

Beyond Family Socioeconomic Status Academic Engagement and Home Learning Environment in Undergraduate Academic Achievement in China

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Abstract: Socioeconomic inequalities can remain relevant to students' academic experiences after entry into higher education, yet family socioeconomic status alone may not fully account for variation in undergraduate achievement. This study examined the associations of family socioeconomic indicators, home learning environment, and academic engagement with academic performance among undergraduates at North China University of Science and Technology in China. Using a quantitative cross-sectional design, data were obtained from 400 valid student questionnaires selected through a stratified sampling approach. Academic performance was measured by grade point average (GPA), while family socioeconomic status was represented by parental education, family income, and parental occupation. Pearson correlation, multiple regression, and analysis of variance were employed. All three socioeconomic indicators were positively associated with GPA, with correlations of $r = .29$ for parental education, $r = .25$ for family income, and $r = .21$ for parental occupation. Stronger associations were observed for home learning environment ($r = .41$) and academic engagement ($r = .47$). The regression model explained 29% of the variance in GPA, with academic engagement ($\beta = .33$) and home learning environment ($\beta = .28$) showing the largest standardized coefficients among the variables included. Significant differences in GPA were also observed across low-, middle-, and high-SES groups, $F(2, 397) = 6.12$, $p = .002$. These findings indicate that socioeconomic background remains associated with undergraduate achievement, while academic engagement and supportive home learning conditions provide additional explanatory value beyond conventional socioeconomic indicators. The study highlights the importance of considering both family resources and students' learning-related experiences when addressing academic disparities in higher education.

Keywords: Family socioeconomic status; academic engagement; home learning environment; academic achievement; educational inequality; undergraduate students; Chinese higher education.

1. Introduction

Socioeconomic inequality remains a persistent concern in education because differences in students' family backgrounds are closely associated with differences in educational opportunities and academic outcomes. Socioeconomic status (SES) is generally understood as a multidimensional construct reflecting a family's relative social and economic position and is commonly operationalized through parental education, household income, and parental occupation. These dimensions influence the material, cultural, and social resources available to students and may consequently shape their

educational experiences and achievement. A substantial body of research has documented positive associations between family SES and academic performance across educational contexts (Chmielewski, 2019; Sirin, 2005). Despite substantial expansion in educational access internationally, socioeconomic disparities in achievement have remained an important challenge, suggesting that access to education alone does not necessarily eliminate inequalities associated with family background (Chmielewski, 2019; OECD, 2022). The association between SES and academic achievement can operate through several mechanisms. Family income affects the resources that households can allocate to education, including books, digital technologies, tutoring, appropriate study spaces, and other learning opportunities. Students from economically disadvantaged households may have more limited access to such resources and may experience additional financial pressures that interfere with their educational experiences (Engzell et al., 2021). Parental education represents a different dimension of socioeconomic advantage because more highly educated parents may possess greater familiarity with educational systems, academic expectations, and strategies for supporting learning. Parental educational expectations and involvement can, in turn, contribute to students' motivation and educational achievement (Davis-Kean, 2005). Parental occupation may further reflect differences in economic stability, social resources, and access to networks that can support students' educational development. Taken together, these dimensions suggest that family socioeconomic background can remain relevant to academic achievement even after students have entered higher education. However, socioeconomic indicators alone may provide an incomplete account of differences in academic performance. The resources associated with family SES are embedded within students' everyday learning environments and may be translated into educational outcomes in different ways. One particularly relevant dimension is the home learning environment, which encompasses the availability of educational resources, suitable study conditions, parental encouragement, and other forms of support for learning. Supportive home environments can contribute to the development of productive study habits, educational motivation, and confidence in dealing with academic demands. Conversely, students whose home environments provide fewer learning resources or less academic support may encounter additional barriers to effective study. Existing research has emphasized the importance of family support and parental involvement for educational outcomes, although the nature and strength of these relationships vary across educational levels and social contexts (Hill & Tyson, 2009; Liu et al., 2020).

The home learning environment may remain relevant during higher education even though university students are expected to exercise greater independence than school-age learners. Earlier family experiences can shape study habits, educational expectations, learning strategies, and attitudes toward academic work that students carry into university. In addition, university students may continue to depend on their families for emotional, material, and educational support. This issue may be particularly relevant in the Chinese context, where educational achievement has traditionally received considerable family attention and where families frequently invest substantial resources in supporting their children's education (Liu et al., 2020; Zhang & Bray, 2023). Examining

the home learning environment alongside conventional SES indicators may therefore provide a more differentiated understanding of how family circumstances are associated with achievement after university entry. A second factor requiring attention is academic engagement. Academic engagement refers broadly to students' active involvement in learning and can encompass behavioral dimensions such as attending classes, participating in academic activities, completing assignments, persisting with academic tasks, and devoting time and effort to study. Engagement is particularly relevant in higher education because undergraduate students are increasingly responsible for organizing their own learning and responding independently to academic demands. Students who participate actively in academic activities and persist in their studies may therefore be better positioned to achieve favorable academic outcomes. Importantly, engagement shifts analytical attention from relatively distal family characteristics toward students' more immediate academic behaviors. Family background may structure educational opportunities, but students' participation in learning constitutes a more proximal component of the academic experience. These relationships can be understood through complementary theoretical perspectives. Social Capital Theory emphasizes resources embedded within social relationships and networks, including information, expectations, trust, guidance, and support that can facilitate educational action (Coleman, 1988). Within families, such resources may be reflected in parental encouragement, communication about education, and access to networks that help students navigate educational institutions. Cultural Capital Theory provides a related explanation by emphasizing the unequal distribution of culturally valued knowledge, dispositions, practices, and competencies that correspond with institutional expectations (Bourdieu, 2011). Parents with greater educational experience may be better positioned to transmit academic knowledge, learning practices, and familiarity with educational institutions, potentially providing their children with advantages that extend beyond financial resources.

