Humanities and Social Sciences Letters
2025 Vol. 13, No. 3, pp. 1130-1144
ISSN(e): 2312-4318
ISSN(p): 2312-5659
DOI: 10.18488/73.v13i3.4390

Classroom engagement in Chinese private colleges: The role of teacher-student interactions and peer relationships

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Article History
Received: 27 February 2025
Revised: 18 July 2025
Accepted: 11 August 2025
Published: 1 September 2025

Keywords
Classroom engagement
Peer relationships
Private college
Teacher-student interactions.

ABSTRACT

Private higher education in China has emerged as a significant platform for the growth and advancement of higher education, serving as a primary catalyst for reform over more than four decades of transformation. This study focused on undergraduate students from Qingdao Hengxing College located in the eastern coastline region of China to examine the relationships among teacher-student interactions, peer relationships and classroom participation. The researcher employed a survey method, analyzing 534 valid questionnaire responses adopting a positivist paradigm and a quantitative research design. Descriptive statistics, simple linear regression and multiple regression analyses were used to interpret the data. The sample was fairly balanced in terms of gender and academic year. 48.5% were male and 51.5% were female with 22.4%, first-year, 27.5% second-year, 27.9% third-year and 22% fourth-year students. Results indicated a significant and positive relationship between classroom engagement and both teacher-student interactions (β=0.566 and $p<0.001$) and peer connections (β=0.550 and $p<0.001$). These factors explained 40.3% of the variance in classroom engagement. These findings highlight the vital importance of teacher-student interactions and peer relationships in promoting classroom engagement, offering valuable insights for teachers and policymakers in private higher education.

Contribution/Originality: This study employs an empirical methodology to evaluate the relevance and influence of teacher-student interactions and peer relationships on classroom engagement in the context of Qingdao Hengxing College, a private higher education institution in China, thereby enhancing the existing literature on classroom dynamics in non-public educational settings. It further underscores the crucial role teachers have in developing evidence-based strategies to enhance classroom engagement rates.

1. INTRODUCTION

Private higher education in China has emerged as a crucial element in the development of the nation's higher education system over the last four decades of reform and liberalization. It is essential for meeting the increasing demand for higher education and enabling educational changes. The "Outline of Strategic Planning for Enhancing Domestic Demand (2022-2035)" was published by the State Council of the People's Republic of China in 2023 after the 20th National Congress of the Communist Party of China. This article emphasizes the significance of private higher education in delivering many educational options and promotes the pursuit of excellence within the industry. Students involved in the learning process have changed their approach to learning since the middle of the 1980s. Numerous studies have investigated the relationship between academic achievement and student involvement.

While proper instructional input and a suitable classroom atmosphere are crucial, it has been highlighted, particularly in higher education, the best learning results arise when students actively interact with the subject matter and the institution. Many experts believe that increased participation will aid students in managing academic anxiety and cultivating a feeling of community, hence improving their academic performance. This research seeks to gather relevant information on classroom participation within the Chinese community.

The concept of engagement, first used in vocational settings was later adopted by scholars and practitioners in educational contexts after its introduction by Schaufeli, Martinez, Pinto, Salanova, and Bakker (2002). They emphasized the importance of educational initiatives that demonstrate certain qualities and exceptional student achievements. Finn and Zimmer (2012) argued that the experiences of dropout, loneliness and boredom among students in the 1980s shaped the understanding of student participation. Teachers would use effective pedagogical strategies in the classroom and programs would be considered successful when students had sufficient resources. The emotional and relational dynamics, as well as the classroom environment substantially impact instructional activities (Newmann, Wehlage, & Lamborn, 1992; Pike & Kuh, 2005).

In alignment with the principles of positive psychology, numerous researchers and practitioners have examined the impact of learner and teacher traits, such as motivation, happiness, enjoyment, and engagement. On learning outcomes, these factors are critical in fostering academic success (Gardner & Lambert, 1972; Trowler, 2010; Wang, Derakhshan, & Zhang, 2021). Egbert (2020) emphasized that effective learning occurs primarily among students who are actively involved in the classroom and motivated to seize learning opportunities. Recognizing that student involvement in decision-making processes can improve educational outcomes, universities and colleges have increasingly prioritized student participation (Tchibozo, 2007). According to Hunter, Tobolowsky, and Gardner (2010) higher education institutions must not only attract and retain students but also provide adequate support and integrate them meaningfully into academic programs. Students in higher education are viewed as active collaborators rather than passive consumers, taking part in various institutional initiatives (Lowe and El Hakim, 2020). Furthermore, Ross, Cen, and Zhou (2011) indicated that many students now view China as a global hub for higher education due to the country's growing investment in this sector. In this context, many private higher education institutions in China are committed to fostering student engagement, thereby enabling the assessment of reform initiatives and the overall quality of the educational system.

