

The Mediating Impact of Psychological Safety between Trust in Teachers, Teacher-Student Relationships, Learning Environment and Student Engagement in Vocational Medical College in Guangdong, China

Liang Jiali¹, Ooi Boon Keat²

Abstract

Student engagement refers to the physical and psychological energy that learners dedicate to academic activities, which is widely recognized as a key determinant of academic achievement, retention, and overall educational outcomes. Engaged students are more capable of grasping complex concepts, retaining knowledge, and applying what they have learned in real-world contexts. This study investigates the influence of students' trust in teachers, teacher–student relationships, and the learning environment on student engagement, with psychological safety as a mediating variable, in higher vocational medical colleges in Guangdong Province, China. Adopting a quantitative design and grounded in a positivist epistemology, data were collected through a Likert-scale questionnaire administered to 381 students randomly selected from six public higher vocational institutions. The data were analyzed using SPSS 27 and AMOS 23 to test ten hypotheses. The results reveal three major findings: (1) all three predictor variables significantly influenced both psychological safety and student engagement, with the learning environment showing the strongest predictive effect on psychological safety, while psychological safety itself emerged as the most robust predictor of engagement; (2) psychological safety partially mediated all tested relationships, with significant indirect effects observed; and (3) although environmental factors exerted the greatest overall influence, interpersonal dimensions also demonstrated significant direct effects, particularly with teacher–student relationships exhibiting a stronger direct impact on engagement than trust in teachers. These findings contribute to a deeper understanding of the mechanisms underlying student engagement in vocational medical education and highlight the importance of cultural and contextual factors that merit further exploration.

Keywords: *trust in teachers, teacher-student relationships, learning environment, medical students, psychological safety, student engagement.*

Introduction

Student engagement, often referred to as student academic involvement, reflects the effort and commitment that learners devote to their studies. It has been widely acknowledged as a prerequisite for effective learning (Palmer et al., 2022). Engagement extends beyond motivation to encompass concrete actions that manifest students' cognitive, emotional, and behavioral characteristics. In the context of higher education, declining performance and low levels of engagement have become pressing global challenges (Gandarillas, Elvira-Zorzo, & Rodríguez-Vera, 2024). According to a 2024 study by The Harris Poll and Discovery Education, 46% of instructors reported a decline in overall student engagement since 2019, while 83% of students perceived that their learning environments lacked opportunities to foster curiosity—a key driver of engagement. Similarly, a large-scale study in China (Fu et al., 2025), involving more than 1,000 students, demonstrated that mobile phone dependence significantly undermines academic engagement. Poor time management exacerbates this effect by fostering greater phone dependency and reducing self-control, ultimately leading to disengagement and distraction.

Medical students are particularly vulnerable, as they face heavy academic workloads and intense

¹Graduate School of Management, Post Graduate Centre, Management and Science; University, University Drive, Off Persiaran Olahraga, Section 13, 40100 Shah Alam, Selangor, Malaysia

² Guangdong Maoming Health Vocational College, No. 1, Anle East Road, Dianhai Street, Dianbai District, Maoming City, 525400, Guangdong Province, China (Corresponding author)

employment competition, making them a high-risk group for mental health issues (Gao, Zhou, & Zhang, 2022). Burnout is also prevalent among this population due to excessive academic demands (Kong et al., 2023). Within this context, psychological safety has emerged as a crucial factor in mental health education. In preceptorship relationships, psychological safety enhances students' interpersonal and educational experiences. It is closely tied to learners' belief that they can take interpersonal risks—such as asking questions, suggesting improvements, or raising concerns to safeguard patient safety—without fear of negative consequences. Furthermore, psychological safety supports teamwork, fosters positive learning experiences, and contributes to effective patient care (Hardie et al., 2022). Despite its growing recognition, many medical educators remain uncertain about its origins and its practical implications for medical education, which can hinder the creation of environments where students feel secure in voicing doubts or acknowledging mistakes (Bump & Cladis, 2024).

Against this backdrop, and considering the specific challenges of medical student engagement, this study aims to examine the influence of students' trust in teachers, teacher–student relationships, and the learning environment on student engagement through the mediating role of psychological safety, drawing upon relevant theoretical frameworks in the context of higher vocational medical colleges in Guangdong Province, China.

Empirical Review

Trust in Teachers

Trust plays a pivotal role in cultivating a safe and supportive learning environment that enhances student engagement, motivation, and a sense of belonging within the educational community (Furrer & Skinner, 2003). When students have confidence in their teachers, school leaders, and the overall learning context, they are more inclined to participate actively in classroom activities, seek academic support when needed, and ultimately achieve higher levels of academic success (Bryk & Schneider, 2002). Prior studies have demonstrated a positive association between interpersonal trust and children's social adjustment, though the underlying psychological mechanisms remain insufficiently explored. In the Chinese context, Dong et al. (2021) examined the indirect role of teacher–student trust from both student and instructor perspectives, and their findings suggest that student-perceived relational trust exerts a stronger influence on children's social adjustment than teacher-perceived trust.

Teacher-student Relationships

Teacher–student interactions are widely recognized as a key determinant of student engagement and academic success. Gao et al. (2023) examined this relationship and highlighted the mediating role of basic psychological needs satisfaction. Their findings indicated that positive teacher–student connections were significantly associated with behavioral, emotional, and cognitive engagement. Moreover, satisfaction of autonomy needs mediated the effects of teacher–student interactions on emotional and cognitive engagement, though not on behavioral engagement. Similarly, Kedia and Mishra (2023) demonstrated that teacher–student relationships positively influence students' academic success through the pathway of student engagement. In contrast, peer interactions were found to exert a comparatively weaker effect on learners' academic performance.

Learning Environment

The learning environment constitutes a critical factor influencing student engagement in higher education. However, engaging students in online settings has proven particularly challenging. Vermeulen and Volman (2024) investigated which e-learning activities effectively foster engagement and identified the underlying mechanisms that support these activities. Their findings emphasized three dimensions of synchronous and asynchronous online learning activities that enhance engagement: promoting attention and concentration, encouraging effort, reducing barriers, and ensuring flexibility. Beyond online contexts, Li and Xu (2023) examined the broader role of environmental factors in shaping engagement across higher education institutions. Their study revealed that environmental supports such as demanding course and assignment requirements may inadvertently generate stress, negative emotions, and resistance among students. Moreover, when teachers display negative behaviors, including criticism and scolding, students are more likely to experience fatigue, absenteeism, and emotional distress, ultimately leading to reduced learning involvement.

Psychological Safety

Psychological safety refers to a shared belief that it is safe to take interpersonal risks within a particular setting (Edmondson, 1999). In the educational context, it reflects students' perceptions of

being accepted, respected, and able to express themselves without fear of negative consequences. Previous studies consistently highlight a positive relationship between psychological safety and student engagement, encompassing emotional, behavioral, and cognitive dimensions. For example, McLeod and Gupta (2023) explored students' experiences in online learning environments and emphasized the significance of instructor characteristics and group dynamics in shaping virtual synchronous learning. Their findings underscore the importance of psychological safety in enhancing students' learning experiences and suggest strategies for promoting it in digital contexts.