Ecological Systems Theory further emphasizes that students' development occurs through interactions between individuals and multiple layers of their environment rather than through isolated characteristics (Bronfenbrenner, 1979). From this perspective, family socioeconomic resources, home learning conditions, students' academic behaviors, and university environments can be understood as interconnected components of a broader educational ecology. Combining these perspectives provides a rationale for examining SES together with home learning environment and academic engagement rather than treating socioeconomic background as a sufficient explanation of academic performance. Social and cultural capital perspectives illuminate differences in family resources and support, while an ecological perspective situates these resources within the environments in which students learn and develop. This multidimensional perspective is particularly pertinent to Chinese higher education. China has experienced substantial expansion of higher education since the large-scale enrollment reforms initiated in the late 1990s, greatly increasing opportunities for university participation. Yet increased access has also raised questions concerning whether students from different socioeconomic backgrounds experience comparable opportunities and outcomes after entering higher education. Research on educational inequality in China indicates that family background remains

associated with access to educational resources and opportunities, while urban–rural and socioeconomic disparities continue to characterize educational trajectories (Gu & Yeung, 2020; Li & Qiu, 2018). Students from comparatively advantaged families may enter university with stronger academic preparation and greater financial, cultural, and social resources, whereas students from disadvantaged backgrounds may face financial constraints and fewer opportunities for academic enrichment. Consequently, the expansion of university participation should not be equated automatically with equality of academic experience or outcomes. Socioeconomic differences may persist after admission because students arrive at university with unequal prior educational experiences and continue to have unequal access to family resources. For example, students receiving greater financial support may be better able to concentrate on their studies and participate in enrichment opportunities, whereas economically disadvantaged students may experience financial pressures alongside their academic responsibilities (Wang et al., 2021). Such inequalities make it important to move the analytical focus beyond access to higher education toward students' experiences and academic achievement within higher education.

Although the association between family SES and academic achievement is well established, several issues warrant further investigation in the undergraduate context. First, treating SES as a single composite characteristic can conceal differences among its components. Parental education, income, and occupation represent related but conceptually distinct resources and may not be equally associated with academic achievement. Second, focusing exclusively on these conventional indicators may understate the relevance of more immediate learning-related factors. Home learning conditions and academic engagement may be more proximal to students' everyday academic experiences than structural indicators of family background. Third, much of the literature concerning family environments, parental involvement, and academic achievement has focused on school-age populations. University students operate within a different educational environment characterized by greater independence and personal responsibility, making it important to examine whether and how family-related factors remain associated with achievement at this stage.

These issues are also evident in the Chinese context. Existing studies have documented relationships among family socioeconomic circumstances, educational resources, parental involvement, and student outcomes (Li & Qiu, 2018; Liu et al., 2020). Nevertheless, additional institution-level evidence is needed to understand how specific dimensions of socioeconomic background relate to actual academic performance among university students and how their associations compare with those of home learning environment and academic engagement. Such evidence is particularly useful for universities serving students from heterogeneous socioeconomic and regional backgrounds because students studying within the same institution may nevertheless arrive with substantially different family resources and educational experiences. The present study addresses this issue using data from undergraduate students at North China University of Science and Technology (NCUST). Rather than treating family SES as a comprehensive explanation of academic achievement, the study examines parental education, family income, and

parental occupation alongside home learning environment and academic engagement. Academic performance is assessed using grade point average (GPA). This approach permits comparison of the associations between relatively distal socioeconomic characteristics and more proximal learning-related factors within the same statistical framework. The study is guided by the argument that understanding undergraduate achievement requires moving beyond family socioeconomic status alone. This does not imply that socioeconomic background becomes irrelevant after university entry. Rather, it recognizes that academic achievement may reflect the intersection of structural family resources, immediate learning conditions, and students' own academic participation. Accordingly, examining these dimensions simultaneously may provide a more nuanced account of socioeconomic differences in higher education than examining family SES in isolation.

The study therefore addresses five research questions:

1. How are parental education, family income, and parental occupation associated with undergraduate students' academic performance?
2. How is the home learning environment associated with undergraduate students' academic performance?
3. How is academic engagement associated with undergraduate students' academic performance?
4. What are the relative contributions of parental education, family income, parental occupation, home learning environment, and academic engagement to explaining variation in undergraduate academic performance when considered simultaneously?
5. Does academic performance differ across low-, middle-, and high-SES groups?

By addressing these questions, the study contributes institution-specific evidence to research on socioeconomic inequality and undergraduate achievement in Chinese higher education. More specifically, it distinguishes among conventional components of SES and evaluates them alongside home learning environment and academic engagement. Because the study uses a cross-sectional correlational design, the analysis is concerned with associations and relative statistical contributions rather than causal effects. This distinction enables a more methodologically appropriate assessment of whether family socioeconomic indicators remain associated with achievement after learning environment and engagement are taken into account.