Qingdao Hengxing College, situated on China's eastern coastline provides an extensive private undergraduate curriculum. As of November 2024, the institution has 17,060 enrolled undergraduate students as reported by the Shandong Provincial Department of Education. Qingdao Hengxing College implements an innovative-focused development plan, utilizes a training model that corresponds with industry demands, and bases its educational philosophy on student-centered principles. It has emerged as a model for the high-quality progress of private undergraduate institutions with Chinese features, offering significant talent and intellectual support for regional economic and social growth. Chinese higher education is under increasing pressure in talent development due to its popularization although some urgent issues need prompt action. Chinese higher education institutions are confronting novel issues in sustaining classroom engagement. Various elements of institutional size, teacher expertise, classroom interactions, academic standards and graduate employment rates indicate the advancement of private higher education. Certain research indicates that classroom involvement is a crucial determinant of instructional quality. Research by Wang, Li, and Xiao (2024) indicates that active classroom interaction is associated with improved learning motivation and the development of analytical thinking and communication skills. Researchers contend that evaluating teacher-student connections and overall instructional quality depends on comprehending classroom engagement (Da Luz, 2015; Robinson, 2022). A crucial factor influencing overall academic achievement in higher education is classroom engagement. It improves comprehension of student learning, hence augmenting results and teaching strategies. The growing recognition of classroom engagement underscores its significance in assessing higher education' quality. Private colleges have challenges, such as

budgetary inconsistencies, disparities in teaching quality and restricted research capabilities compared to public universities. These disparities may impact students' classroom engagement and learning experiences, hence influencing their educational outcomes (Kang, Yang, Jiang, & Liu, 2018; Shu & Zhang, 2023).

Yuan (2024) study reveals that student involvement in the classroom is significantly enhanced by interactions between teachers and students and by peer connections. Multiple research examine the impact of teacher-student communication on student involvement in the classroom indicating that the contact between teachers and students affects the classroom environment (Chan & Lee, 2023; Thornberg, Forsberg, Hammar Chiriac, & Bjereld, 2022; Xie & Derakhshan, 2021). The interaction between teachers and learners spans the whole learning process. Hence, a constructive teacher-student connection may improve classroom engagement and result in superior academic performance (Thornberg et al., 2022). Lecturer assistance may significantly improve classroom engagement, thereby promoting student creativity and success (Chan & Lee, 2023). Current research has focused on assessing how the closeness of the teacher-student connection influences student engagement in the classroom. The performance of students depends on teacher-student interactions, thus, emotional closeness. The quality of these connections might improve student engagement and motivation (Xue & Li, 2023). Research demonstrates that lecturers' interactions with students at higher education institutions affect students' classroom engagement, development and the quality of talent cultivation. Further research is required to ascertain the measurable effects of teacher-student interactions and peer relationships on classroom engagement among students in China, particularly at Qingdao Hengxing College and comparable private undergraduate institutions, an area that remains inadequately examined in existing studies. Based on the preceding analysis, this gap is particularly crucial given that classroom engagement of students at Qingdao Hengxing College and similar private undergraduate colleges has clear issues. Yet, teacher-student interactions and peer relationships all affect classroom engagement. Simultaneously, current studies highlight that teacher-student interactions in colleges and universities (Chen, 2020; Wang, Xiang, & Li, 2019) present serious issues in the classroom engagement. For instance, the teacher-student interactions' in higher education show common issues, such as the unavailability of academic cognition and incorrect academic actions displayed by uncontrolled explicit truancy and implicit truancy (Guo et al., 2022). The success of students reflects both an aimless and utilitarian inclination simultaneously. Some researchers claim that Chinese university students have a modest degree of connection to classroom participation (Yang, Shao, & Zeren, 2020). One of the main concerns is how to inspire the students' engagement in class activities centered on the problems with student involvement in higher education itself as well as the obvious problems with their influencing elements, such as teacher-student interactions and peer relationships. The variations in teacher-student interactions and peer relationships that affect classroom engagement among students are examined in this paper.