Similarly, Wang et al. (2022) examined the relationships among proactive personality, academic self-efficacy, psychological safety, and critical thinking. Their results indicated that proactive personality, psychological safety, and academic self-efficacy are key predictors of critical thinking. Students with higher levels of psychological safety and self-efficacy demonstrated greater creativity in thinking and deeper involvement in learning activities. At the group and organizational level, psychological safety has also been shown to play a mediating role. Edmondson (1999) demonstrated that it mediates the effect of team leader coaching and behavior on team learning, while Nembhard and Edmondson (2006) found that it mediated the relationship between leader inclusive behaviors and engagement in quality improvement initiatives among healthcare teams. Recent studies have extended this perspective to educational settings, suggesting that psychological safety mediates the relationship between environmental and interpersonal factors and student engagement.

Theoretical Review

Social Learning Theory (SLT)

Social learning theory was first proposed by psychologist Albert Bandura in the 1960s and 1970s. Bandura combines elements of classical learning theory with the idea that people can learn new behaviors by observing others. In his famous experiment published in 1961, Bandura demonstrated that children could learn aggressive behavior simply by observing an adult model's aggression toward a Bobo doll, which contradicted the prevailing theory at the time that behavior had to be directly reinforced by reward or punishment. At that time, the dominant theory of learning was behavior-based, focusing on rewards, punishments, and associations as drivers of learning. Bandura agrees that these factors play a role in the process of learning, but he adds a social factor - people can learn indirectly by observing how others act and seeing the consequences of those actions (Bandura & Ross, 1961). The Social Learning Theory contains three underlying themes: environmental, personal, and behavioral. Figure 2.1 depicts how behavioral, contextual, and personal elements interact with one another to impact teenagers' behavior. According to Social Learning Theory, children and teens learn by watching their environment, particularly those closest to them (Bandura, 1977).

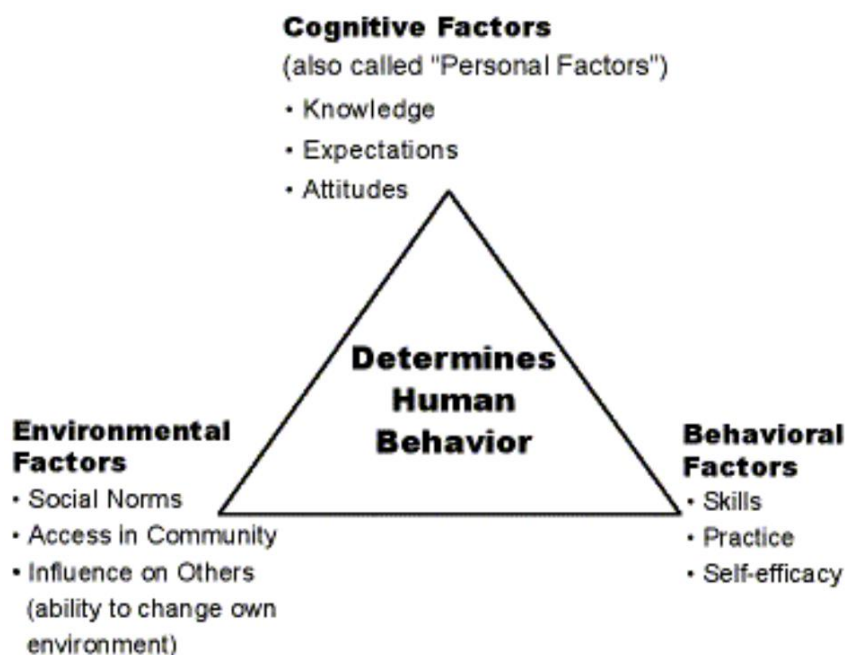


Figure 1 : Social Learning Theory (Source: Bandura, 1977)

Social Learning ideas such as vicarious reinforcement and result expectancies have influenced efforts to improve student motivation and self-efficacy views. Teachers that demonstrate tenacity and passion, as well as emphasize the importance of educational attainments, might enhance students' expectations of their own skills (Urdan & Schoenfelder, 2006). In addition, the concept of reciprocal determinism has resulted in a greater emphasis on developing supportive school settings that positively impact student conduct. Creating classroom environments that encourage cooperative learning, build good social norms, and handle behavior difficulties creates ideal circumstances for observational learning and self-regulation. Establishing relationship-building classroom norms, supporting cooperative learning, and controlling inappropriate behaviors can all help to improve student learning and self-regulation (Wentzel, 2012). Furthermore, applications include reading and writing teaching, where cognitive modeling of processes such as summarizing and editing, along with chances for practice, improves literacy abilities (Zimmerman & Kitsantas, 2002). Social Learning concepts also guide therapies for kids with learning difficulties and behavioral concerns. Social Learning ideas inspire strategies such as setting rules/consequences, group contingencies, and modeling and reinforcing certain actions (Bear, 2010).

Overall, Social Learning Theory has a significant impact by focusing educational priorities on student self-regulation, modeling successful practices, developing self-efficacy beliefs, and addressing the social elements in classroom environments that influence learning. Social Learning Theory has transformed ideas on student learning and teacher instructional approaches, emphasizing observational learning, self-regulation, modeling effective tactics, and improving the social classroom environment.

Conceptual Framework

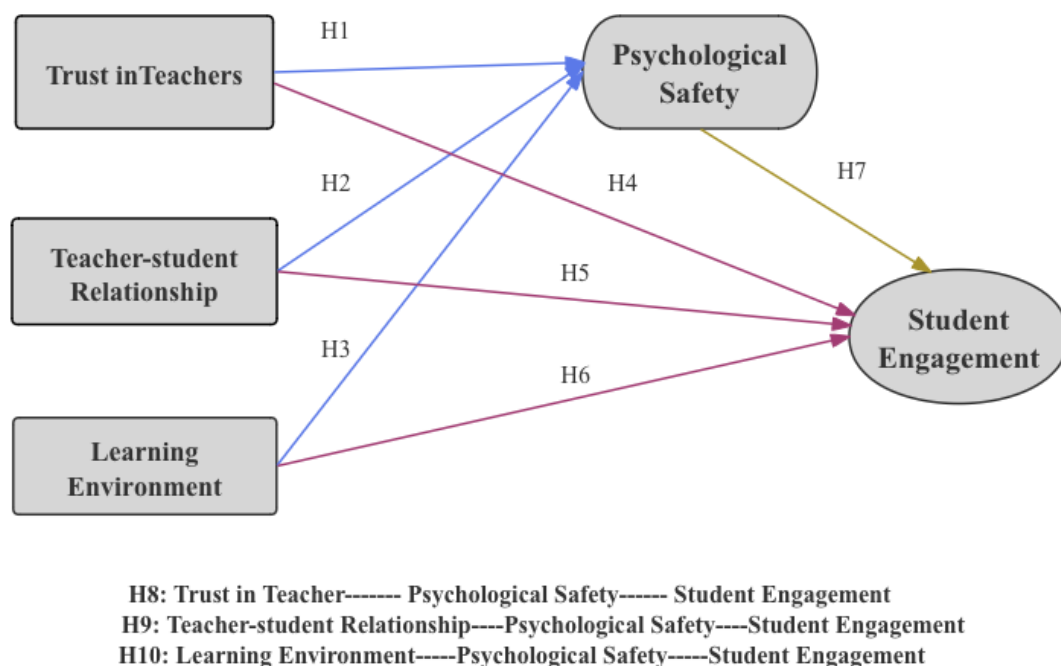


Figure 2: Conceptual Framework

H1: There is a statistically significant impact of trust in teachers on psychological safety at higher vocational medical colleges in Guangdong province, China.