2. Method

2.1 Research Design and Setting

This study employed a quantitative, cross-sectional, correlational design to examine the associations of family socioeconomic status (SES), home learning environment, and academic engagement with undergraduate academic performance. Data were collected at a single point in time using a structured questionnaire. The design enabled examination of associations among the study variables without manipulating participants or their

educational environment. Given its cross-sectional nature, the study was designed to identify statistical relationships rather than establish causal effects. The methodological framework reported in the study similarly characterizes the study as quantitative, cross-sectional, and correlational.

The study was conducted at North China University of Science and Technology (NCUST), a comprehensive public university located in Tangshan, Hebei Province, China. The university offers undergraduate and postgraduate programs across multiple disciplines, including engineering, medicine, management, science, and the humanities. Its multidisciplinary undergraduate population includes students from different regional and socioeconomic backgrounds, providing an appropriate institutional context for examining variation in family socioeconomic circumstances and academic experiences. The study population consisted of students enrolled during the 2024–2025 academic year.

2.2 Participants and Sampling

The target population comprised full-time undergraduate students enrolled at NCUST during the 2024–2025 academic year. A stratified random sampling procedure was used, with students stratified by academic year and faculty or academic discipline. Participants were then randomly selected within the relevant strata to improve representation of different stages of undergraduate study and disciplinary backgrounds. The study specifies these sampling dimensions and identifies full-time undergraduate students as the target population.

For sample-size determination, the study reports an undergraduate population of approximately 12,000 students and applies Slovin's formula using a 5% margin of error, producing an estimated minimum sample of approximately 387 respondents. The study therefore targeted a sample above this minimum. A total of 450 questionnaires were distributed and 423 were returned. Following data screening, 23 questionnaires were excluded because they were incomplete or contained inconsistent responses. The final analytical sample therefore comprised 400 undergraduate students. Students were eligible if they were full-time NCUST undergraduates enrolled during the study period, voluntarily agreed to participate, and completed the questionnaire. Postgraduate students, students who were not currently enrolled as full-time undergraduates, and respondents providing incomplete or inconsistent questionnaires were excluded.

2.3 Measures

Data were collected using a structured questionnaire comprising sections on demographic characteristics, family socioeconomic status (SES), home learning environment, academic engagement, self-perceived academic competence, and academic performance. Consistent with the research questions and analytical framework of the present study, the analysis focused on parental education, family income, parental occupation, home learning environment, academic engagement, and academic performance. Table 1 summarizes the operationalization, measurement, and analytical role of the variables included in the analysis.

Table 1. Study Variables and Measurement

Variable	Operationalization	Measurement	Analytical role
Parental education	Highest educational qualification of parents	Categorical	Predictor
Family income	Approximate family income level	Categorical	Predictor
Parental occupation	Occupational category of parents	Categorical	Predictor
Home learning environment	Availability of learning resources and academic support within the home	Five-point Likert-type items	Predictor
Academic engagement	Attendance, participation, assignment completion, study effort, and help-seeking	Five-point Likert-type items	Predictor
Academic performance	Self-reported current GPA	Five ordered GPA categories	Outcome

Note. SES = socioeconomic status; GPA = grade point average.

Family socioeconomic status

Family SES was represented by three indicators consisting of parental education, family income, and parental occupation. Participants reported their parents' educational qualifications and occupational categories as well as their approximate family income category. These indicators were retained separately in the analysis to represent the educational, economic, and occupational dimensions of family socioeconomic background rather than treating SES as a single undifferentiated construct.

Home learning environment

Home learning environment represented the educational resources and academic support available within students' family environments. The measure comprised five items addressing access to a quiet place for studying, parental encouragement for academic achievement, access to educational resources, parental interest in academic progress, and family support for educational goals. Responses were recorded on a five-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with higher scores indicating a more supportive home learning environment.

Academic engagement

Academic engagement represented students' behavioral involvement and commitment to their studies. The measure comprised five items assessing regular class attendance, active participation in classroom discussions, timely completion of assignments, allocation of sufficient time to studying, and help-seeking when experiencing academic difficulties. Responses were recorded on a five-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with higher scores indicating greater academic engagement.

Academic performance

Academic performance was assessed using students' self-reported current grade point average (GPA). Participants reported their GPA using five ordered response categories consisting of below 2.0, 2.0–2.5, 2.6–3.0, 3.1–3.5, and above 3.5. Academic performance was therefore collected as an ordered categorical measure based on students' self-reported GPA.

Validity and reliability

The questionnaire underwent expert review to assess content and face validity before the main data collection. A pilot study involving 30 undergraduate students was subsequently conducted to evaluate the clarity of the questionnaire and the reliability of the multi-item measures. Feedback obtained during the pilot study resulted in minor wording revisions before the questionnaire was finalized.

Internal consistency was assessed using Cronbach's alpha. The five-item home learning environment measure yielded a Cronbach's alpha coefficient of $\alpha = .82$, while the five-item academic engagement measure yielded $\alpha = .85$. These coefficients indicated satisfactory internal consistency for the two multi-item measures included in the present analysis.

2.4 Data Collection and Ethical Considerations

Data collection commenced after the research instrument had been reviewed, pilot-tested, and finalized and the necessary institutional permissions had been obtained. Participants were selected according to the stratified sampling procedure and approached through appropriate university channels. Depending on accessibility, questionnaires were administered in either paper-based or online form. Students were instructed to complete the questionnaire independently, and completion required approximately 10–15 minutes.