The following research concerns are intended to be addressed to achieve the objectives:

1. Is there a significant relationship between teacher-student interactions and classroom engagement among undergraduate private college students in Shandong, China?
2. Is there a significant relationship between peer relationships and classroom engagement among undergraduate private college students in Shandong, China?
3. Is there a significant influence of teacher-student interactions and peer relationships on classroom engagement among undergraduate private college students in Shandong, China?

1.1. Research Hypothesis

Hypothesis 1

There is a significant relationship between teacher-student interactions and classroom engagement *among undergraduate private college students in Shandong, China.*

Hypothesis 2

There is a significant relationship between teacher-student interactions and classroom engagement *among undergraduate private college students in Shandong, China.*

Hypothesis 3

There is a significant influence of teacher-student interactions and peer relationships on classroom engagement among undergraduate private college students in Shandong, China.

2. LITERATURE REVIEW

Accomplishing academic goals and fostering good personality development depend on teacher-student interactions, a basic and pervasive way of involvement in the educational environment. According to Sun et al. (2022), teacher-student interaction is the dynamic contact between teachers and students shaped by the personal traits of both sides. Like all close partnerships, student–teacher connections are based on personality and trust. Teachers who show students that they appreciate having them in class and treat them with love and affection help students to feel they belong in the classroom (Martin & Dowson, 2009; Robinson, 2022; Shin & Idang, 2025). Students feel linked to their teachers and protected at the school when teachers are reliable sources of emotional support and practical help in trying circumstances.

Styles of supportive teacher-student interactions might inspire pupils to be more involved in their education. According to Zhan and Yan (2024) such supportive interaction techniques include giving positive feedback, motivating students to ask questions and expressing their ideas. Moreover, significant for cultivating students' self-confidence and enthusiasm for learning is the study conducted by Xue and Li (2023) which demonstrates that teacher-student interactions characterized by positive feedback and encouragement are essential.

2.1. Peers Relationships

Interpersonal relationships among peers are formed among individuals of similar age or psychological maturity (Yan, 2018). Ji (2024) characterizes peer connections as the paramount interpersonal social contacts that students encounter on campus, formed through shared academic and residential experiences. Zhong, Liu, and Chen (2014) observe that as students age, peer interactions increasingly influence their socialization and personal development. Positive peer relationships have been shown to enhance students' subjective well-being (Letkiewicz, Li, Hoffman, & Shankman, 2023) and mitigate negative emotions.

2.2. Classroom Engagement

Originating in the works of educational philosopher Ralph Tyler in the 1930s, who described it as the time and effort students commit to their academic endeavors, classroom engagement is a vital notion that has changed throughout time. Various scholars, such as Astin (1984); Tinto (1993) and Coe (1900) have elaborated on this concept throughout time, resulting in several meanings. These definitions have common underlying ideas even if their wording differs somewhat. Classroom engagement has been found by researchers as a multi-layered, developmental, and multi-dimensional notion including behavioral, affective and cognitive elements (Fredricks, Blumenfeld, & Paris, 2004; Korhonen, Mattsson, Inkinen, & Toom, 2019; Larson, Pas, Bottiani, Kush, & Bradshaw, 2021). Improved academic achievement, more cognitive skills, and generally favorable learning outcomes—all of which depend on high degrees of classroom participation are intimately related to each other (Kahu, 2013; Millard et al., 2013; Trowler, 2010).

According to Trowler (2010) student involvement basically consists of time and effort. Institutions and students use suitable technologies to enhance learning results, raise learner performance, strengthen institutional reputation and include students undergoing the process of acquiring knowledge. Teslenko (2019) argued that the involvement of students goes beyond learning tasks. Higher education institutions have committed to provide a

forum whereby students may actively express their opinions on curriculum development, staff recruitment, mental health issues, involvement in strategy formulation and policy-making conferences. Lowe and El Hakim (2020) underlined that institutions and students have to be alert for expected conflicts and disagreements and should be ready to resolve such problems via peaceful coexistence. According to Reeve (2012) participation refers to behavioral engagement indicating the effort and concentration on an educational project leading to active involvement. Agentic engagement is purposeful and proactive participation in the learning process while cognitive engagement emphasizes meaningful learning through conceptual comprehension in curriculum creation. Emotional engagement is reducing bad emotions and promoting good ones including creativity.

