Conference Name: EduCon Kuala Lumpur – International Conference on Education, 06-07 May 2024
Conference Dates: 06-May- 2024 to 07-May- 2024
Conference Venue: Hotel Capitol, Bukit Bintang, Kuala Lumpur, Malaysia
Appears in: PUPIL: International Journal of Teaching, Education and Learning (ISSN 2457-0648)
Publication year: 2024

Wenzhe Deng, 2024

Volume 2024, pp. 178-200

DOI- https://doi.org/10.20319/ictel.2024.178200.

This paper can be cited as: Deng, W. (2024). Unlocking the Drive to Learn: Navigating Individual, Familial, and Educational Dynamics of Cognitive Engagement in University Students. EduCon Kuala Lumpur – International Conference on Education, 06-07 May 2024. Proceedings of Teaching and Education Research Association (TERA), 2024, 178-200.

UNLOCKING THE DRIVE TO LEARN: NAVIGATING INDIVIDUAL, FAMILIAL, AND EDUCATIONAL DYNAMICS OF COGNITIVE ENGAGEMENT IN UNIVERSITY STUDENTS

Wenzhe Deng
Guangzhou Tianhe District Private New Oriental Education and Training Center Co., Ltd, Guangzhou, China
719341074@qq.com

Abstract

This research paper explores the multi-dimensional factors influencing cognitive engagement among university students in Shanghai, integrating individual, familial, and institutional dynamics. Utilizing a mixed-methods approach, the study draws on data from the "China College Student Survey (CCSS)" to measure cognitive engagement through a specifically designed Likert scale. The study sample consists of 1,452 valid responses from 1,600 distributed questionnaires across six universities. Through descriptive statistics, correlation, and regression analyses, the research identifies significant determinants of cognitive engagement. Key findings indicate that

cognitive engagement is profoundly influenced not only by individual characteristics—such as holding leadership positions—but also by familial factors like parental education and social networks, as well as comprehensive institutional factors including teaching quality and university infrastructure. Notably, urban-rural backgrounds and family economic conditions emerge as significant moderators, affecting how institutional and familial inputs influence students' cognitive engagement. Results underscore the critical role of tailored educational strategies and supportive familial and institutional environments in enhancing cognitive engagement. The research contributes to educational theory by providing empirical support for the integration of multi-dimensional factors in understanding student engagement, offering actionable insights for educational policy makers and institution administrators aiming to foster enriched learning environments.

Keywords

Cognitive Engagement, Individual Factors, Familial Factors, Institutional Factors

1. Introduction

Student engagement as a concept in education that has been referred to in the early 20th century is a pivotal phenomenon that is underpinned by students' time and effort and universities' resources for learning activities' improvement (Wong & Liem, 2022). Thus, this engagement is not about the mere participation, but it involves all the aspects of behavior, emotions, and cognition, impacting the academic performance greatly (Chiu, 2021). Behavioral engagement implies students' visible participation and obvious contribution to educational activities (Lai et al., 2021). Emotional engagement focuses on the feelings of excitement, energy, and emotional connection with learning, while cognitive engagement is about mental effort and solving learning matters (Lim et al., 2020). While cognitive engagement deals with the application of deep cognitive strategies and self-regulation, which are both necessary for the understanding of complex concepts and learning skills (Liu et al., 2022).

This study concentrates on cognitive engagement among university students, exploring how individual, familial, and institutional factors affect their learning.

Drawing from the "China College Student Survey (CCSS)" and considering the developmental traits of university students, the research aims to enhance the quality of learning and overall higher education standards (Zhao et al., 2022).

This study is crucial as it deals with a vital gap in the literature that discusses the multi-dimensional determinants of cognitive engagement among university students. Cognitive engagement is a vital factor of academic success, yet the mechanisms involved are frequently overlooked in the educational research. An in-depth examination of the interplay between individual, familial, and institutional factors will give the study an overall impression of the forces that influence students' cognitive efforts and strategies. Theoretically, it broadens existing educational models by taking into account the multiple factors, and, therefore, it provides a multi-dimensional framework for cognitive engagement in higher education institutions. In a practical sense, the findings may help universities and policymakers develop focused interventions that improve students' academic results. Such interventions would be especially revolutionary in addressing the various demands of students, which could thus result in more individualized educational methods that would include the unique background of each student.

2. Literature Review

2.1 Learning Engagement

Learning engagement reflects the degree of a student's active participation and effort in effective educational activities, attracting widespread attention in the academic community (Tamah et al., 2020). Research on online English learning indicates that cognitive engagement primarily manifests through the application of robust learning strategies and proactive self-adjustment to enhance English learning efficacy (Lee, 2020). This is particularly evident in the selection and application of metacognitive strategies, such as setting learning goals, planning, self-evaluation, and creating learning opportunities (Shan, 2021). Studies have also identified learning engagement as a key factor in addressing student burnout, loneliness, and dropout issues (Singh et al., 2021). Higher levels of cognitive engagement create more learning

opportunities, facilitating the full realization of students' potential to apply cognitive regulation strategies in activities like learning design. Based on the internal feedback mechanisms of teacher-student interactions, further research has revealed that integrating strategies to enhance active engagement into instructional design benefits students' learning outcomes, particularly in English learning (Singh et al., 2021; Yusof et al., 2023).