Before participation, students were informed of the purpose and procedures of the study. Participation was voluntary, and students could decline participation or withdraw without penalty. Informed consent was obtained before questionnaire completion. Participants were also informed that their responses would be used for academic research purposes and treated confidentially. No personally identifying information was collected, thereby maintaining respondent anonymity.

2.5 Data Analysis

Completed questionnaires were screened before statistical analysis. Data screening included checks for completeness, consistency, and potential data-entry errors. Questionnaires that did not meet the screening criteria were excluded from the final analytical sample. Descriptive statistics were used to summarize participant characteristics and the distributions of the principal study variables. Means and standard deviations were calculated for the home learning environment and academic engagement measures and for academic performance as represented in the analytical dataset.

Pearson correlation coefficients were calculated to examine bivariate associations between parental education, family income, parental occupation, home learning environment, academic engagement, and academic performance. Multiple regression analysis was subsequently conducted to examine the relative statistical contributions of parental education, family income, parental occupation, home learning environment, and academic engagement to academic performance when the variables were considered simultaneously. Standardized regression coefficients were used to compare the relative magnitude of the associations among the predictors included in the model.

Differences in academic performance across low-, middle-, and high-SES groups were examined using one-way analysis of variance (ANOVA). Statistical significance was evaluated using an alpha level of .05. Exact p values are reported where available, with values below .001 reported as $p < .001$.

Because the study employed a cross-sectional correlational design, the statistical analyses were used to identify associations rather than causal relationships. Regression coefficients were therefore interpreted as conditional statistical associations. Similarly, the term *predictor* refers to an explanatory variable included in the statistical model and does not imply temporal or causal prediction.

3. Results

3.1 Participant Characteristics and Descriptive Statistics

Following data screening, 400 valid responses were retained for analysis. Of these participants, 218 (54.5%) were male and 182 (45.5%) were female. The sample included undergraduate students from different academic years and disciplinary areas, consistent with the stratified sampling procedure.

Participants also represented heterogeneous socioeconomic backgrounds. The study indicates variation in parental education and occupation, while most respondents reported monthly family incomes within the middle-income range of RMB 3,000–6,000, with a substantial proportion also coming from lower-income households.

Descriptive statistics for the principal learning-related variables are presented in Table 2. Both home learning environment and academic engagement had an overall mean of 3.74 on the five-point response scale. For home learning environment, parental encouragement to achieve good academic results had the highest item mean ($M = 3.85$, $SD = 0.76$), whereas access to educational resources had the lowest ($M = 3.66$, $SD = 0.79$). For academic engagement, regular class attendance had the highest mean ($M = 3.95$, $SD = 0.71$), whereas active participation in classroom discussions had the lowest ($M = 3.55$, $SD = 0.83$).

Table 2. Descriptive Statistics for Home Learning Environment and Academic Engagement

Construct/item	<i>M</i>	<i>SD</i>
Home learning environment		
Quiet place for studying	3.70	0.82
Parental encouragement for academic achievement	3.85	0.76
Access to educational resources	3.66	0.79
Parental interest in academic progress	3.72	0.81
Family support for educational goals	3.79	0.74
Overall home learning environment	3.74	0.78
Academic engagement		
Regular class attendance	3.95	0.71
Active participation in classroom discussions	3.55	0.83
Completion of assignments on time	3.88	0.76
Sufficient time devoted to studying	3.67	0.79
Seeking help for academic difficulties	3.65	0.81
Overall academic engagement	3.74	0.78

Note. Responses were measured on a five-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

The item-level descriptive statistics in Table 2 reproduce those reported in the study. With respect to academic performance, the study reports an overall mean GPA of approximately 3.12 ($SD = 0.48$). Most respondents were concentrated within the moderate-to-higher GPA ranges, particularly between 2.6 and 3.5.

3.2 Correlations among Study Variables

Pearson correlation analyses were used to examine the associations between family socioeconomic indicators, home learning environment, academic engagement, and academic performance. As shown in Table 3, all five variables examined were positively and statistically significantly associated with GPA. Among the conventional SES indicators, parental education showed the largest correlation with academic performance ($r = .29$), followed by family income ($r = .25$) and parental occupation ($r = .21$). The study reports each of these associations as statistically significant at $p < .05$.

The associations were larger for the two learning-related variables. Home learning environment was moderately positively correlated with academic performance ($r = .41$, $p < .05$), while academic engagement showed the largest bivariate association with GPA ($r = .47$, $p < .05$).

Table 3. Correlations of Socioeconomic and Learning-Related Variables with Academic Performance

Variable	r with GPA	Significance
Parental education	.29	$p < .05$
Family income	.25	$p < .05$
Parental occupation	.21	$p < .05$
Home learning environment	.41	$p < .05$
Academic engagement	.47	$p < .05$

Note. GPA = grade point average. Statistical significance is reported at the level available in the study.

The correlation results therefore showed a consistent positive pattern across the study variables. Academic engagement had the largest observed correlation with GPA, followed by home learning environment, whereas the three family SES indicators showed smaller positive correlations. The home learning environment correlation reported in the study was $r = .41$, and the corresponding academic engagement correlation was $r = .47$.

3.3 Predictors of Academic Performance

Multiple regression analysis was conducted to examine the simultaneous statistical contributions of parental education, family income, parental occupation, home learning environment, and academic engagement to academic performance. The overall model yielded $R = .54$, $R^2 = .29$, adjusted $R^2 = .27$, with a standard error of the estimate of 0.42. Thus, the five variables included in the model collectively accounted for approximately 29% of the variance in academic performance.