H2: There is a statistically crucial impact of teacher-student relationships on psychological safety at higher vocational medical colleges in Guangdong province, China.

H3: There is a statistically crucial impact of learning environment on psychological safety at higher

vocational medical colleges in Guangdong province, China.

H4: There is a statistically crucial impact of students' trust in teachers on student engagement at higher vocational medical colleges in Guangdong province, China.

H5: There is a statistically crucial impact of teacher-student relationships on student engagement at higher vocational medical colleges in Guangdong province, China.

H6: There is a statistically crucial impact of learning environment on student engagement at higher vocational medical colleges in Guangdong province, China.

H7: There is a statistically crucial influence of psychological safety on student engagement at higher vocational medical colleges in Guangdong province, China.

H8: There is a mediating effect of psychological safety in the relationship between trust in teachers and students' engagement at higher vocational medical colleges in Guangdong province, China.

H9: There is a mediating effect of psychological safety in the relationship between teacher-student relationships and students' engagement at higher vocational medical colleges in Guangdong province, China.

H10: There is a mediating effect of psychological safety in the relationship between learning environment and students' engagement at higher vocational medical colleges in Guangdong province, China.

Materials and Methods

Participants and Sampling

The study population of this study are 50476 medical students from 6 medical colleges in Guangdong province, China. According to the Morgan Scale (Krejcie & Morgan, 1970), the sample size in the research is 381. To compensate for the potential participant attrition (dropouts, non-responses, or incomplete data) during the study, the researcher selected 20% more participants than the calculated sample size (Creswell, J. W., & Creswell, J. D., 2017). Finally, there were all together 457 students being identified as the sample of this study. They answered questionnaires on the topic of factors influencing student engagement.

Measures

The researcher designed a questionnaire on how to increase medical students' engagement in higher vocational colleges under the influence of teacher-student relationships, trust in teachers, and learning environments using quantitative research methods and questionnaires from pertinent literature. Five-point Likert scale questionnaires with five distinct option levels—strongly disagree, disagree, neutral, agree, and highly agree—was used to gather the data.

Data analysis Technology

Using SPSS and AMOS, a number of analyses was carried out on the questionnaire data in addition to testing the research hypothesis. Quantitative comparisons was used to confirm the factors that influence medical student engagement in higher vocational colleges, such as students' trust in teachers, relationships between teachers and students, the impact of the learning environment, and to verify if the independent and dependent variables are mediated by psychological safety.

Data Analysis

Descriptive statistical analysis

Table 1: Descriptive Statistics

Item	Mean	Std. Deviation	Minimum	Maximum	Skewness	Kurtosis
TT1	.70	1.090	1	5	-.869	.357
TT2	.75	1.081	1	5	-.855	.373
TT3	.74	1.045	1	5	-.934	.736

TT4	.73	1.068	1	5	-.7 60	310
TT5	.75	1.159	1	5	-.8 02	031
TT6	.84	.998	1	5	-.9 61	920
TSR1	.65	1.229	1	5	-.9 44	036
TSR2	.74	1.014	1	5	-.7 69	434
TSR3	.64	1.269	1	5	-.8 83	132
TSR4	.78	1.168	1	5	-.9 85	299
TSR5	.68	1.197	1	5	-.9 28	157
TSR6	.84	1.167	1	5	-.9 41	192
LE1	.74	1.204	1	5	-.6 95	347
LE2	.74	1.171	1	5	-.6 84	355
LE3	.76	1.207	1	5	-.6 80	332
LE4	.84	1.219	1	5	-.7 94	277
LE5	.83	1.210	1	5	-.7 77	284
LE6	.76	1.207	1	5	-.8 56	057
PS1	.67	1.222	1	5	-.5 04	830
PS2	.67	1.103	1	5	-.4 99	462
PS3	.62	1.139	1	5	-.3 79	781
PS4	.67	1.134	1	5	-.5 61	439
PS5	.44	1.200	1	5	-.1 66	1.042
PS6	.58	1.163	1	5	-.4 02	782
PS7	.59	1.189	1	5	-.4 99	694
SE1	.84	1.160	1	5	-.7 05	430
SE2	.77	1.099	1	5	-.4 51	819
SE3	.87	1.185	1	5	-.7 53	468
SE4	.79	1.148	1	5	-.5 56	670
SE5	.86	1.149	1	5	-.6 92	542
SE6	.02	1.069	1	5	-.8 21	227
SE7	.59	1.266	1	5	-.4 67	908

It can be seen from Table 1 that the sample size of all variables is 457, indicating that the data is complete without missing values. The mean reflects the average level of a variable. The mean value of TT1 is 3.70, indicating that respondents' overall evaluation of TT1 tends to be positive. The mean of SE6 was 4.02, the highest of all variables, indicating that respondents rated SE6 the most positively. The PS5 has a mean of 3.44, the lowest of all variables, indicating that respondents have a relatively low opinion of the PS5. The mean values for all variables ranged from 3.44 to 4.02, indicating a positive bias in respondents' overall evaluation of each indicator. Standard deviation reflects the degree of discrete data. The standard deviation of TT6 is 0.998, indicating that respondents' evaluation of TT6 is concentrated. The standard deviation of TSR1 is 1.229, indicating that respondents' evaluation of TSR1 varies greatly. The standard deviation of each variable is between 0.929 and 1.269, indicating that the data distribution is reasonable and there is no extreme dispersion. Skewness is index of distribution of symmetry. In an ideal normal distribution, the skewness value should be close to 0. If the absolute value of the skewness value is less than ± 1 , it is generally assumed that the data distribution is not significantly skewed. Kurtosis reflects the peak shape of the distribution. In a normal distribution, the theoretical kurtosis value is 0 (the kurtosis in SPSS is provided in adjusted form, the actual normal distribution value may be shown as ± 3). If the absolute value of the kurtosis value is less than ± 1 , the peak shape of the data can also be considered to be close to a normal distribution. In Table 1, the absolute values of skewness and kurtosis are both less than 1. Therefore, it is generally considered that the data distribution has no significant skew and is close to normal distribution.