2.2 Cognitive Engagement in Learning

Cognitive engagement in learning encompasses both deep and surface cognitive involvement. Deep cognitive engagement involves processing information in-depth and applying self-regulated learning strategies (Wen, 2021). This includes constructing cognitive structures by linking new knowledge with existing knowledge, engaging in self-reflection, planning, and other strategic applications. Surface cognitive engagement, in contrast, involves merely processing surface-level information and employing simple learning techniques, such as rote memorization (Pickering, 2017). Drawing on Bloom's Taxonomy of Educational Objectives, scholars have classified cognitive engagement into six aspects ranging from concrete to abstract: remember, understand, apply, analyze, evaluate, and create (Arievitch, 2020). This classification underscores that analyses of cognitive engagement in online learning often rely on content analysis (Peng, 2017). Ramirez-Arellano et al. (2019) developed a cognitive engagement scale that allows learners to self-report their level of engagement across four dimensions: emotional, resource management, cognitive, and metacognitive. Smart and Marshall (2013) has categorized cognitive engagement into five aspects: questioning, stating, reflecting, directing, and scaffolding.

2.3 Factors Influencing University Students' Development

The development of university students is influenced by a multifaceted array of factors, encompassing individual characteristics, familial backgrounds, and institutional environments. This review delves into these dimensions, drawing on empirical studies to shed light on their implications for student development.

2.3.1 Individual Factors

Research underscores that individual characteristics of university students significantly impact their developmental trajectories. Studies indicate variations in students' learning-related psychological capital, self-efficacy, and self-regulation based on geographical origins, prior achievements, and academic performance (Ben-Eliyahu et al., 2018). For instance, students who have received awards exhibit higher levels of psychological capital compared to their peers. Moreover, gender differences manifest in developmental stress, with female students and those from rural areas facing higher stress levels (Blumenfeld et al., 2006). Self-reported surveys reveal that students perceive individual factors as paramount in shaping their educational experiences. Effective learning strategies and motivation are highlighted as crucial for changing students' academic status and fostering career development (Liu & Duan, 2022). The literature also reveals a significant negative correlation between academic procrastination and self-efficacy, suggesting that higher levels of procrastination are associated with lower self-efficacy. Additionally, mobile phone dependency, prevalent among 53.83% of students, has been identified as a predictor of diminished learning capacity, pointing to the influence of non-cognitive factors on academic development (Barnes et al., 2019). Thus Hypothesis 1 is proposed.

Hypothesis 1: individual factors have a significant impact on university students' cognitive engagement;

2.3.2 Familial Factors

The family environment plays a critical role in shaping student development. Harmonious family environments strengthen students' sense of belonging to their universities (Lee & Shute, 2010). Studies exploring the relationship between family intimacy and academic burnout suggest that family closeness has a modulating mediating effect on students' experiences of burnout (Nolvi, 2012). The psychological health of students is also significantly influenced by parenting styles, with negative or inconsistent behaviors from parents predicting mental health issues. Conversely, positive expectations from mothers can mitigate feelings of loneliness (Wang et al.,

2019). Socioeconomic status and positive parenting styles are positively correlated with career development, underscoring the importance of family dynamics in educational outcomes (Amiri et al., 2019). Furthermore, students from single-parent families or those experiencing adverse family structures report lower psychological capital, indicating that family structure impacts academic optimism and mental well-being (Garg et al., 2007). Thus Hypothesis 2 is proposed.

Hypothesis 2: Familial factors have a significant impact on university students' cognitive engagement;

2.3.3 Institutional factors

Institutional factors are significant determinants of student development. Effective teaching strategies enhance learning enthusiasm and efficiency, with student-centered pedagogies providing learners with more opportunities for growth, interest, and problem-solving capabilities (Graham et al., 2023). Research-oriented learning, especially in mathematics education, is advocated as a method for transforming learning modalities, necessitating a process of inquiry and skepticism (Watt & Goos, 2017). Additionally, different courses and teaching activities influence student development, with innovative teaching designs encouraging creativity and adaptability in learning (Sanders, 2013). The quality of interpersonal relationships between teachers and students is identified as a key factor in educational success. Harmonious relationships contribute to academic achievement and satisfaction with university life (Joo et al., 2017). However, the current state of teacher-student relationships in universities, characterized by an overemphasis on teacher authority and a lack of democratic interaction, has been critiqued for limiting the formation of constructive educational ecosystems (Gregory & Korth, 2016). Surveys indicate dissatisfaction with teacher-student relations, with a significant proportion of students experiencing feelings of alienation and disconnection from their instructors, ultimately affecting their academic engagement and performance (Pöysä et al., 2019). Thus Hypothesis 3 is proposed.