As presented in Table 4, all five regression coefficients were positive and statistically significant. Academic engagement had the largest standardized coefficient ($\beta = .33$, $p < .001$), followed by home learning environment ($\beta = .28$, $p < .001$). Among the SES

indicators, parental education had the largest standardized coefficient ($\beta = .19, p = .002$), followed by family income ($\beta = .16, p = .009$) and parental occupation ($\beta = .13, p = .028$).

Table 4. Multiple Regression Predicting Academic Performance

Predictor	<i>B</i>	β	<i>t</i>	<i>p</i>
Parental education	0.18	.19	3.12	.002
Family income	0.14	.16	2.64	.009
Parental occupation	0.11	.13	2.21	.028
Home learning environment	0.27	.28	4.78	< .001
Academic engagement	0.32	.33	5.21	< .001

Note. $R = .54$; $R^2 = .29$; adjusted $R^2 = .27$; standard error of the estimate = 0.42. β = standardized regression coefficient.

These coefficients reproduce the regression results reported in the study. The original table reports $p = .000$ for home learning environment and academic engagement; following APA reporting conventions, these values are reported here as $p < .001$, because a probability value should not be reported as zero. The pattern of standardized coefficients was consistent with the bivariate results. Academic engagement showed the largest coefficient in the multivariable model, followed by home learning environment. The standardized coefficients for the three conventional SES indicators were smaller but remained statistically significant after the other variables in the model were considered. Importantly, these results indicate conditional statistical associations and should not be interpreted as evidence that academic engagement, home learning environment, or SES causally affected GPA. As illustrated in Figure 1, academic engagement showed the largest standardized regression coefficient ($\beta = .33$), followed by home learning environment ($\beta = .28$). The standardized coefficients for parental education ($\beta = .19$), family income ($\beta = .16$), and parental occupation ($\beta = .13$) were comparatively smaller. This pattern indicates that, when all five variables were considered simultaneously, academic engagement and home learning environment showed stronger conditional associations with academic performance than the three conventional socioeconomic indicators. These coefficients represent statistical associations within the cross-sectional model and should not be interpreted as evidence of causal effects.

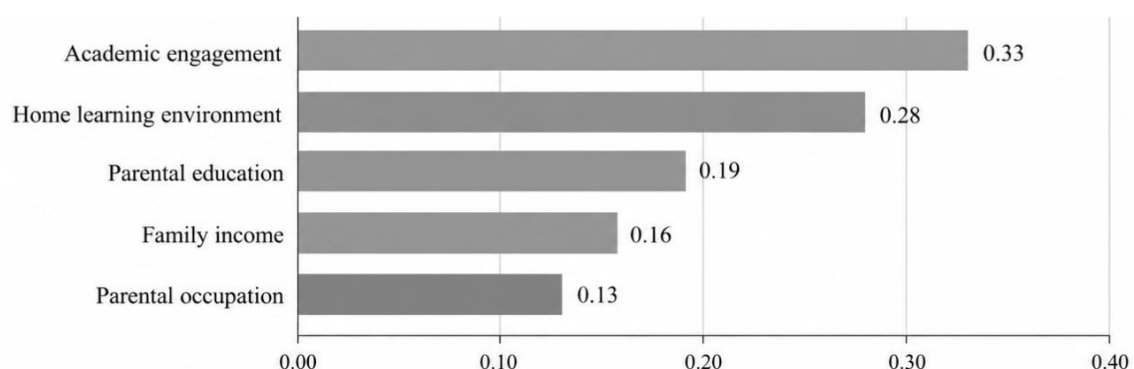


Figure 1. Standardized Regression Coefficients for Variables Associated with Academic Performance

3.4 Academic Performance across Socioeconomic Groups

Academic performance was compared across low-, middle-, and high-socioeconomic status (SES) groups. The descriptive results showed an increasing pattern in mean GPA

across the three groups. Students in the low-SES group ($n = 124$) had a mean GPA of 2.94 ($SD = 0.46$), compared with 3.11 ($SD = 0.43$) for students in the middle-SES group ($n = 198$) and 3.28 ($SD = 0.39$) for students in the high-SES group ($n = 78$).

Table 5. *Academic Performance across Socioeconomic Status Groups*

SES group	<i>n</i>	Mean GPA	<i>SD</i>
Low SES	124	2.94	0.46
Middle SES	198	3.11	0.43
High SES	78	3.28	0.39
Total	400	3.12	0.48

Note. SES = socioeconomic status; GPA = grade point average.

A one-way ANOVA indicated a statistically significant overall difference in academic performance across the three SES groups, $F(2, 397) = 6.12$, $p = .002$. Mean GPA increased descriptively from the low-SES group to the middle-SES group and from the middle-SES group to the high-SES group. Because post hoc pairwise comparisons were not reported, the omnibus ANOVA indicates an overall difference among the three groups but does not establish which specific pairs of SES groups differed significantly.