On the other hand, teachers and students argue that encouraging and keeping student participation in the classroom has become more challenging (Hiver, Al-Hoorie, & Mercer, 2021). Moreover, Egbert (2020) advised teachers to stress instructional goals to fit the capacities and desires of their students, thereby fostering their involvement in classroom activities. According to Xie and Derakhshan (2021) effective communication between teachers and students improves educational results for people from many backgrounds.

Many studies have shown a clear relationship between academic success and classroom participation. According to Bekkering and Ward (2020) higher degrees of classroom participation correlate with improved final exam results. According to Tomaszewski, Xiang, and Huang (2024) student involvement greatly influences academic performance. Therefore, engagement is quite important for bettering academic results. Similarly, Schnitzler, Holzberger, and Seidel (2021) found that students who have a superior academic self-concept typically participate more in the classroom, hence producing better academic outcomes. Wang (2022) underlined in China the importance of improving classroom involvement by means of bettering teaching approaches and learning surroundings. Research by Chang (2019) and Wang et al. (2019) underlined the need for encouraging teacher-student interactions and peer relationships.

2.3. Teacher-Student Interactions and Classroom Engagement

The promotion of classroom engagement mostly relies on teacher-student interactions. The attainment of educational objectives and the holistic development of students significantly rely on these linkages. Research by Reschly and Christenson (2022) indicates that students' levels of classroom engagement are significantly affected by teachers' attitudes and behaviors. Research demonstrates that academically prepared and actively engaged students tend to interact more often with their professors, hence enhancing their classroom involvement (Jiang, Zhu, Li, An, & Wang, 2024; Reschly & Christenson, 2022). Chen (2020) found that teacher-student interactions positively influence classroom engagement in several contexts, including instructional activities, extracurricular involvement and interdisciplinary learning, hence promoting students' overall development. Students' perceptions of effective teaching often center around their ideas on how teachers and the classroom environment influence their emotional and behavioral engagement in school. According to Thornberg et al. (2022) two primary dimensions of effective teaching emerged from these perceptions, *"teacher being"* and *"teacher doing"*.

2.4. Peer Relationships and Classroom Engagement

Numerous studies have shown that peer relationships positively affect classroom engagement. Wang (2024) study demonstrates that harmonious peer connections facilitate positive psychological development, hence enhancing engagement rates. Wentzel, Jablansky, and Scalise (2021) observed a robust relationship between academic achievement, classroom participation and peer relationships. Students who are well-accepted by their classmates often engage more actively in classroom activities, hence enhancing their academic achievement. Academic success is positively correlated with social competence among peers, showing that peer relationships might influence students' engagement and performance in academic endeavors.

There is little empirical information on the interplay among these three factors, particularly from the viewpoint of private college students despite several studies emphasizing the value of classroom engagement, teacher-student interactions and peer connections. The objective of this research is to address this gap by examining the relationships among these variables in undergraduate students at Qingdao Hengxing College. The findings will provide a comprehensive examination of the influence of interactions among teachers and students, classroom engagement and peer connections on academic outcomes with recommendations for improving pedagogical practices in private higher education institutions.

3. RESEARCH METHODOLOGY

Research designs aim to exactly show how to include quantitative elements and content as well as how to compile and examine data ahead of time (Davies, 2020). This study combines quantitative research with its aims in line.

This study used the survey technique. One of the necessary approaches and a generally used, accepted research tool is a survey. Scientists can evaluate and deduce a range of intangible elements, including concepts, knowledge, attitudes and beliefs concerning subjective awareness by means of investigations and studies (Stantcheva, 2023). Furthermore, they can offer basic data support for additional research and analysis.

3.1. Research Population and Sample Size

3.1.1. Population of Research

Private undergraduate Qingdao Hengxing College is located in Shandong province, China. The Shandong Provincial Department of Education's quality report claims that as of November 2024, 28,627 full-time students overall, including 17,060 undergraduates accounting for 64.28% of the total full-time student population. This study is to investigate the links between teacher-student interactions, peer relationships and classroom engagement among undergraduate students.