Hypothesis 3: Institutional factors have a significant impact on university students'

cognitive engagement.

3. Methodology

3.1 Research Design

The study adopts a mixed-methods approach, incorporating both quantitative and qualitative methodologies through the use of surveys and interviews. This design enables a comprehensive understanding of student engagement, encompassing both structural dimensions and the impact of various influencing factors. To fully understand the complexities of student engagement, the study breaks down the analysis into three main categories: individual factors, familial factors, and institutional factors. Each category provides unique insights into the different forces that influence students' educational experiences.

Individual factors include gender, only child status, transfer status, and whether the student has held a class leadership role, all coded as binary variables with reference categories set as female, not an only child, no transfer, and not having held a class office, respectively.

Familial factors are comprised of six dimensions: rural-urban background (multi-categorical, with rural areas as the reference group), parental education level (measured in years of education with specified values for different educational stages), parental occupation (highest score among parents' occupations, with specific scores assigned to various occupations), family economic conditions (self-assessed by students on a 5-point scale), family relationships (a composite score from three questions concerning relationships with parents and family atmosphere), and family social network (calculated based on the number and occupational scores of close friends and relatives).

Institutional factors include infrastructure, atmosphere, teacher teaching ability, teacher engagement, teacher attention, and peer relationships. These were assessed through multiple questions for each factor, with responses ranging on a 5-point scale from "strongly disagree" to "strongly agree". University infrastructure and atmosphere scores were derived from questions about educational and living facilities,

respectively. Teaching ability was assessed through questions on teachers' suitability of teaching methods, classroom atmosphere, and use of modern teaching tools. Teacher engagement was measured by teachers' passion and energy in class, while teacher attention focused on out-of-class concern for students' lives. Peer relationships were evaluated based on the number of close friends students reported having in class.

3.2 Questionnaire

Central to this research is the deployment of the Likert scale to measure indicators related to student engagement. These indicators are categorized into two main types: structural indicators of student engagement and indicators of factors influencing student engagement. The former primarily examines the basic status of university student engagement to showcase the performance of students across key metrics of engagement and to compare differences, thereby analyzing intrinsic correlations. The latter seeks to understand the sources of influence on student engagement and the roles these influencing factors play in shaping the manifestation of student engagement. This will provide references for efforts to explore and improve the state of student engagement among university students. The survey instrument is developed with reference to the sub-dimensions of student learning cognitive engagement from the "China University Student Survey (CCSS)" and is tailored to incorporate questions characteristic of university students' cognitive engagement in learning, taking into account the developmental characteristics of university students. This results in a specialized scale measuring cognitive engagement among university students. Principal component analysis was utilized to derive factor scores representing students' cognitive engagement levels, with higher scores indicating greater levels of engagement. The reliability and validity of the scale were confirmed through testing, resulting in a Cronbach's alpha coefficient of 0.982 and a KMO value of 0.974.

3.3 Sampling

In this study, 1,600 questionnaires were distributed among six universities in Shanghai. Out of them, 1,452 were considered valid. This sample is a broad and varied

starting point for exploring the different elements of university students' cognitive engagement and factors that determine it allowing for a thorough investigation of the collected data.

3.4 Data Collection and Analysis

The quantitative data is analyzed using statistical methods to see whether there are patterns, correlations, and differences in student engagement and those factors that can affect it. Descriptive statistics, correlation analysis, and regression analysis are applied in order to break down the structural indicators of engagement and the effect of individual, familial, and institutional factors on cognitive engagement of students.

3.5 Model

To examine the factors affecting cognitive engagement among university students, a multivariate linear regression model was employed. The model is expressed as follows:

$$V_i = \beta_0 + \beta_j \sum_{j=1}^{J} \mathbf{P}_{ji} + \beta_k \sum_{k=J+1}^{K} F_{ki} + \beta_l \sum_{L=K+1}^{L} S_{ki} + \varepsilon_i$$

Where V_i represents the cognitive engagement score of the ith university student; P denotes individual factors; F represents familial factors; and S stands for university-related characteristics. J, K, and L indicate the number of variables associated with individual, familial, and institutional factors, respectively, with j, k, and l representing each variable within these categories. β reflects the partial effect of each independent variable on V, and ε represents the random error unexplained by the model.