4. Discussion

The present study examined the associations of family socioeconomic background, home learning environment, and academic engagement with academic performance among undergraduate students at North China University of Science and Technology. Three principal patterns emerged. First, parental education, family income, and parental occupation were each positively associated with academic performance. Second, home learning environment and academic engagement showed stronger bivariate associations with GPA than the three conventional SES indicators. Third, when the variables were considered simultaneously, academic engagement and home learning environment had the largest standardized regression coefficients, while parental education, family income, and parental occupation remained statistically significant. The model accounted for 29% of the variance in academic performance. Academic performance also differed significantly across the low-, middle-, and high-SES groups. Together, these findings support the central premise of the study that understanding undergraduate achievement requires attention not only to socioeconomic background but also to students' immediate learning conditions and academic participation.

4.1 Principal Findings

The positive associations between the three SES indicators and academic performance are consistent with the broader literature linking family socioeconomic resources with educational achievement. Previous research has repeatedly shown that students from more socioeconomically advantaged families tend, on average, to demonstrate stronger academic outcomes than students from less advantaged backgrounds (Sirin, 2005). In China specifically, a meta-analysis of 78 independent samples involving 215,649 students found an overall positive association between family SES and academic achievement, although the magnitude of the relationship varied according to educational and

contextual characteristics (Liu et al., 2020). The present findings extend this general pattern to an undergraduate sample within a Chinese university context. Among the three conventional SES indicators, parental education displayed the largest bivariate association with GPA ($r = .29$) and the largest standardized regression coefficient ($\beta = .19$). Family income ($r = .25$; $\beta = .16$) and parental occupation ($r = .21$; $\beta = .13$) were also positively associated with academic performance, although their coefficients were smaller. These results indicate that different components of socioeconomic background are related to academic performance to different degrees rather than functioning as interchangeable indicators. More importantly for the central argument of this study, the learning-related variables demonstrated larger associations with academic performance. Academic engagement had the largest bivariate correlation ($r = .47$) and standardized regression coefficient ($\beta = .33$), followed by home learning environment ($r = .41$; $\beta = .28$). These patterns indicate that the more immediate conditions under which students study and participate in academic activities provide explanatory information beyond conventional indicators of socioeconomic position.

The findings should nevertheless be interpreted as associations rather than causal effects. The cross-sectional design does not establish that higher engagement or a more supportive home learning environment produces higher GPA. Higher-performing students could, for example, become more academically engaged, and unmeasured characteristics could contribute to both engagement and achievement. The regression coefficients establish conditional statistical relationships within this sample rather than temporal or causal pathways.

4.2 Family Socioeconomic Background and Academic Achievement

The positive association between parental education and academic performance is theoretically consistent with both cultural and social capital perspectives. Parents with greater educational experience may possess greater familiarity with academic expectations, educational institutions, and strategies for navigating educational challenges. They may consequently be better positioned to provide academically relevant guidance and transmit educational expectations and practices to their children (Bourdieu, 2011; Coleman, 1988). Previous Chinese research has similarly identified parental education and home educational resources as important correlates of academic achievement (Zhao & Bodovski, 2020). Parental education may remain relevant even after students enter university. Although undergraduate students exercise considerably more academic independence than school-age students, university entry does not necessarily eliminate previously accumulated differences in cultural resources, study practices, educational expectations, or familiarity with academic institutions. In this sense, the association observed in the present study may reflect socioeconomic differences accumulated across students' earlier educational trajectories as well as continuing family support.

Family income was also positively associated with GPA. Economic resources can affect students' access to educational materials, digital technologies, suitable study conditions, tutoring or supplementary learning opportunities, and other resources that facilitate

academic participation. Financial circumstances may also affect the extent to which students can concentrate on their studies without competing economic pressures. The positive association identified here is therefore consistent with the broader proposition that material resources constitute one pathway through which socioeconomic inequality is reflected in educational outcomes. Parental occupation showed the smallest of the three SES coefficients but remained positively associated with academic performance. Occupational status can reflect several dimensions of family advantage, including economic security, educational experience, professional networks, and social resources. Its smaller coefficient relative to parental education suggests that these SES dimensions should not automatically be treated as equivalent. This distinction is important because SES is inherently multidimensional. A student may come from a household characterized by relatively high parental education but modest income, or comparatively high income but lower formal educational attainment. Analyzing the components separately therefore provides more information than assuming that a single SES measure captures all dimensions of family advantage. The group comparison reinforces this general socioeconomic pattern. Mean GPA increased from 2.94 among low-SES students to 3.11 among middle-SES students and 3.28 among high-SES students, with a statistically significant overall group difference, $F(2, 397) = 6.12, p = .002$. This pattern is consistent with previous Chinese evidence showing positive associations between family SES and academic achievement (Liu et al., 2020; Xue et al., 2020). However, because no post hoc pairwise comparisons were reported, the present results establish an overall difference among the three groups but do not establish which particular SES groups differed significantly from one another.

4.3 Academic Engagement and Home Learning Environment

One of the most noteworthy findings was the comparatively strong association between academic engagement and academic performance. Academic engagement had the largest correlation with GPA and the largest standardized coefficient in the regression model. This pattern is consistent with previous evidence showing positive relationships between student engagement and academic achievement. A meta-analysis by Lei et al. (2018), for example, found an overall positive association between engagement and academic achievement across a large body of studies. More recent meta-analytic evidence likewise indicates significant associations between multiple forms of engagement and achievement.