Reliability analysis

Table 2: Reliability analysis

Reliability Analysis				
Variable	Item	CITC	Cronbach's Alpha if Item Deleted	Cronbach's α
TT	TT1	.779	.877	0.902
	TT2	.738	.883	
	TT3	.761	.880	
	TT4	.641	.897	
	TT5	.706	.889	
	TT6	.772	.879	
TSR	TSR1	.825	.890	0.915
	TSR2	.780	.898	
	TSR3	.755	.901	
	TSR4	.761	.899	
	TSR5	.747	.901	
	TSR6	.707	.907	
LE	LE1	.681	.884	0.896
	LE2	.700	.881	
	LE3	.732	.876	
	LE4	.720	.878	
	LE5	.718	.878	
	LE6	.765	.870	
PS	PS1	.782	.870	0.896
	PS2	.711	.879	
	PS3	.770	.872	
	PS4	.706	.880	
	PS5	.750	.874	
	PS6	.755	.874	
	PS7	.428	.911	

SE	SE1	.704	.867	0.887
	SE2	.686	.869	
	SE3	.783	.857	
	SE4	.774	.858	
	SE5	.692	.868	
	SE6	.702	.868	
	SE7	.445	.901	

Reliability Analysis is a statistical method used to assess the stability and consistency of measurement tools. It reflects whether the measuring tool can measure the same concept stably at different times and under different conditions. The core of reliability analysis is to calculate the reliability coefficient, the most commonly used reliability coefficient is Cronbach's Alpha (Kronbach α coefficient). Cronbach's Alpha: to evaluate the internal consistency of scale, the scale of the project is measuring the same concept. Its value ranges from 0 to 1, with higher values indicating better internal consistency of the scale. It can be seen from Table 2 that Cronbach's Alpha (TT) is equal to 0.902, indicating a very high reliability and good consistency of the TT project. Cronbach's Alpha (TSR) = 0.915 indicates that the measurements are very consistent across items. Cronbach's Alpha (LE) is equal to 0.896, indicating high reliability between variables. Cronbach's Alpha (PS) equals 0.896, indicating that the questionnaire data is stable and reliable. Cronbach's Alpha (SE) equal to 0.887 indicates good reliability performance and high overall consistency. CITC value indicates that the correlation between the score of a project and other projects, the measure of a single project contribution to the overall scale of consistency. If a project has a CITC value below 0.4, you may want to consider removing the project. (PS7 CITC = 0.428) and SE7 (CITC = 0.445) value is low, PS7 and SE7 project, after deleting the reliability enhance obviously, therefore, consider deleting PS7 and SE7 project.

Exploratory Factor Analysis (EFA)

Table 3: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.949
Bartlett's Test of Sphericity	Approx. Chi-Square	9279.795
	df	496
	Sig.	.000

KMO tests are used to evaluate the suitability of data for factor analysis. It determines whether there are enough common factors by measuring the ratio of correlation and partial correlation between variables. The Bartlett sphericity test is used to detect whether the correlation matrix between variables is an identity matrix (that is, there is no significant correlation). The significance results showed that the data were suitable for factor analysis. In this study, the KMO value is equal to 0.949 and the P value is equal to 0, so the data in this study are suitable for further factor analysis.

Table 4: Total Variance Explained

Total Variance Explained						
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.084	37.763	37.763	12.084	37.763	37.763
2	2.812	8.788	46.551	2.812	8.788	46.551
3	2.329	7.279	53.830	2.329	7.279	53.830
4	2.243	7.011	60.841	2.243	7.011	60.841

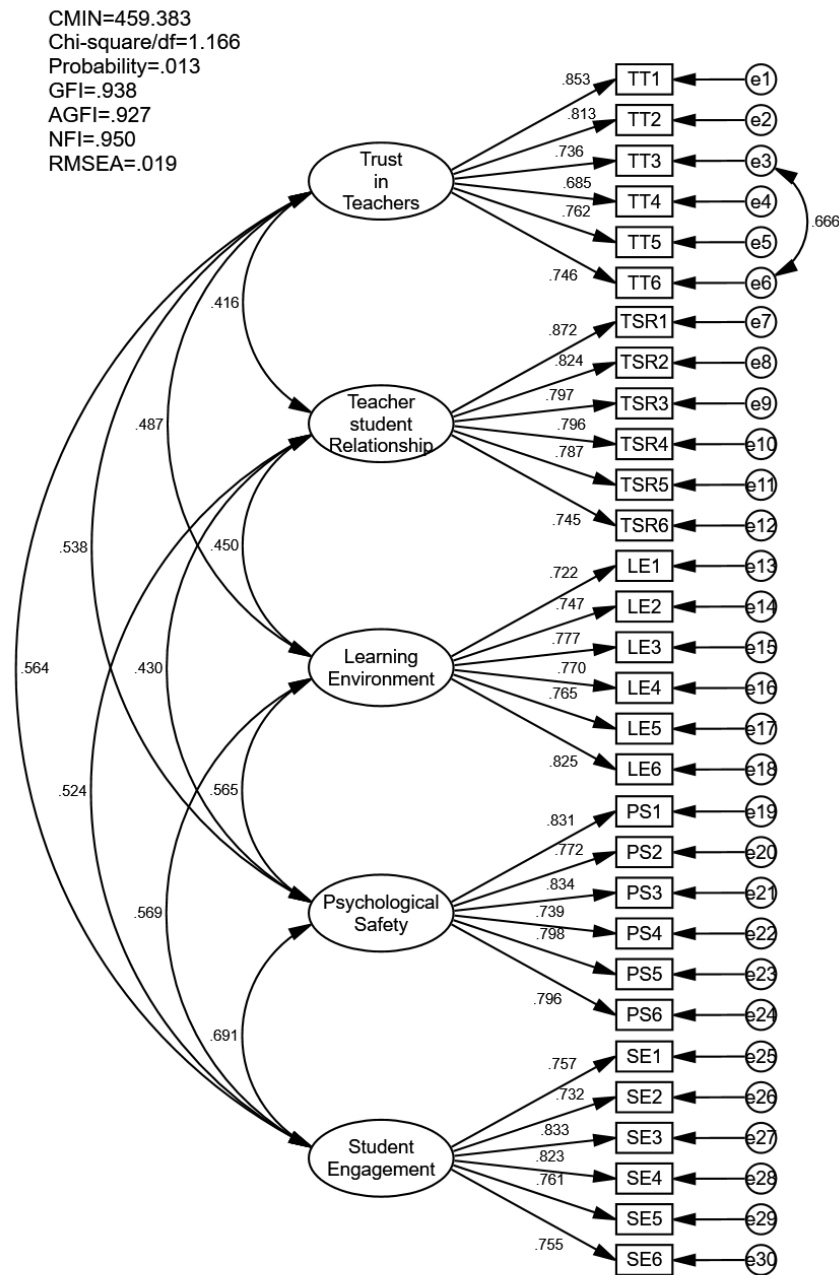
5	1.586	4.957	65.797	1.586	4.957	65.797
6	.852	2.662	68.460			
7	.692	2.164	70.623			
8	.665	2.077	72.701			
9	.584	1.824	74.525			
10	.554	1.733	76.257			
11	.514	1.605	77.862			
12	.500	1.563	79.426			
13	.488	1.525	80.950			
14	.462	1.444	82.395			
15	.444	1.389	83.784			
16	.418	1.308	85.092			
17	.414	1.293	86.385			
18	.398	1.244	87.629			
19	.393	1.229	88.858			
20	.360	1.125	89.982			
21	.348	1.088	91.071			
22	.336	1.050	92.120			
23	.315	.984	93.104			
24	.296	.926	94.030			
25	.285	.890	94.920			
26	.268	.838	95.758			
27	.267	.834	96.593			
28	.256	.799	97.391			
29	.252	.788	98.180			
30	.235	.735	98.915			
31	.217	.678	99.592			
32	.130	.408	100.000			
Extraction Method: Principal Component Analysis.						