4. Results

4.1 Regression Results

Table 4.1 presents the hierarchical regression results for the effects of individual, familial, and institutional factors on university students' cognitive engagement. Model 1 examines the impact of individual factors, Model 2 integrates both individual and familial factors, and Model 3 encompasses individual, familial, and institutional factors. The adjusted R^2 values increase from 0.021 in Model 1 to 0.708 in

Model 3, indicating a significant improvement in the model's explanatory power regarding students' cognitive engagement levels. The findings are detailed as follows:

Model 1 assesses the influence of individual characteristics on cognitive engagement among university students. The results show no significant gender differences in cognitive engagement levels. Similarly, there are no significant differences between only children and those with siblings, nor between students with and without transfer experiences. However, holding a class leadership role significantly affects cognitive engagement, with class officers showing a standardized score increase of 0.308 ($p<0.001$) compared to non-officers.

Results from Model 2 reveal that, even after controlling for individual factors, certain familial factors significantly influence cognitive engagement. Compared to students from rural areas, those from towns and county cities do not show significant differences, while urban students exhibit cognitive engagement levels 0.151 points higher ($p<0.05$). Parental education level has a positive impact on cognitive engagement ($p<0.1$), with each unit increase in education level raising cognitive engagement scores by 0.013 points. Parental occupation and family economic conditions do not statistically affect cognitive engagement, whereas family relationships and social networks have a significant positive impact ($p<0.001$). A one-unit increase in family relationship scores boosts cognitive engagement by 0.152 points, and a one-unit increase in family social network scores elevates it by 0.004 points. This suggests higher parental education levels, harmonious family relationships, and stronger family social networks correlate with increased student cognitive engagement.

The inclusion of institutional factors in Model 3, after accounting for individual and familial variables, significantly influences cognitive engagement, with the adjusted R^2 rising from 0.059 to 0.708. This substantial increase in model fit underscores the considerable impact of institutional factors. University infrastructure, atmosphere, teacher teaching ability, teacher engagement, and teacher attention all significantly positively affect cognitive engagement ($p<0.001$). Each one-unit improvement in university infrastructure increases cognitive engagement scores by

0.039 points; a similar increase in university atmosphere elevates scores by 0.117 points. Enhancements in teacher teaching ability and engagement raise cognitive engagement scores by 0.129 and 0.084 points, respectively, while increased teacher attention boosts scores by 0.112 points. Additionally, peer relationships significantly positively impact cognitive engagement ($p<0.1$), with each one-unit increase in peer relations enhancing cognitive engagement scores by 0.001 points.

Table 4.1 *Analysis of the Factors Influencing Cognitive Engagement in University Students' Learning*

Variable	Cognitive Engagement Score		
	Model 1	Model 2	Model 3
Individual Factors			
Male	0.152 (0.039)	0.021 (0.038)	0.0042 (0.022)
Only Child	0.043 (0.042)	-0.087 (0.043)	-0.012 (0.025)
Transferred Students	-0.034 (0.039)	0.011 (0.039)	0.032 (0.022)
Hold a class leadership position	0.368*** (0.035)	0.384*** (0.039)	0.172*** (0.022)
Familial Factors			
Town		-0.014 (0.034)	-0.0452 (0.0154)
County		0.073 (0.063)	-0.0284 (0.541)
City		0.151* (0.073)	0.0272 (0.0421)
Parental Education Level		0.013 (0.007)	0.024 (0.004)
Parental Occupation Score		0.024 (0.041)	-0.015 (0.046)
Family Economic Condition		0.025 (0.046)	-0.011 (0.026)
Family Relationship		0.254*** (0.045)	0.025* (0.041)
Family Social Network		0.006*** (0.002)	0.004*** (0.002)
Institutional factors			
University Infrastructure			0.038*** (0.022)

University Atmosphere			0.116*** (0.022)
Teacher Teaching Ability			0.114*** (0.006)
Teacher Involvement			0.076*** (0.034)
Teacher Attention			0.121*** (0.021)
Peer Relationships			0.004 (0.002)
Constant Term	-0.121** (0.025)	-0.426*** (0.121)	-2.220*** (0.077)
N	892	892	674
adj R^2	0.028	0.049	0.762

Note: (1) Standard errors are in parentheses; (2) *p<0.05, **p<0.01, ***p<0.001; (3) a indicates that the reference group is rural areas.

4.2 Moderating Effects

The analysis explored the moderating effects of urban-rural backgrounds and family economic conditions on the relationship between institutional factors and university students' cognitive engagement.

To investigate the moderating role of urban-rural background between university infrastructure, peer relationships, and university students' cognitive engagement, the study included interaction terms in the model, controlling for individual, family, and university characteristics. The presence of significant interaction terms indicated a moderating effect.