3.1.2. Respondent of this Study

Cohen, Manion, and Morrison (2017) and Althubaiti (2023) observed that there is no universal rule for determining an ideal sample size as it largely depends on the study's objectives and the characteristics of the target population. However, a minimum of 30 participants is commonly recommended for conducting statistical analyses (Cohen et al., 2017). In this study, the sample size was determined using the method proposed by Krejcie and Morgan (1970). According to their statistical table, a population of 17,060 individuals requires a minimum sample size of 375 participants. Stratified random sampling was employed across eight strata based on gender (male/female) and academic year (first-year, second-year, third-year, and fourth-year) to ensure balanced representation.

Conducting independent sampling within each stratum and ensuring that the sample size in each stratum is no less than 50 can guarantee that various subgroups will not yield unstable estimates due to insufficient samples in regression analysis and multivariate analysis (Hair, Black, Babin, & Anderson, 2018). In this study, questionnaires were distributed to the target population through Wenjuanxing, and 534 valid responses were collected. This not only met the statistical requirements but also enhanced the reliability of analysis across different subgroups.

Table 1 shows the distribution of respondents by gender and year of study at Qingdao Hengxing College. According to the established research design and arrangement, this study distributed electronic questionnaires through Wenjuanxing to ordinary undergraduate students. 580 electronic questionnaires were collected with 534 being valid, resulting in a questionnaire efficiency rate of 92%. After collecting the sample data, this study mainly used simple linear regression analysis and multiple regressions to process the data.

Table 1. Distribution of respondents by gender and year of study

Category	Subcategory	Frequency	Percentage (%)
Year of study	1st-year	101	18.90%
	2nd-year	157	29.40%
	3rd-year	158	29.60%
	4th-year	118	22.10%
	Total	534	100%
Gender	Female	259	48.50%
	Male	275	51.50%
	Total	534	100%

3.2. Instruments of the Study

3.2.1. Classroom Engagement

The questionnaire, designed by Handelsman, Briggs, Sullivan, and Towler (2005) was utilized to assess college students' classroom engagement. The questionnaire is composed of 17 items and follows a 5-point Likert format. It encompasses four sub-dimensions with the first being skills engagement comprising seven items and demonstrating a Cronbach's alpha of 0.906. The second sub-dimension is emotional engagement consisting of three items and exhibiting a Cronbach's alpha of 0.829. The third sub-dimension is interaction engagement, comprising four items with a Cronbach's alpha of 0.900. Lastly, the fourth sub-dimension is performance engagement which includes three items and has a Cronbach's alpha of 0.868. The scale demonstrates high internal consistency with a Cronbach's alpha of 0.872.

3.2.2. Teacher-Student Interactions

Fisher, Henderson, and Fraser (1995) employed the teacher- student relationship questionnaire as a tool to assess the dynamics of teaching and learning interactions. The scale comprises four dimensions, encompassing a total of 23 items, and utilizes a 5-point rating scale for responses. It encompasses five sub-dimensions with the first being leadership, comprising six items and demonstrating a Cronbach's alpha of 0.877. The second sub-dimension is helping/friendly, consisting of five items and exhibiting a Cronbach's alpha of 0.886. The third sub-dimension is understand, comprising six items with a Cronbach's alpha of 0.897. The fourth sub-dimension is student responsibility/freedom, which includes three items and has a Cronbach's alpha of 0.808. Lastly, the fifth sub-dimension, which focuses on strictness consists of three items, yielding a Cronbach's alpha coefficient of 0.844. The internal consistency of the scale as indicated by Cronbach's alpha is 0.859.

3.2.3. Peer Relationships

Aydogdu (2022) developed a measure of peer relationships that encompasses 21 items across four sub-domains, employing a 5-point Likert scale to evaluate responses. It encompasses four sub-dimensions with the first sub-dimension being intimacy, comprising nine items and demonstrating a Cronbach's alpha of 0.932. The second sub-dimension is popularity, consisting of four items and exhibiting a Cronbach's alpha of 0.863. The third sub-dimension is trust, comprising five items with a Cronbach's alpha of 0.868. Lastly, the fourth sub-dimensions, which focus on insightfulness, consist of three items, yielding a Cronbach's alpha coefficient of 0.834. The internal consistency of the scale as indicated by Cronbach's alpha is 0.894.

3.2.4. Validity and Reliability Tests

Reliability and validity are important indicators for analyzing whether the tools are usable or not. The researcher analyzed the reliability and validity of the instrument employed in this study. The findings of the analysis indicated that the research instrument was used. Table 2 shows the results of the reliability analysis of the

formally sampled data. Therefore, the results of the analyses show that the reliability is up to the mark, which meets the research needs.