This finding is particularly relevant at the undergraduate level because university learning places considerable responsibility on students to organize their time, attend learning activities, complete academic tasks, study independently, and seek assistance when necessary. The engagement measure in the present study captured behaviors such as regular class attendance, completing assignments on time, participating in classroom discussions, devoting time to studying, and seeking help when encountering academic difficulties. Such behaviors are closely situated within students' immediate academic experiences. The finding does not imply that engagement is independent of socioeconomic background. Family circumstances may shape opportunities for engagement by influencing access to resources, time available for study, academic

expectations, psychological support, and the conditions under which students undertake university work. Evidence from Chinese student populations has similarly suggested that family resources, parental involvement, student engagement, and academic achievement can be interconnected, although the nature of these relationships depends on the population and study design (Chen et al., 2024). However, Chen et al. (2024) examined primary-school children using a longitudinal design during the COVID-19 period, whereas the present study concerns university students using cross-sectional data. Their findings therefore provide conceptual context rather than direct evidence about the mechanisms operating in the current undergraduate sample. In particular, the present study did not conduct formal mediation analysis and consequently cannot establish that engagement mediates the relationship between SES and academic achievement.

Home learning environment also showed a substantial positive association with academic performance. Students reporting stronger educational support and learning conditions at home tended to report higher GPA. The construct included parental encouragement, parental interest in academic progress, access to educational resources, a suitable place for studying, and family support for educational goals. These findings are compatible with research showing that home educational resources and family support can be associated with academic outcomes in Chinese students (Zhao & Bodovski, 2020). The importance of home learning environment at the undergraduate level deserves particular attention. Family support is often studied in primary and secondary education, where parents are expected to play a more active role in children's learning. University students are more autonomous, but autonomy does not imply complete separation from family circumstances. Material resources, encouragement, expectations, and supportive study conditions may remain relevant during higher education. The distinction between family SES and home learning environment is consequently important. SES primarily describes families' structural socioeconomic positions and resources, whereas home learning environment captures aspects of how students experience educational resources and support within everyday family life. Two families occupying similar socioeconomic positions may not necessarily provide identical learning environments. Conversely, families with limited economic resources may still provide substantial encouragement and educational support. This interpretation is consistent with an ecological understanding of academic development. From (Bronfenbrenner's ,1979) perspective, students' educational experiences occur within interconnected environments rather than being determined by a single background characteristic. The present findings fit such a perspective insofar as both relatively distal family characteristics and more proximal learning experiences were associated with academic performance.

4.4 Theoretical and Practical Implications

The findings have implications for how socioeconomic inequality in higher education is conceptualized. A narrow SES explanation would focus primarily on parental education, income, and occupation. The present results indicate that these characteristics matter, but they do not constitute the entire empirical picture. Home learning environment and academic engagement showed larger standardized coefficients than any individual SES

indicator when the variables were considered within the same regression model. This pattern is compatible with the complementary theoretical perspectives underpinning the study. Cultural capital theory draws attention to educationally valued knowledge, dispositions, and practices transmitted through family environments (Bourdieu, 2011), while social capital theory emphasizes resources accessible through relationships, expectations, guidance, and social networks (Coleman, 1988). Ecological systems theory broadens the perspective further by locating individual development within interacting social environments (Bronfenbrenner, 1979). Considered together, these perspectives suggest that socioeconomic position may be relevant to achievement while students' immediate learning environments and academic behaviors remain important components of their educational experience. The results also have practical implications for universities. Family socioeconomic characteristics such as parental education or occupation are not readily modifiable by higher education institutions. Academic engagement and students' learning conditions, by contrast, identify areas in which institutional support may be more feasible. Universities can provide accessible study spaces, digital and library resources, academic advising, tutoring, peer-learning opportunities, and mechanisms for identifying students experiencing academic or financial difficulties. Such provision may be particularly relevant for students whose family circumstances afford fewer educational resources.

The engagement findings similarly suggest the value of educational environments that facilitate consistent participation in learning. Academic advising, timely formative feedback, accessible instructor support, structured peer learning, and opportunities for meaningful classroom participation may help create conditions conducive to engagement. These implications should nevertheless be regarded as practice considerations informed by observed associations, not as interventions whose causal effectiveness was tested by the present study. The results therefore do not support the interpretation that individual effort simply overrides socioeconomic inequality. Such an interpretation would overlook the fact that engagement itself occurs within unequal material, social, and educational conditions. A more appropriate interpretation is that undergraduate achievement is associated with both structural family characteristics and more proximal learning-related experiences.

4.5 Limitations and Future Research

Several limitations qualify the interpretation of these findings. First, the cross-sectional design prevents conclusions about temporal ordering or causality. Although SES indicators, home learning environment, and academic engagement were statistically associated with GPA, the study cannot establish the direction of these relationships. Longitudinal research would be valuable for examining how family circumstances, engagement, and achievement develop across students' university careers. Second, the study was conducted at a single university in China. NCUST provides a useful context because its students represent different disciplines and socioeconomic backgrounds, but the sample should not be interpreted as nationally representative of Chinese undergraduates. Future research could employ multi-institutional samples incorporating

universities from different provinces, institutional tiers, urban and regional settings, and disciplinary profiles.