Table 4.2 *The Moderating Role of Urban and Rural Backgrounds on the Impact of Cognitive Engagement in Learning*

Variable	Cognitive Engagement in Learning	
	Model 1	Model 2
Town*University Facilities	-0.007 (0.007)	
County*University Facilities	-0.023 (0.006)	
City*University Facilities	-0.004 (0.020)	
Town*Peer Relationships		-0.002***

		(0.002)
County*Peer Relationships		-0.003 (0.008)
City*Peer Relationships		0.001 (0.009)
OtherControl Variables	V	V
N	892	892
Adj R^2	0.727	0.748

Note: Other control variables include male, only child, transferred student, class officer, parents' occupational score, urban-rural background, family relations, family social network, institutional factors, university atmosphere, teacher's teaching ability, teacher involvement, and teacher attentiveness.

The interaction between urban-rural background and university infrastructure shows that the coefficient for town background is -0.008 ($p<0.1$), for county background is -0.043 ($p<0.01$), and for city background is 0.008 ($p<0.1$). This indicates that urban-rural background moderates the impact of university infrastructure on university students' cognitive engagement. Specifically, for students from rural, town, and city backgrounds, higher university infrastructure scores are associated with higher levels of cognitive engagement, with a significant positive effect evident across these backgrounds.

The interaction between urban-rural background and peer relationships shows coefficients of -0.002 ($p<0.001$) for town backgrounds, -0.003 ($p<0.1$) for county backgrounds, and 0.001 ($p<0.1$) for city backgrounds. This reveals that urban-rural background moderates the effect of peer relationships on cognitive engagement. Specifically, for students from rural and city backgrounds, cognitive engagement increases with better peer relationships. For those from county backgrounds, cognitive engagement decreases as peer relationships improve. For town backgrounds, peer relationships have almost no effect on cognitive engagement, suggesting that the impact of peer relationships on cognitive engagement is dependent on the student's urban-rural background.

The study further explored the moderating role of family economic conditions on the relationship between teacher teaching ability, teacher involvement,

and university students' cognitive engagement, including interaction terms in the model.

Table 4.3 *The Moderating Role of Family Economic Conditions on the Impact of Cognitive Engagement in Learning*

Variable	Cognitive Engagement in Learning	
	Model 1	Model 2
Financially Challenging*Teacher's Teaching Ability	0.046** (0.019)	
Average*Teacher's Teaching Ability	0.045* (0.016)	
Relatively Wealthy*Teacher's Teaching Ability	0.059** (0.025)	
Very Wealthy*Teacher's Teaching Ability	-0.095** (0.033)	
Financially Challenging*Teacher Engagement		0.145** (0.056)
Average*Teacher Engagement		0.085* (0.048)
Relatively Wealthy*Teacher Engagement		0.082 (0.073)
Very Wealthy*Teacher Engagement		-0.241** (0.099)
N	892	892
Adj R^2	0.727	0.748

Note: Other control variables include male, only child, transferred student, class officer, parents' occupational score, urban-rural background, family relations, family social network, institutional factors, university atmosphere, teacher's teaching ability, teacher involvement, and teacher attentiveness.

The interaction between family economic conditions and teacher teaching ability shows coefficients of 0.046 ($p<0.01$) for lower economic conditions, 0.045 ($p<0.05$) for average economic conditions, 0.059 ($p<0.01$) for higher economic conditions, and 0.095 ($p<0.01$) for the wealthiest conditions. This suggests that family economic conditions moderate the effect of teacher teaching ability on cognitive engagement. Higher teaching ability positively affects students across various economic backgrounds, with the most significant positive impact on the wealthiest students, indicating that the influence of teacher teaching ability on cognitive

engagement depends on family economic conditions.

The interaction between family economic conditions and teacher involvement shows a coefficient of 0.145 ($p<0.01$) for lower economic conditions, indicating that these conditions can moderate the effect of teacher involvement on cognitive engagement. For average economic conditions, the coefficient is 0.085 ($p<0.05$), showing a similar moderating effect. For higher economic conditions, the coefficient is not significant ($p>0.1$), indicating no moderating effect, while for the wealthiest conditions, the coefficient is -0.241 ($p<0.01$), suggesting that wealthier family conditions can significantly alter the impact of teacher involvement on cognitive engagement, potentially diminishing its positive effects.

4.3 Group Regression

The disparities in educational resources available to university students from different urban and rural backgrounds likely lead to variations in their cognitive engagement in learning. Students from rural, town, county, and city backgrounds experience different learning environments, family conditions, and the quality of universities they attend. These background differences contribute to the levels of cognitive engagement in learning among university students. This section explores whether the effects of individual characteristics, family features, and university attributes on cognitive engagement differ based on the urban-rural distribution. The analysis conducted separate regression analyses for students from rural, town, county, and city backgrounds.

Overall, the selected independent variables explained 72.6% of the variance in cognitive engagement for students with rural backgrounds, 67.9% for town backgrounds, 65.6% for county backgrounds, and 74.9% for city backgrounds. Regarding individual factors, gender, being an only child, and having a history of transferring universities did not significantly impact cognitive engagement across all backgrounds. Holding a class leadership role significantly positively affected cognitive engagement for students with rural ($p<0.05$) and town ($p<0.01$) backgrounds but had no significant impact on students from county and city backgrounds.