Table 2. The Cronbach's alpha of the questionnaire

Scales	No. of items	Cronbach's alpha
Teacher-student interactions	23	0.951
Peer relationships	21	0.929
Classroom engagement	17	0.936
Overall scale	81	0.972

4. RESULTS

4.1. The Relationship between Teacher-student Interactions and Classroom Engagement among Undergraduate Private College Students in Shandong, China.

The relationship between variables was examined using simple linear regression analysis. The findings revealed a statistically significant relationship between teacher–student interactions and classroom engagement at the 5% significance level. The analysis yielded an F-value of 250.748, indicating that the model is a good fit for the data distribution. The results of this relationship are presented in Tables 3 and 4.

Table 3. Statistical summary for the regression between teacher-student interactions and classroom engagement

Model	R	R^2	Adjusted R^2	Std. error of the estimate	Change statistics			Durbin Watson
					R^2 change	F change	Sig. F change	
1	0.566	0.320	0.319	0.779	0.320	250.748	<0.001	1.109

Table 4. Coefficients for teacher-student interactions and classroom engagement

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
1	1.356	0.109		12.483	<0.001
1	0.580	0.037	0.566	15.835	<0.001

The results of the simple linear regression analysis presented in Tables 3 and 4 indicate that a statistically meaningful correlation exists between teacher-student interactions and classroom engagement with an F-value of 250.748 and a p-value less than 0.001 (which is significant at the 0.05 level). The t-statistic of 15.835 accompanied by a p-value less than 0.001, which is sufficient to establish significance at the conventional 0.05 level, suggests that teacher-student interactions have a significant impact on classroom engagement. The Durbin-Watson statistic is 1.109, indicating mild positive autocorrelation in the residuals. As the ideal value is 2 for no autocorrelation, a value slightly above 1 suggests the presence of some degree of autocorrelation, though it is not severe, suggesting that teacher-student interaction was significant in classroom engagement. The determination coefficient, denoted as R^2 for this model, stands at 0.320, suggesting that 32% of the variability observed in classroom engagement can be attributed to teacher-student interactions. In other words, a substantial proportion of classroom engagement is predictably accounted for by teacher-student interactions. Other factors account for the variation in classroom engagement beyond the 32% explained by teacher-student interactions alone.

According to Table 4, the intercept ($\beta 0$) is 1.356 and the slope ($\beta 1$) is 0.580 allowing the linear equation to be formulated as follows:

$$Y = 1.356 + 0.580X$$

Where

Y = Classroom engagement (dependent variable).

X = Teacher-student interactions (independent variable).

Y-intercept and $\beta 0 = 1.356$.

Slope and $\beta 1 = 0.580$.

The intercept ($\beta 0$) value of 1.356 suggests that the anticipated level of classroom engagement is 1.356% when the percentage of teacher-student interactions is zero. The coefficient $\beta 1$ with a value of 0.623 indicates that a 1% increase in teacher-student interactions is associated with a predicted increase of 0.580% in classroom engagement. As indicated by this equation, this provides evidence that there exists a statistically significant positive linear correlation between teacher-student interactions and classroom engagement. Therefore, hypothesis 1 is accepted.

4.2. The Relationship between Peer Relationships and Classroom Engagement among Undergraduate Private College Students in Shandong, China.

The present investigation analyzed the relationship between peer relationships and classroom engagement. At a significance level of 5%, the F-statistic of 231.320 indicates the presence of a statistically significant model. The outcomes of this relationship are detailed in Tables 5 and 6.

The present study examined the relationship between peer relationships and classroom engagement. At the 5% significance level, the analysis produced an F-statistic of 231.320, indicating a statistically significant model. The results of this analysis are presented in Tables 5 and 6.