Eigenvalues are usually reserved only for factors whose Eigenvalue is greater than 1. This is Kaiser's standard, which states that only factors with eigenvalues greater than 1 can explain more variance than one variable. The proportion of variance in the cumulative interpretation generally needs to exceed 60% for the factor analysis results to be considered to have sufficient explanatory power. Initial characteristic value (Initial Eigenvalues) % of Variance is the percentage of Variance of each factor to explain. Cumulative % is the cumulative variance explanation rate. Reflecting multiple factors together explain the total variance of the data. A high cumulative ratio (e.g. 60%-70%) is ideal. Extraction Sums of Squared Loadings are obtained after factor extraction and are used to reflect the total variance of the data that can still be explained after factor extraction. In Table 4, it can be found that there are 5 eigenvalues greater than 1. Factor 1, with an initial eigenvalue of 12.084, explains 37.763% of the variance. This factor is the primary contributing factor, indicating that it represents the most important underlying structure in the data. Factors 2 to 5 explain the variance of 8.788%, 7.279%, 7.011% and 4.957%, respectively. Cumulatively, 65.797% of the total variance is explained. In general, a cumulative explanation of more than 60% is considered to be a more desirable result.

Table 5: Rotated Component Analysis

Rotated Component Matrix ^a					
	Component				
	1	2	3	4	5
TT1	.154	.171	.170	.781	.175
TT2	.136	.196	.150	.739	.209
TT3	.103	.172	.124	.813	.123
TT4	.143	.086	.076	.708	.172
TT5	.126	.116	.208	.738	.141
TT6	.089	.179	.139	.810	.157
TSR1	.835	.152	.138	.119	.177
TSR2	.798	.116	.179	.175	.131
TSR3	.793	.099	.119	.135	.162
TSR4	.812	.108	.135	.101	.103
TSR5	.798	.071	.071	.111	.188
TSR6	.741	.116	.194	.102	.142
LE1	.092	.140	.723	.160	.164
LE2	.123	.148	.744	.137	.152
LE3	.152	.143	.773	.122	.144
LE4	.156	.119	.759	.128	.155
LE5	.130	.189	.758	.093	.144
LE6	.201	.130	.765	.225	.159
PS1	.137	.757	.228	.180	.223
PS2	.178	.680	.249	.206	.195
PS3	.136	.752	.254	.159	.208
PS4	.068	.690	.270	.152	.234
PS5	.173	.748	.155	.163	.223
PS6	.125	.731	.202	.212	.235
PS7	.013	.600	-.115	.040	.136
SE1	.181	.249	.168	.177	.693
SE2	.179	.124	.200	.201	.706
SE3	.152	.231	.221	.222	.749
SE4	.219	.269	.176	.139	.743
SE5	.182	.283	.274	.171	.632
SE6	.224	.269	.161	.157	.676
SE7	.042	.133	.025	.103	.567
Extraction Method: Principal Component Analysis.					
Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 6 iterations.					

According to table 5, it can be preliminarily concluded which variables are significantly loaded to which factors. The high load value variables of Component 1 are TSR1 (.835), TSR2 (.798), TSR3 (.793), TSR4 (.812), TSR5 (.798), and TSR6 (.741). These variables belong to TSR (Teacher-Student Relationships), indicating that factor 1 represents the potential dimension of teacher-student relationships. Component 2 high load values of a variable is PS1 (.757), PS2 (.680), the PS3 (.752), PS4 (.690), PS5 (.748), PS6 (.731). The PS variable is significantly assigned to factor 2, suggesting that this factor may represent "Psychological Support." The high load value variables of Component 3 are LE1 (.723), LE2 (.744), LE3 (.773), LE4 (.759), LE5 (.758), LE6 (.765). Factor 3 clearly reflects the "Learning Environment" related variables. Component four high load values of variables are TT1 (.781), TT2 (.739), TT3 (.813), TT4 (.708), TT5 (.738), TT6 (.810). Factor 4 focuses on TT (trust in teachers), indicating that it reflects the underlying dimension of trust in teachers. The high load value variables of Component 5 are SE1 (.693), SE2 (.706), SE3 (.749), SE4 (.743), SE5 (.632), SE6 (.676). The Student Engagement (SE) variable is loaded high, and the factor 5 represents the Student Engagement of the student.

Confirmatory Factor Analysis (CFA)**Figure 2: Measurement model**

Based on the structural equation model results, the fit indices demonstrate excellent model adequacy. In this study, the internal consistency reliability, indicator reliability, convergent validity, as well as discriminant validity of the integrated measurement model were assessed on the basis of items of each dimension. The overall measurement model is presented in Figure 2. The results fit the econometric model, $\chi^2/df=1.680$, $P=0$. The results show that GFI, AGFI, IFI and other goodness-of-fit indexes pass the critical value. The RMSEA value is 0.019, which is less than 0.05. Therefore, the index conforms to the general research criteria, so it can be considered as a good fitting model.

As can be seen from Table 6, each item has a standardized factor loading value of more than 0.6 for its underlying variables, indicating that all items have high significance and convergence. In addition,

AVE values derived from the mean variance of each variable range from 0.572 to 0.633, all exceeding the threshold of 0.5, showing good structural validity. Finally, the structural reliability values of the composite reliability range from 0.818 to 0.925, all of which exceed the minimum standard of 0.7, thus confirming the reliable structural reliability level obtained by the scale.

Table 6: The results of CFA

Variable	Item	Loading (Convergent Validity)	Construct Reliability	AVE (Construct Validity)
TT	TT1	0.853	0.913	0.596
	TT2	0.813		
	TT3	0.736		
	TT4	0.685		
	TT5	0.762		
	TT6	0.746		
TSR	TSR1	0.873	0.878	0.591
	TSR2	0.824		
	TSR3	0.797		
	TSR4	0.796		
	TSR5	0.787		
	TSR6	0.745		
LE	LE1	0.722	0.908	0.572
	LE2	0.748		
	LE3	0.776		
	LE4	0.77		
	LE5	0.765		
	LE6	0.825		
PS	PS1	0.831	0.925	0.633
	PS2	0.772		
	PS3	0.834		
	PS4	0.739		
	PS5	0.798		
	PS6	0.797		
SE	SE1	0.757	0.818	0.612
	SE2	0.732		
	SE3	0.833		
	SE4	0.824		
	SE5	0.76		
	SE6	0.755		

Table 7: Discriminant Validity

Variable	SE	PS	LE	TSR	TT
SE	0.782				
PS	0.691	0.796			
LE	0.569	0.565	0.756		
TSR	0.524	0.43	0.45	0.769	

TT	0.548	0.53	0.473	0.398	0.772
----	-------	------	-------	-------	-------

The criterion of discriminant validity is the square root of the mean variance extraction (AVE) of each factor, which should be greater than the correlation coefficient between the factor and other factors. Fornell & Larcker (1981) proposed a traditional measure that compares the AVE (internal variance) of each structure to the shared variance of all structures, which should not exceed their respective AVE. According to the results shown in Table 7, each structure of the square root of AVE is greater than the correlation coefficient of each structure. Thus, the discriminative validity between all constructs is sufficiently high. The correlation coefficient between latent variables was 0.398 ~ 0.691. These values are less than the square root of AVE, indicating good discriminative validity between these constructs (Kline, 2011). Therefore, the model can be used for further analysis and testing of hypotheses.

Structural Equation Model (SEM)

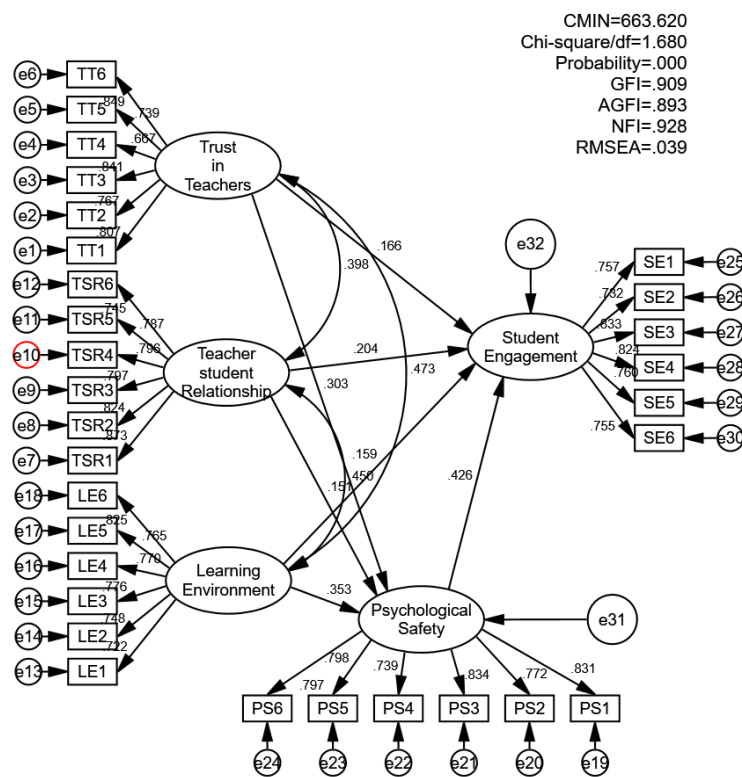


Figure 3: Structure Model

The measurement model is composed of five constructs of 30 items (TT=6 items, TSR=6 items, LE=6 items, PS=6 items, SE=6 items) related to the final CFA result. The specific construction is shown in Figure 4.14. The results of confirmatory factor analysis (CFA) showed that the fit index of the model performed well: Chi-square freedom ratio (χ^2/df) was 1.68, close to the ideal value. The goodness of fit index (GFI) was 0.909, the adjusted Goodness of Fit index (AGFI) was 0.893, and the normative fit index (NFI) was 0.928, all exceeding the recommended value of 0.9. The approximate root mean square error (RMSEA) is 0.039, well below the maximum allowable value of 0.08. These results show that the model has good reliability and validity, and the measurement framework can effectively reflect the research constructs and fit the standard values, which is statistically significant ($p=0.000$). In summary, the measurement model fits well and provides a solid foundation for the subsequent structural model and further analysis.

Table 8: Path Coefficient

Hypothesis	Path	Estimate	β	S.E	T	P
H1	TT→PS	.350	.303	.059	5.957	***
H2	TSR→PS	.143	.151	.046	3.120	.002
H3	LE→PS	.413	.353	.064	6.482	***
H4	TT→SE	.166	.166	.047	3.508	***
H5	TSR→SE	.167	.204	.036	4.611	***
H6	LE→SE	.160	.159	.051	3.160	.002
H7	PS→SE	.368	.426	.047	7.799	***

After building the structural equation model, the estimated value of the detection path, standardized path coefficient, standard error s.e., T-value and significance P-value are obtained through the software model fitting. Generally speaking, if the T-value is greater than 1.96 and the P-value is less than 0.05, then the path coefficient can be considered to pass the significance test within the 95% confidence interval, indicating that the corresponding path hypothesis of the preset model is valid. Otherwise, the hypothesis is invalid. This study through structural equation model has carried on the system to put forward the theory of hypothesis test, the results show that all seven directly related hypothesis (H1 - H7) obtained statistics support. It can be seen from the test results in Table 8 that all path coefficients reach the significance level ($p < 0.05$), and the T-value exceeds the critical value of 1.96, indicating that the research model has a robust statistical basis. Specifically, learning environment (LE), teacher-student relationship (TSR) and teacher trust (TT) all have significant positive effects on psychological safety (PS), among which learning environment has the largest impact ($\beta = 0.353$), followed by teacher trust ($\beta = 0.303$), and teacher-student relationship has a relatively small impact ($\beta = 0.151$). This proves that external environmental factors play an important role in shaping the psychological security of medical students, especially the optimization of learning environment plays a key role in improving psychological security.

On the other hand, the results also confirm the direct impact of psychological safety (PS) and three independent variables on student engagement (SE). It is worth noting that the influence of psychological safety is the most prominent ($\beta = 0.426$), and its effect even exceeds the direct influence of the three anthems (TT→SE: $\beta = 0.166$; TSR→SE: $\beta = 0.204$; LE→SE: $\beta = 0.159$). This finding strongly supports the basic theoretical framework of the study, namely that environmental factors not only directly affect student engagement behavior, but more importantly, promote learning engagement by shaping the key of psychological security. All path coefficients were significant within 95% confidence interval, indicating that the study conclusion has high reliability, and provides a clear theoretical basis and practical direction for improving students' learning participation in higher vocational medical colleges.

Intermediary test

Figure 4: Mediating model of psychological safety in the relationship between TT and SE

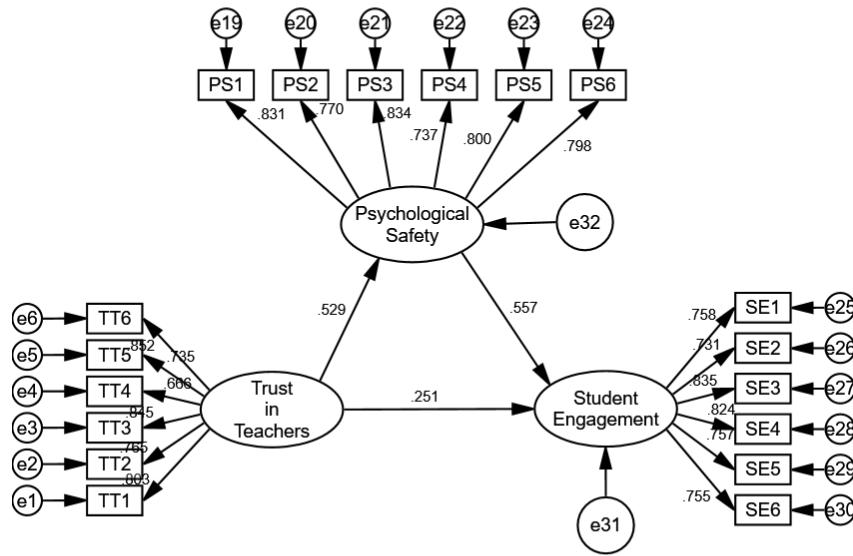


Table 9: Mediating effect of psychological safety in the relationship between TT and SE