In terms of family factors, parental education level, parental occupation, and family economic conditions did not significantly influence cognitive engagement across any backgrounds. Family social networks had no significant impact on students with rural and county backgrounds but showed a significant positive effect on those from town ($p<0.1$) and city ($p<0.001$) backgrounds.

Regarding institutional factors, university infrastructure significantly positively influenced cognitive engagement for students with rural ($p<0.01$) and town ($p<0.05$) backgrounds but not for those from county and city backgrounds. Each unit increase in university infrastructure scores raised cognitive engagement by 0.045 points for rural and 0.068 points for town backgrounds. University atmosphere significantly positively affected cognitive engagement for students with rural, town, and city backgrounds ($p<0.001$), with each unit increase raising cognitive engagement by 0.267, 0.246, and 0.185 points, respectively. Teacher teaching ability had a significant positive impact across all backgrounds ($p<0.001$), with each unit increase raising cognitive engagement by 0.128, 0.146, 0.152, and 0.143 points for rural, town, county, and city backgrounds, respectively. Teacher involvement significantly positively influenced cognitive engagement for students with rural backgrounds ($p<0.01$), with each unit increase raising cognitive engagement by 0.079 points, but had no significant impact on students from town, county, and city backgrounds. Teacher attention significantly positively affected students with rural, town, and city backgrounds, with each unit increase raising cognitive engagement by 0.265, 0.073, and 0.149 points, respectively, but had no significant impact on students from county backgrounds. Peer relationships significantly positively influenced cognitive engagement for students with rural backgrounds ($p<0.001$), with each unit increase raising cognitive engagement by 0.002 points, but had no significant effect on students from town, county, and city backgrounds.

Table 4.4 *Regression Analysis of Cognitive Engagement in Learning Among University Students by Urban and Rural Backgrounds*

Independent Variable	Village	Town	County	City
Male	-0.004	-0.003	-0.099	-0.003

	(0.028)	(0.045)	(0.114)	(0.028)
Only Child	-0.001 (0.034)	-0.026 (0.047)	0.191 (0.123)	-0.071 (0.059)
Transferred Students	0.016 (0.027)	0.069 (0.048)	-0.107 (0.110)	0.024 (0.070)
Hold a class leadership position	0.077* (0.028)	0.047* (0.045)	0.078 (0.120)	0.047 (0.062)
Parental Education Level	0.019 (0.005)	-0.021 (0.008)	0.017 (0.019)	0.004 (0.010)
Parental Occupation Score	0.006 (0.009)	-0.017 (0.013)	-0.070 (0.030)	0.004 (0.016)
Family Economic Condition	-0.034 (0.025)	0.077 (0.049)	0.049 (0.112)	0.078 (0.059)
Family Relationship	0.028 (0.014)	-0.021 (0.024)	0.052 (0.055)	-0.048 (0.029)
Family Social Network	0.021 (0.001)	0.002 (0.001)	-0.001 (0.003)	0.006*** (0.001)
University Facility	0.045** (0.015)	0.068* (0.023)	0.019 (0.056)	-0.013 (0.037)
University Atmosphere	0.267*** (0.015)	0.246*** (0.026)	-0.034 (0.072)	0.185*** (0.031)
Teacher Teaching Ability	0.128*** (0.013)	0.146*** (0.020)	0.152*** (0.057)	0.143*** (0.029)
Teacher Engagement	0.079** (0.031)	0.079 (0.051)	0.105 (0.149)	0.052 (0.077)
Teacher Attention	0.265*** (0.025)	0.073* (0.037)	0.002 (0.094)	0.149** (0.051)
Peer Relationships	0.002*** (0.001)	0.001 (0.001)	0.002 (0.094)	0.171** (0.051)
Constant Term	-3.246*** (0.097)	-3.171 (0.173)	-3.376*** (0.454)	-3.696*** (0.242)
N adj R^2	625 0.726	302 0.679	144 0.656	209 0.749

Note: (1) Standard errors are in parentheses; (2) *p<0.05, **p<0.01, ***p<0.001.

5. Discussion and Conclusion

This study focused on university students in Shanghai, a city with a superior industrial environment that provides a solid economic foundation and demand support for the development of higher education. Overall, the cognitive engagement scores of university students in Shanghai show a left-skewed distribution, with urban students generally exhibiting higher levels of engagement. Detailed discussions on individual, family, and institutional factors affecting students' cognitive engagement in learning are as follows:

The distribution of cognitive engagement scores among university students is generally left-skewed. An analysis based on individual differences revealed that class officers had significantly higher levels of cognitive engagement than non-officers, and students without a history of transferring universities had significantly higher engagement levels than those who had transferred. From a family perspective, economic conditions significantly affect cognitive engagement, with lower economic conditions being detrimental and higher conditions being favorable to students' cognitive engagement levels. Urban-rural background differences also play a role, with urban students having the highest levels of cognitive engagement, followed by town students, and county students having the lowest levels.