Table 5. Statistical summary of the regression between peer relationships and classroom engagement

Model	R	R^2	Adjusted R^2	Std. error of the estimate	Change statistics			Durbin-Watson
					R^2 change	F change	Sig. F change	
1	0.550	0.303	0.302	0.789	0.303	231.320	<0.001	1.063

Table 6. Coefficients for peer relationships and classroom engagement

Models	Unstandardized coefficients		Standardized coefficients	t	Sig.
1	B	Std. error	Beta		
1	1.326	0.114		11.610	<0.001
1	0.623	0.041	0.550	15.209	<0.001

The results of the simple linear regression analysis presented in Tables 5 and 6 indicate an F-statistic of 231.320 and a p-value less than 0.001 (which is below the significance threshold of 0.05). These findings suggest that the independent variable, peer relationships has a statistically significant impact on classroom engagement. Given that $t=15.209$ and $p < 0.001$ (which is below the significance level of 0.05), the results suggest that peer relationships have a statistically significant impact on classroom engagement. The Durbin-Watson statistic of 1.063 indicates a significant correlation between the two variables, namely peer relationships and classroom engagement. The coefficient of determination, R^2, for this model stands at 0.303, suggesting that 30.3% of the variability in classroom participation (the dependent variable) can be attributed to peer relationships (the independent variable).

According to Table 6, the intercept ($\beta 0$) is 1.326 and the slope ($\beta 1$) is 0.623. Therefore, the corresponding linear equation can be formulated as follows:

$Y = 1.326 + 0.623X$.

Where

Y= Classroom engagement (dependent variable).

X= Peer relationships (independent variable).

Y-intercept, $\beta 0 = 1.326$.

Slope, $\beta 1 = 0.623$.

The intercept ($\beta 0$) value of 1.326 signifies that when peer relationships are zero, the predicted level of classroom engagement is 1.326%. The coefficient $\beta 1 = 0.623$ indicates that for each 1% increase in peer relationships,

there is a predicted increase of 0.623% in classroom engagement. Based on this equation, it can be inferred that there exists a statistically significant notable direct linear correlation between peer relationships and classroom engagement. Therefore, hypothesis 2 is accepted.

4.3. The Influence of Teacher-Student Interactions and Peer Relationships on Classroom Engagement among Undergraduate Private College Students in Shandong, China.

This study utilized multiple regression analysis to address the research question. This statistical method allows the simultaneous examination of the combined effects of multiple independent variables on a single dependent variable, thereby allowing for a quantitative assessment of the individual contributions of teacher–student interactions and peer relationships (independent variables) to classroom engagement (dependent variable). The detailed results of this analysis are presented in Tables 7 and 8.

Table 7. Model summary for teacher-student interactions and peer relationships predicting classroom engagement

Model	R	R2	Adjusted R2	Std. error of the estimate	F	Sig.	Durbin Watson
1	0.635	0.403	0.401	0.7211	179.417	<0.001	1.180

Table 8. Coefficients for teacher-student interactions and peer relationships predicting classroom engagement

Models	Variables	B	Std. error	Beta	t	Sig.
1	(Constant)	9.100	0.117		4.128	<0.001
1	Teacher-student interactions	0.273	0.029	0.382	9.561	<0.001
1	Peer relationships	0.296	0.035	0.341	8.551	<0.001

The results of the multiple regression analysis as presented in Tables 7 and 8 indicate an F-statistic of 179.417 and a p-value less than 0.001 (which is well below the 0.05 significance threshold). These findings suggest that the independent variable, teacher-student interactions and peer relationships have a statistically significant impact on classroom engagement. Specifically, both teacher-student interactions ($t=9.561$ and $p<0.001$) and peer relationships ($t=8.551$ and $p<0.001$) demonstrated significance beyond the critical threshold, further confirming their influence on classroom engagement. Additionally, the Durbin-Watson statistic of 1.180 indicates a moderate level of positive autocorrelation, indicating a correlation among the variables, teacher–student interactions, peer relationships, and classroom engagement.

The coefficient of determination, R^2 for this model stands at 0.403 suggesting that 40.3% of the variability in classroom engagement (the dependent variable) can be attributed to teacher-student interactions and peer relationships (the independent variable).

According to Table 8, the intercept ($\beta 0$) is 9.100, the slope ($\beta 1$) is 0.273 and the slope ($\beta 2$) is 0.296; therefore, the corresponding linear equation can be formulated as follows:

$$Y = 9.100 + 0.273X_1 + 0.296X_2$$

Where

Y = Classroom engagement (dependent variable).

X_1 = Teacher-student interactions (independent variable).

X_2 = Peer relationships (independent variable).

Y-intercept and $\beta 0 = 9.100$.

Slope, $\beta 1 = 0.273$ and $\beta 2 = 0.296$.