Relationship		TT→PS→SE			
Effect		Confidence Interval		P value	Conclusion
		Lower Bound	Upper Bound		
Indirect Effect	.296	.226	.397	.012	Partial Mediation
Direct Effect	.251	.145	.349	.005	
Total Effect	.549	.428	.641	.011	

The results indicate that TT's influence on SE includes both significant direct effects and significant indirect effects mediated through PS. The indirect effect is 0.296 (confidence interval: 0.226 to 0.397, p-value: 0.012), showing that PS plays a mediating role between TT and SE. The direct effect is 0.251 (confidence interval: 0.145 to 0.349, p-value: 0.005), suggesting that TT's direct influence on SE

remains significant even after accounting for the mediation effect. The total effect is 0.549 (confidence interval: 0.428 to 0.641, p-value: 0.011), reflecting the overall significant impact of TT on SE. The confidence intervals of all effects do not cross zero, further confirming statistical significance. Overall, these findings highlight the important mediating role of PS in the relationship between TT and SE.

In conclusion, this study assesses the mediating role of psychological safety in the relationship between trust in teachers and students' engagement. The results show that there is a significant indirect effect between trust in teacher and student engagement, and the positive effect is significant, supporting H8.

Figure 5: Mediating model of psychological safety in the relationship between TSR and SE

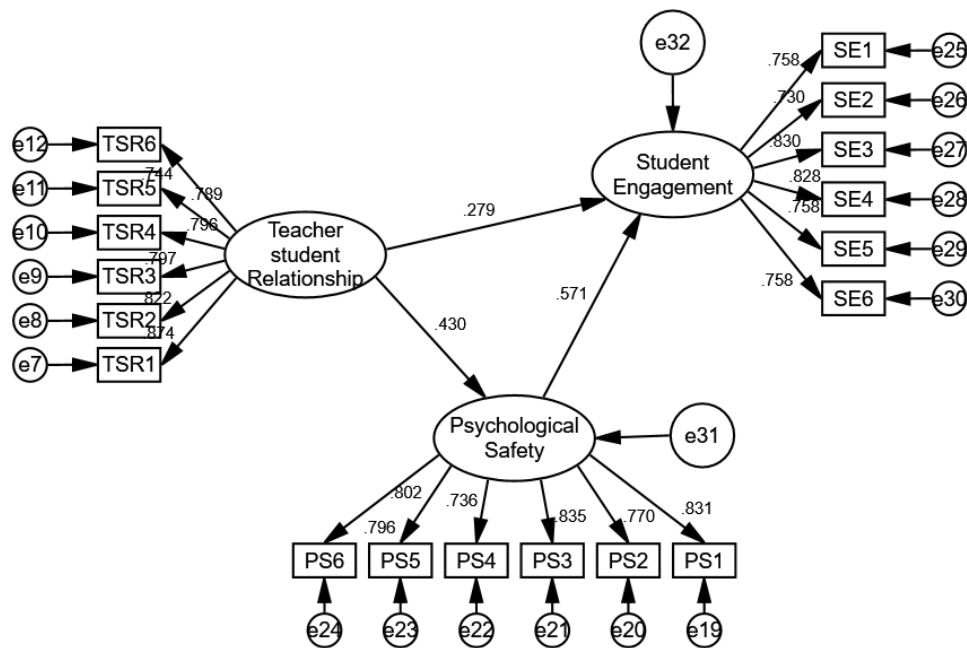


Table 10: Mediating effect of psychological safety in the relationship between TSR and SE

Relationship		TSR→PS→SE			Conclusion
Effect		Confidence Interval		P value	
		Lower Bound	Upper Bound		
Indirect Effect	.201	.142	.269	.009	Partial Mediation
Direct Effect	.229	.161	.310	.005	
Total Effect	.430	0.235	0.413	0.003	

As can be seen from Table 10, the value of indirect effect (TSR→PS→SE) is 0.201, the confidence interval is [0.142, 0.269], and the p value is 0.009. This shows that the indirect effect of TSR on SE is significant through the intermediary variable PS. TSR indirectly affects SE by affecting PS. Since the confidence interval does not cross zero and the P-value is less than 0.05, the significance of the indirect effect is confirmed. This indirect effect is a core part of the mediation model, suggesting that PS acts as a key bridge between TSR and SE. The value of the direct effect (TSR→SE) is 0.229, the confidence interval is [0.161, 0.310], and the p value is 0.005. Even after controlling for the effect of PS, the direct relationship between TSR and SE remained significant. This means that in addition to the indirect effect of PS, there is also a direct correlation between TSR and SE, indicating that the influence of TSR on SE is multipath. The value of the total effect is 0.430, the confidence interval is [0.235, 0.413], and the P-value is 0.003. Total effect represents the total effect of TSR on SE, combining direct and indirect effects. This result further emphasizes the significant effect of TSR on SE, and the confidence interval does not cross zero, so the statistical significance is confirmed. Can draw from the form (TSR) impact on SE includes both the direct path, but also a indirect path through PS, or PS play a part in a relationship (TSR) and SE intermediary role. The indirect effect accounted for a part of the total effect, indicating that the existence of PS has a certain adjustment and explanatory power on the connection between TSR and SE. This model shows that TSR not only directly acts on SE, but also indirectly acts on SE through affecting PS, which provides in-depth analysis support for the study.

Figure 6: Mediating model of psychological safety in the relationship between TSR and SE

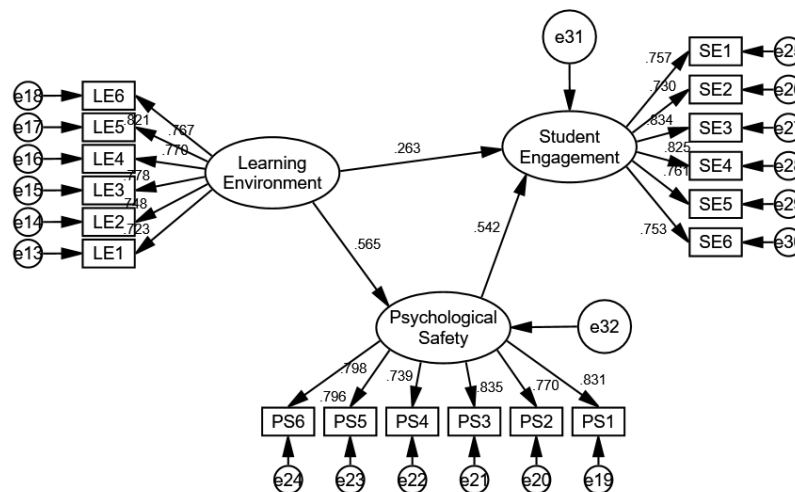


Table 11: Mediating effect of psychological safety in the relationship between LE and SE

Relationship		LE→PS→SE			
Effect		Confidence Interval		P value	Conclusion
		Lower Bound	Upper Bound		
Indirect Effect	.309	.234	.424	.006	Partial Mediation