Leadership roles in class significantly benefit cognitive engagement, especially for students from rural and town backgrounds. This is consistent with Munna and Kalam (2021) findings that active cooperation in learning, rich learning experiences, and academic challenges significantly impact students' engagement.

Urban-rural backgrounds moderate the effects of university infrastructure and peer relationships on cognitive engagement. University infrastructure has a significant positive impact across different backgrounds, with the greatest effect observed for students from rural areas, followed by those from cities, and the least impact for town students (Baker & Gowda, 2010). This suggests that for students from rural areas, who typically have fewer material resources, improvements in university infrastructure can somewhat compensate for their disadvantages, thereby motivating them to engage more in their studies.

For students from rural and urban backgrounds, peer relationships significantly enhance cognitive engagement, with the greatest effect observed for urban students. Conversely, for county students, cognitive engagement decreases as peer relationships improve.

Family background moderates the impact of teacher teaching ability and teacher involvement on cognitive engagement. Students from less affluent families benefit more from improvements in teaching ability and teacher involvement,

indicating that while affluent family backgrounds may obscure the positive effects of teaching quality and teacher involvement, less advantaged backgrounds highlight their importance (Karabchuk & Roshchina, 2023).

The impact of individual, family, and institutional factors on cognitive engagement varies according to the students' urban-rural backgrounds. Specifically, holding a leadership position significantly positively affects students from rural and town backgrounds. Family social networks only significantly benefit students from urban backgrounds. University infrastructure significantly benefits students from rural and town backgrounds, while university atmosphere and teacher attention positively affect students across rural, town, and urban backgrounds (Hernández-Torrano, 2018). Teacher teaching ability has the largest positive impact on students from county backgrounds, whereas teacher involvement and peer relationships only significantly benefit students from rural backgrounds.

Reference

Amiri, L., Ebrahimi Moghadam, H., & Babakhani, N. (2019). Structural model of predicting academic engagement based on cognitive ability and socioeconomic status by mediating academic enthusiasm in students. *Journal of psychologicalscience*, *18*(74), 215-222.

Arievitch, I. M. (2020). Reprint of: The vision of Developmental Teaching and Learning and Bloom's Taxonomy of educational objectives. *Learning, culture and social interaction*, *27*, 100473.

Baker, R. S., & Gowda, S. M. (2010). An analysis of the differences in the frequency of students' disengagement in urban, rural, and suburban high schools. Educational data mining 2010,

Barnes, S. J., Pressey, A. D., & Scornavacca, E. (2019). Mobile ubiquity: Understanding the relationship between cognitive absorption, smartphone addiction and social network services. *Computers in Human Behavior*, *90*, 246-258.

Ben-Eliyahu, A., Moore, D., Dorph, R., & Schunn, C. D. (2018). Investigating the multidimensionality of engagement: Affective, behavioral, and cognitive engagement across science activities and contexts. *Contemporary educational psychology*, *53*, 87-105.

Blumenfeld, P. C., Kempler, T. M., & Krajcik, J. S. (2006). *Motivation and cognitive engagement in learning environments*. na.

Chiu, T. K. (2021). Digital support for student engagement in blended learning based on self-determination theory. *Computers in Human Behavior*, *124*, 106909.

Garg, R., Melanson, S., & Levin, E. (2007). Educational aspirations of male and female adolescents from single-parent and two biological parent families: A comparison of influential factors. *Journal of Youth and Adolescence*, *36*(8), 1010-1023.

Graham, C., Borup, J., Tuiloma, S., Arias, A. M., Caicedo, D. M. P., & Larsen, R. (2023). Institutional Support for Academic Engagement in Online and Blended Learning Environments: Exploring Affective, Behavioral, and Cognitive Dimensions. *Online Learning*, *27*(3), 4-40.

Gregory, A., & Korth, J. (2016). Teacher–student relationships and behavioral engagement in the classroom. In *Handbook of social influences in school contexts* (pp. 178-191). Routledge.

Hernández-Torrano, D. (2018). Urban–rural excellence gaps: Features, factors, and implications. *Roeper Review*, *40*(1), 36-45.

Joo, B.-K., Zigarmi, D., Nimon, K., & Shuck, B. (2017). Work cognition and psychological well-being: The role of cognitive engagement as a partial mediator. *The Journal of Applied Behavioral Science*, *53*(4), 446-469.

Karabchuk, T., & Roshchina, Y. (2023). Predictors of student engagement: the role of universities' or importance of students' background? *European Journal of Higher Education*, *13*(3), 327-346.