Third, several measures relied on student self-report, including the home learning environment, academic engagement, socioeconomic information, and reported academic performance. Self-reported measures may be affected by recall error, social desirability, or differences in respondents' interpretations. Future studies could combine questionnaires with verified academic records and, where feasible, independently measured socioeconomic information. Fourth, the measurement of academic performance requires particular caution. The questionnaire records GPA using ordered categories, whereas the study subsequently reports continuous GPA means and applies Pearson correlation, multiple linear regression, and ANOVA. This inconsistency should be checked against the original dataset before journal submission. If only categorical GPA data are available, analytical approaches appropriate for ordinal outcomes should be considered. Fifth, although the regression model explained 29% of the variance in GPA, a substantial proportion of variation remained unexplained. Academic performance is likely associated with factors not included in the present analysis, potentially including prior academic achievement, academic motivation, self-regulation, mental well-being, instructional quality, peer relationships, field of study, and institutional characteristics. Future research could test broader models incorporating individual and institutional factors. Finally, the present analysis did not formally test mediation or moderation. Although the theoretical framework provides reasons to consider relationships among SES, home learning environment, engagement, and achievement, the current regression analyses do not establish mechanisms through which socioeconomic background is associated with performance. Future longitudinal studies could test theoretically specified mediation pathways while establishing appropriate temporal ordering. Research in Chinese school-age populations has already demonstrated the value of examining such mechanisms, but equivalent evidence should not be assumed for university students without direct investigation. Overall, the findings support a multidimensional account of undergraduate academic achievement. Family socioeconomic background remained associated with GPA, but home learning environment and particularly academic engagement showed comparatively larger associations within this sample. The findings therefore suggest that socioeconomic inequality in higher education is best examined alongside the learning conditions and academic experiences through which students navigate university study, rather than through family SES alone.

5. Conclusion

This study examined the associations of family socioeconomic background, home learning environment, and academic engagement with academic performance among undergraduate students at North China University of Science and Technology. The findings showed that parental education, family income, and parental occupation were each positively associated with academic performance. At the same time, home learning environment and academic engagement displayed comparatively stronger associations with GPA, indicating that undergraduate achievement is related not only to students'

socioeconomic backgrounds but also to the learning conditions and academic behaviors that characterize their educational experiences. The multivariable findings reinforce this conclusion. Together, parental education, family income, parental occupation, home learning environment, and academic engagement accounted for 29% of the variance in academic performance. Academic engagement had the largest standardized regression coefficient ($\beta = .33$), followed by home learning environment ($\beta = .28$), while parental education ($\beta = .19$), family income ($\beta = .16$), and parental occupation ($\beta = .13$) remained statistically significant. Academic performance also differed significantly across socioeconomic groups, $F(2, 397) = 6.12$, $p = .002$, with mean GPA increasing from 2.94 in the low-SES group to 3.11 in the middle-SES group and 3.28 in the high-SES group. These findings demonstrate that socioeconomic disparities remain visible within the university context while also showing that SES indicators alone do not account for the full variation in students' academic outcomes.

The study therefore contributes to a more multidimensional understanding of undergraduate academic achievement. Rather than treating socioeconomic status as a sufficient explanation of educational differences, the findings highlight the relevance of considering structural family resources alongside students' immediate learning environments and academic engagement. This perspective also has practical significance because universities cannot directly alter students' parental education, occupation, or family income, but they can strengthen access to academic resources, supportive learning environments, advising, and opportunities that facilitate sustained engagement. Such implications should be understood as directions suggested by the observed associations rather than as evidence of intervention effects. Finally, the findings should be interpreted within the boundaries of the study's cross-sectional, single-institution, and predominantly self-reported design. They establish statistical associations rather than causal relationships and should not be generalized automatically to all Chinese university students. Future multi-institutional and longitudinal research incorporating verified academic records and more comprehensive measures of student and institutional characteristics could clarify how socioeconomic resources, learning environments, and academic engagement interact over time. Within these limitations, the present study indicates that explaining undergraduate achievement in China requires looking beyond family socioeconomic status alone and considering the learning-related experiences through which students engage with higher education.

References

- Bourdieu, P. (2011). The forms of capital. In I. Szeman & T. Kaposy (Eds.), *Cultural theory: An anthology* (pp. 81–93). Wiley-Blackwell.
- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Harvard University Press.
- Chmielewski, A. K. (2019). The global increase in the socioeconomic achievement gap, 1964 to 2015. *American Sociological Review*, 84(3), 517–544.

- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, S95–S120.
- Davis-Kean, P. E. (2005). The influence of parent education and family income on child achievement: The indirect role of parental expectations and the home environment. *Journal of Family Psychology*, 19(2), 294–304.
- Engzell, P., Frey, A., & Verhagen, M. D. (2021). Learning loss due to school closures during the COVID-19 pandemic. *Proceedings of the National Academy of Sciences of the United States of America*, 118(17), e2022376118.
- Hill, N. E., & Tyson, D. F. (2009). Parental involvement in middle school: A meta-analytic assessment of the strategies that promote achievement. *Developmental Psychology*, 45(3), 740–763.
- Li, Z., & Qiu, Z. (2018). How does family background affect children's educational achievement? Evidence from contemporary China. *The Journal of Chinese Sociology*, 5, Article 13.
- Liu, J., Peng, P., & Luo, L. (2020). The relation between family socioeconomic status and academic achievement in China: A meta-analysis. *Educational Psychology Review*, 32(1), 49–76.
- Organisation for Economic Co-operation and Development. (2022). *Education at a glance 2022: OECD indicators*. OECD Publishing.
- Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research*, 75(3), 417–453.
- Wang, J., Chen, C., & Gong, X. (2021). The impact of family socioeconomic status and parenting styles on children's academic trajectories: A longitudinal study comparing migrant and urban children in China. *New Directions for Child and Adolescent Development*, 2021(176), 81–102.