The intercept ($\beta 0$) value of 0.863 signifies that when teacher-student interactions and peer relationships are zero, the predicted level of classroom engagement is 9.100%. The coefficient $\beta 1 = 0.273$ for teacher-student interactions and $\beta 2 = 0.296$ for peer relationships indicates that for each 1% increase in teacher-student interactions, there is a predicted increase of 0.273% in classroom engagement. For each 1% increase in peer relationships, there is

a predicted increase of 0.296% in classroom engagement. Based on this equation, it can be inferred that there exists a statistically significant positive impact of teacher-student interactions and peer relationships on classroom engagement. The multiple regression analysis further confirms the combined explanatory power of these two factors. Additionally, the standardized coefficient for teacher-student interactions (standard β=0.382) is higher than that for peer relationships (standard β=0.341). Therefore, hypothesis 3 is accepted.

5. DISCUSSION AND CONCLUSION

This study investigates the relationship of teacher-student interactions, peer relationships and classroom engagement, focusing on undergraduate private college students in Shandong Province. The findings reveal that both teacher-student interactions and peer relationships positively influence classroom engagement with teacher-student interactions showing a greater positive relationship. The results of multiple regression analysis further indicate that both factors have significant relationships with classroom engagement.

The first key finding is that teacher-student interactions have a positive relationship with classroom engagement with a regression coefficient (β=0.566 and $p<0.001$). This result indicates that stronger teacher-student interactions promote higher levels of classroom engagement. The findings align with the student engagement theory (Fredricks et al., 2004) which suggests that teacher support and interaction are crucial for enhancing students' classroom engagement. This study supports previous research, such as Reschly and Christenson (2022) highlighting the critical role of teachers in boosting engagement through their behaviors and attitudes. Furthermore, the study fills a gap in the existing literature by focusing on private higher education institutions, offering a fresh perspective on classroom management in these settings.

The second significant finding is that peer relationships also positively affect classroom engagement with a regression coefficient (β=0.550 and $p<0.001$). Peer relationships contribute to students' engagement supported by the significant others theory, which suggests that peer recognition and support significantly impact students' learning behaviors (Zhong et al., 2014). In private colleges where students have active social networks, peer relationships emerge as an influential factor in classroom engagement. The results align with previous studies, such as Wentzel et al. (2021) showing that positive peer relationships predict higher classroom engagement. However, the influence of peer relationships is found to be slightly weaker than that of teacher-student interactions, underscoring the critical role of positive teacher-student interactions in enhancing classroom engagement.

Another key finding is that teacher-student interactions and peer relationships collectively account for 40.3% of the variance in classroom engagement ($R^2=0.403$). This highlights that factors are significant predictors of classroom engagement and influence it from distinct perspectives complementing each other. The multiple regression analysis further confirms the combined explanatory power of these two factors. The standardized coefficient for teacher-student interactions (Standard β=0.382) is higher than that for peer relationships (standard β=0.341), indicating that teacher-student interactions play a more crucial role in promoting classroom engagement among undergraduate private college students.

These findings emphasize the importance of prioritizing teacher-student interactions and peer relationships in private undergraduate classrooms. Educational policymakers at Qingdao Hengxing College and other private undergraduate institutions can improve student engagement and create a more conducive learning environment by focusing on these two aspects.

This study demonstrates that teacher-student interactions and peer relationships significantly contribute to classroom engagement among undergraduate students in private colleges in Shandong Province. Teacher-student interactions have a stronger impact with a higher regression coefficient, highlighting their crucial role in enhancing engagement. Peer relationships also play a positive but slightly weaker role in fostering engagement. Together, these factors account for 40.3% of the variance in classroom engagement, emphasizing the complementary influence of both teacher support and peer connections. These findings underline the importance of fostering positive

interactions in teacher-student and peer relationships to boost classroom engagement and academic success. The findings of this study may also require further research due to the limitations of the sample selection and research methodology. The researcher is still trying to get objective results that reflect reality well. This study argues that Chinese higher education still faces outstanding problems after entering the popularization stage, especially how to improve the quality of talent cultivation by stimulating students' classroom engagement based on this conclusion. Therefore, it is still worth studying how to build a decent peer relationship, establish a scientific and reasonable teacher-student interactions system, and then guide and stimulate college students' classroom engagement.

Funding: This study received no specific financial support.
Institutional Review Board Statement: The Ethical Committee of the Qingdao Hengxing University, China has granted approval for this study on 20 December 2024 (Ref. No. 053200123).
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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