Direct Effect	.265	.138	.368	.011	
Total Effect	.574	.478	.690	.005	

Table 11 shows that the indirect effect of LE on SE through PS is significant, the estimated value is 0.309, and the 95% confidence interval is [0.234, 0.424] ($p=0.006$), indicating that PS plays a partially mediating role between LE and SE. Because the confidence interval of indirect effect does not contain zero and the P-value is significant, it indicates that the intermediary effect of PS is statistically significant. At the same time, after controlling the mediating effect of PS, the direct effect of LE on SE was still significant (0.265, 95% CI [0.138, 0.368], $p=0.011$), indicating that PS could only partially explain the effect of LE on SE. The total effect of LE on SE was also significant (0.574, 95%CI [0.478, 0.690], $p=0.005$), further supporting the conclusion that LE not only directly affects SE, but also indirectly affects SE through PS. The research results show that although the PS in LE SE relationship plays a mediating role, but did not fully explain the correlation between, because the direct effect is still significant. The confidence intervals for indirect effects and direct effects are narrow and do not contain zero, indicating that the estimates are robust. The P-values of all effects were less than 0.05, which further verified the statistical significance of the results. This part of the mediation model shows that the influence of LE on SE exists both direct path and indirect path through PS. PS is an important factor in the influence mechanism, but it is not the only path.

Table 12: Summary of the mediating effects

Relationship	Conclusion
TT→PS→SE	Partial Mediation
TSR→PS→SE	Partial Mediation
LE→PS→SE	Partial Mediation

The summary of mediating effects in Table 12 indicates that the relationships TT→PS→SE, TSR→PS→SE, and LE→PS→SE all exhibit partial mediation. This means that the variable PS plays a mediating role in each of these relationships, facilitating an indirect pathway between the independent variables (TT, TSR, LE) and the dependent variable SE, alongside significant direct effects. The partial mediation highlights the dual influence of TT, TSR, and LE on SE, showing both direct interactions and indirect effects through PS. These findings underscore the critical role of PS as a bridging factor that enhances the understanding of how TT, TSR, and LE contribute to SE.

Discussion and Conclusion

The findings from higher vocational medical colleges in Guangdong Province indicate that trust in teachers (TT), teacher–student relationships (TSR), and the learning environment (LE) significantly influence both psychological safety (PS) and student engagement (SE), with PS functioning as a critical mediating variable. TT exerts notable direct and indirect effects on PS and SE, suggesting that trust constitutes a fundamental basis for fostering psychological safety and sustaining engagement. Although the effects of TSR on PS and SE are comparatively weaker, they remain statistically significant, underscoring the importance of teacher–student interactions in enhancing students' intrinsic motivation. LE demonstrates the strongest impact on both PS and SE, primarily by indirectly promoting engagement through heightened psychological safety, thereby highlighting the essential role of environmental design in strengthening students' sense of security and participation.

Moreover, PS emerges as the most robust predictor of SE, significantly shaping students' cognitive and behavioral engagement, thereby affirming the central tenets of psychological safety theory. Collectively, these results suggest that TT, TSR, and LE not only enhance SE indirectly via PS but also exert independent direct effects. This study thus provides important theoretical and practical implications for instructional design and student development in vocational medical education, particularly in emphasizing strategies that cultivate psychological safety as a pathway to improving engagement outcomes.

Limitation and Suggestions for Future Research

Although this study, based on large-scale sampling, elucidated the mechanisms linking teacher–student relationships, learning environment, and student engagement among medical students in Guangdong Province, several limitations should be acknowledged. First, regarding sample representativeness, the study employed probability sampling across six medical vocational colleges; however, the sample was restricted to public institutions within a single province and only included students with more than one year of enrollment. Second, the exclusive reliance on student self-reported measures introduces potential risks of common method bias and social desirability effects. Finally, the cultural specificity of China’s vocational medical education system, particularly in teacher–student interactions, may constrain the generalizability of the findings to other educational and cultural contexts.

Future research could address these limitations from multiple perspectives. Expanding the diversity and representativeness of samples is recommended by incorporating institutions from central and western regions of China and conducting comparative studies across different types of higher education institutions, such as comprehensive universities. Longitudinal designs should also be employed to capture dynamic changes in teacher–student relationships and student engagement from enrollment through clinical internship, paying particular attention to variations across academic stages.

From a methodological standpoint, mixed-methods approaches are strongly encouraged. Future studies could integrate quantitative surveys with qualitative techniques such as in-depth interviews and classroom observations, supplemented with objective indicators (e.g., learning behavior logs, academic performance) to strengthen multi-source validation. Experimental interventions, such as teacher–student relationship training or learning environment optimization, could be tested with control groups to generate more robust evidence for educational reform.

Such in-depth investigations would contribute to building a more comprehensive theoretical framework for medical education relationships while offering practical guidance to improve the quality of medical student training. Additionally, future research should pay closer attention to the needs of special student groups (e.g., students with learning difficulties) and explore the transformative influence of emerging technologies, such as artificial intelligence, on traditional teacher–student dynamics in order to capture evolving trends in contemporary medical education.

References

- [1]. Bandura, A. (1977). *Social learning theory*. Prentice Hall.
- [2]. Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.
- [3]. Bandura, A., Ross, D., & Ross, S. A. (1961). Transmission of aggression through imitation of aggressive models. *Journal of Abnormal and Social Psychology*, 63(3), 575–582.
- [4]. Bear, G. G. (2010). *School discipline and self-discipline: A practical guide to promoting student behavior*. Guilford Press.
- [5]. Bryk, A. S., & Schneider, B. (2002). *Trust in schools: A core resource for improvement*. Russell Sage Foundation.
- [6]. Bump, G. M., & Cladis, F. P. (2024). Psychological Safety in Medical Education, Another Challenge to Tackle?. *Journal of General Internal Medicine*, 1-5.
- [7]. Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- [8]. Dong, Y., Wang, H., Luan, F., Li, Z., & Cheng, L. (2021). How children feel matters: teacher–student relationship as an indirect role between interpersonal trust and social adjustment. *Frontiers in Psychology*, 11, 581235.
- [9]. Edmondson, A. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, 44(2), 350-383.
- [10]. Fu, H., Liu, M., & Zhang, Q. (2025). Mobile phone dependence, time management disposition, self-control and academic engagement among Chinese college students: A chain mediation model. *BMC Psychology*, 13, Article 112. <https://doi.org/10.1186/s40359-025-02619-x>
- [11]. Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology*, 95(1), 148-162.
- [12]. Gandarillas, M. A., Elvira-Zorzo, M. N., & Rodríguez-Vera, M. (2024). The impact of parenting practices and family economy on psychological wellbeing and learning patterns in higher education students. *Psicología: Reflexão e Crítica*, 37, 8.

- [13].Gao Li, Yanfang Zhou, & Qiumei Zhang.(2022). Research on the status quo and educational countermeasures of mental health education for medical students. *Chinese Journal of School Medicine*, 36(5), 385-387.
- [14].Gao, Q., Bao, C., Du, H., & Yan, R. (2023). The mediating role of basic psychological needs satisfaction in the relationship between teacher-student relationshipss and academic engagement in China. *Asia Pacific Journal of Education*, 43(2), 514-525.
- [15].Hardie, P., O'Donovan, R., Jarvis, S., & