hours	6. More than 4 hours

B8.How much time *ON AVERAGE EVERYDAY* did you spend on the following extra-curricular activities *ON WEEKENDS*?

Doing homework assigned by teacher:		
1. 0 hour	2. Less than 2 hour	3. About 2-4 hours
4. About 4-6 hours	5. About 6-8 hours	6. More than 8 hours
Doing homework assigned by parents or cram school:		
1. 0 hour	2. Less than 2 hour	3. About 2-4 hours
4. About 4-6 hours	5. About 6-8 hours	6. More than 8 hours
Taking cram school courses (related to schoolwork):		
1. 0 hour	2. Less than 2 hour	3. About 2-4 hours
4. About 4-6 hours	5. About 6-8 hours	6. More than 8 hours
Taking interest related courses (not related to schoolwork):		
1. 0 hour	2. Less than 2 hour	3. About 2-4 hours
4. About 4-6 hours	5. About 6-8 hours	6. More than 8 hours
Watching TV:		
1. 0 hour	2. Less than 2 hour	3. About 2-4 hours
4. About 4-6 hours	5. About 6-8 hours	6. More than 8 hours
Surfing on the Internet or playing video games:		
1. 0 hour	2. Less than 2 hour	3. About 2-4 hours
4. About 4-6 hours	5. About 6-8 hours	6. More than 8 hours

Q6. Student self-engagement items question in CEPS Academic Year 2013-14

Student Questionnaire

C13. How much do you agree with each of the following statements about the main subjects?

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
My mathematics teacher always asks me to answer questions in class.	1	2	3	4
My Chinese teacher always asks me to answer questions in class.	1	2	3	4
My English teacher always asks me to answer questions in class.	1	2	3	4
My mathematics teacher always praises me.	1	2	3	4
My Chinese teacher always praises me.	1	2	3	4
My English teacher always praises me.	1	2	3	4

C17. How much do you agree with each of the following statements about your school life?

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
Most of my classmates are nice to me.	1	2	3	4
My class is in good atmosphere.	1	2	3	4
I often take part in school/class activities.	1	2	3	4
I feel close to people in this school.	1	2	3	4
I feel bored in this school.	1	2	3	4
I hope that I could transfer to another school.	1	2	3	4

B14. How much time did you spend on homework assigned by your teachers at school last week?
(Please fill in 00 hours and 00 minutes if no time is spent on the homework.)

[__|__] hours [__|__] minutes (on average) from Monday to Friday

[__|__] hours [__|__] minutes (on average) at weekends

B15. How much time ON AVERAGE did you spend on the following extra-curricular activities from Monday to Friday last week? (Please fill in 00 hours 00 minutes if no time is spent on these activities.)

	From Monday to Friday (on average per day)
Doing homework assigned by parents or cram school	[__|__] hours [__|__] minutes
Taking cram school courses (related to schoolwork)	[__|__] hours [__|__] minutes
Surfing on the Internet or playing video games	[__|__] hours [__|__] minutes
Helping your parents with housework	[__|__] hours [__|__] minutes

B16. How much time ON AVERAGE did you spend on the following extra-curricular activities LAST WEEKEND? (Please fill in 00 hours 00 minutes if no time is spent on these activities)

	At weekends (on average per day)
Doing homework assigned by parents or cram school	[__|__] hours [__|__] minutes
Taking cram school courses (related to schoolwork)	[__|__] hours [__|__] minutes
Surfing on the Internet or playing video games	[__|__] hours [__|__] minutes
Helping your parents with housework	[__|__] hours [__|__] minutes

Q7. The item questions of parent involvement

Items	Questions
Item1	Do your parents care, and are they strict with you about your homework and examination?
Item2	Do your parents care, and are they strict with you about your behavior at school?
Item3	Do your parents care and are they strict with you about whom you make friends with?
Item4	Do your parents care and are they strict with you about your dress style?
Item5	Do your parents care and are they strict with you about time you spend on the Internet?
Item6	Do your parents care and are they strict with you about time you spend on watching TV?
Item7	How often do your parents discuss things happened at school?
Item8	How often do your parents discuss the relationship between you and your friends?
Item9	How often do your parents discuss the relationship between you and your teachers?
Item10	How often do your parents discuss your worries and troubles?
Item11	How often do you have dinner with your parents?
Item12	How often do you visit museums, zoos, science museums, etc. with your parents?
Item13	How often do you go out to watch movies, shows, sports games, etc. with your parents?
Item14	What is your parents' requirement on your academic record?
Item15	What is the highest level of education your parents expect you to receive?
Item16	What kind of job do your parents MOST expect you to do in the future?
Item17	Are your parents confident about your future?

Q8. The items questions of student self-engagement

Items	Questions
Item1	My mathematics teacher always asks me to answer questions in class.
Item2	My Chinese teacher always asks me to answer questions in class.
Item3	My English teacher always asks me to answer questions in class.
Item4	My mathematics teacher always praises me.
Item5	My Chinese teacher always praises me.
Item6	My English teacher always praises me.
Item7	Most of my classmates are nice to me.
Item8	My class is in good atmosphere.
Item9	I often take part in school/class activities.
Item10	I feel close to people in this school.
Item11	I feel bored in this school. （reverse code）
Item12	I hope that I could transfer to another school. （reverse code）
Item13	How much time on average a week did you spend on doing homework assigned by your teachers at school
Item14	How much time on average a week did you spend on doing homework assigned by parents or cram school
Item15	How much time on average a week did you spend on taking cram school courses (related to schoolwork)
Item16	How much time on average a week did you spend on watching TV
Item17	How much time on average a week did you spend on surfing on the Internet or playing video games

Appendix IV: Supporting Results in Discussion

Table A

The descriptive statistics of demographic information and academic scores in 2014-15

Variable	Obs	Mean	Std. Dev.	Min	Max
Math	9,880	63.13	26.16	0	136.67
English	9,867	61.30	24.41	0	106.00
Chinese	9,875	68.20	15.52	0	98.33
Father's Occupation Score	9,367	46.53	18.19	5	86.13
Mother's Occupation Score	9,345	40.38	20.67	5	86.13
Fathere's Education	10,036	4.23	1.99	1	9
Mother's Education	10,049	3.87	1.97	1	9
Hukou	9,550	0.54	0.50	0	1

Table B

The correlations between the subject scores and the demographic variables in 2014-15 datasets

Variables	Math	English	Chinese	Father's occupation	Mother's occupation	Fathere's education	Mother's education	Huk ou
Math	1							
English	0.73	1						
Chinese	0.66	0.68	1					
Father's Occupation	0.17	0.23	0.14	1				
Mother's Occupation	0.13	0.19	0.10	0.42	1			
Fathere's Education	0.21	0.29	0.20	0.51	0.34	1		
Mother's Education	0.21	0.28	0.21	0.44	0.43	0.67	1	
Hukou	-0.11	-0.22	-0.10	-0.34	-0.27	-0.43	-0.42	1

Note: All the correlations are at a 5% significant level.

Table C

The regression of parents' demographic variables on students' academic scores

Variable	Chinese			English			Math		
	N=8038	F=87.62	R^2=0.06	N=8035	F=198.49	R^2=0.11	N=8035	F=100.13	R^2=0.11
	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t
Mother's occupation	-0.004	0.009	0.67	0.05	0.01	<0.01	0.02	0.02	0.12
Father's occupation	0.034	0.011	<0.01	0.10	0.02	<0.01	0.09	0.02	<0.01
Mother's education	1.00	0.12	<0.01	1.25	0.18	<0.01	1.45	0.20	<0.01
Father's education	0.74	0.12	<0.01	1.58	0.18	<0.01	1.29	0.20	<0.01
Hukou	0.47	0.37	0.20	-3.97	0.58	<0.01	0.24	0.64	0.71
Constants	60.28	0.65	<0.01	46.16	1.03	<0.01	47.60	1.14	<0.01

Table D

The regression results of family status score and Hukou on academic achievements

Variable	Chinese			English			Math		
	N=8038	F=128.5	R^2=0.05	N=8035	F=329.2	R^2=0.11	N=8040	F=126.2	R^2=0.06
	Coef.	SE.	P	Coef.	SE.	P	Coef.	SE.	P
Family status score	2.01	0.14	<0.01	4.68	0.22	<0.01	4.26	0.24	<0.01
Hukou	0.29	0.37	0.45	-4.55	0.59	<0.01	-0.35	0.65	0.59
Hukou * Family Status	0.21	0.26	0.42	-1.33	0.41	<0.01	-1.17	0.46	<0.05

Table E

The item questions about the students' leisure time

2014-15 survey	2013-14 survey	Questions
w2b074	b15e	Watching TV
w2b075	b15f	Surfing on the Internet or playing video games
w2b09	b1701	Visiting museums, zoos, science museums, etc.
w2b10	b1702	Going out to watch movies, shows, sports games, etc.

Table F

The results of four factors analysis for student self-engagement of the factor and loadings

Variable	Factor1	Factor2	Factor3	Factor4
w2b0504	0.66			
w2b0505	0.68			
w2b0506	0.61			
w2b0507	0.82			
w2b0508	0.83			
w2b0509	0.80			
w2b0605		0.57		
w2b0606		0.60		
w2b0607		0.46		
w2b0608		0.68		
w2b0609		0.57		
w2b0610		0.52		
w2b071			0.36	
w2b072			0.61	
w2b073			0.59	
w2b074				0.24
w2b075				0.40
w2b09				0.61
w2b10				0.62

Note: All the correlations are at a 5% significant level.

Table G

The correlation coefficients of the four-factor EFA

Correlation matrix				
Factors	Factor1	Factor2	Factor3	Factor4
Factor1	1			
Factor2	0.41	1.00		
Factor3	0.21	0.34	1.00	
Factor4	0.19	0.02	-0.05	1

Note: All the correlations are at a 5% significant level.