Lai, H.-M., Hsieh, P.-J., Uden, L., & Yang, C.-H. (2021). A multilevel investigation of factors influencing university students' behavioral engagement in flipped

classrooms. *Computers & Education, 175*, 104318.

Lee, C. (2020). A study of adolescent English learners' cognitive engagement in writing while using an automated content feedback system. *Computer Assisted Language Learning*, *33*(1-2), 26-57.

Lee, J., & Shute, V. J. (2010). Personal and social-contextual factors in K–12 academic performance: An integrative perspective on student learning. *Educational psychologist*, *45*(3), 185-202.

Lim, J. S., Choe, M.-J., Zhang, J., & Noh, G.-Y. (2020). The role of wishful identification, emotional engagement, and parasocial relationships in repeated viewing of live-streaming games: A social cognitive theory perspective. *Computers in Human Behavior*, *108*, 106327.

Liu, L., & Duan, Z. (2022). Influences of environmental perception on individual cognitive engagement in online learning: the mediating effect of self-efficacy. *International Journal of Emerging Technologies in Learning (iJET)*, *17*(4), 66-78.

Liu, S., Liu, S., Liu, Z., Peng, X., & Yang, Z. (2022). Automated detection of emotional and cognitive engagement in MOOC discussions to predict learning achievement. *Computers & Education*, *181*, 104461.

Munna, A. S., & Kalam, M. A. (2021). Impact of active learning strategy on the student engagement. *GNOSI: an interdisciplinary journal of human theory and praxis*, *4*(2), 96-114.

Nolvi, S. (2012). Individual, family and teacher level correlates of behavioral and cognitive school engagement. In.

Peng, W. (2017). Research on model of student engagement in online learning. *Eurasia Journal of Mathematics, Science and Technology Education*, *13*(7), 2869-2882.

Pickering, J. D. (2017). Cognitive engagement: A more reliable proxy for learning? *Medical Science Educator*, *27*(4), 821-823.

Pöysä, S., Vasalampi, K., Muotka, J., Lerkkanen, M. K., Poikkeus, A. M., & Nurmi, J.

E. (2019). Teacher–student interaction and lower secondary school students' situational engagement. *British Journal of Educational Psychology*, *89*(2), 374-392.

Ramirez-Arellano, A., Bory-Reyes, J., & Hernández-Simón, L. M. (2019). Emotions, motivation, cognitive–metacognitive strategies, and behavior as predictors of learning performance in blended learning. *Journal of Educational Computing Research*, *57*(2), 491-512.

Sanders, M. J. (2013). Classroom design and student engagement. Proceedings of the human factors and ergonomics society annual meeting,

Shan, L. (2021). Measuring cognitive engagement: An overview of measurement instruments and techniques. *International Journal of Psychology and Educational Studies*, *8*(3), 63-76.

Singh, L. B., Kumar, A., & Srivastava, S. (2021). Academic burnout and student engagement: a moderated mediation model of internal locus of control and loneliness. *Journal of International Education in Business*, *14*(2), 219-239.

Smart, J. B., & Marshall, J. C. (2013). Interactions between classroom discourse, teacher questioning, and student cognitive engagement in middle school science. *Journal of Science Teacher Education*, *24*(2), 249-267.

Tamah, S. M., Triwidayati, K. R., & Utami, T. S. D. (2020). Secondary school language teachers' online learning engagement during the COVID-19 pandemic in Indonesia. *Journal of Information Technology Education: Research*, *19*, 803-832.

Wang, M.-T., Degol, J. L., & Henry, D. A. (2019). An integrative development-in-sociocultural-context model for children's engagement in learning. *American Psychologist*, *74*(9), 1086.

Watt, H. M., & Goos, M. (2017). Theoretical foundations of engagement in mathematics. *Mathematics Education Research Journal*, *29*, 133-142.

Wen, Y. (2021). Augmented reality enhanced cognitive engagement: Designing classroom-based collaborative learning activities for young language

learners. *Educational Technology Research and Development*, *69*(2), 843-860.

Wong, Z. Y., & Liem, G. A. D. (2022). Student engagement: Current state of the construct, conceptual refinement, and future research directions. *Educational psychology review*, *34*(1), 107-138.

Yusof, R., Harith, N. H. M., Lokman, A., Abd Batau, M. F., Zain, Z. M., & Rahmat, N. H. (2023). A Study of Perception on Students' Motivation, Burnout and Reasons for Dropout. *International Journal of Academic Research in Business & Social Sciences*, *13*.

Zhao, S., Liang, Y., Hee, J. Y., Qi, X., & Tang, K. (2022). Difference in the sexual and reproductive health of only-child students and students with siblings, according to sex and region: Findings from the National College Student Survey. *Frontiers in Public Health*, *10*, 925626.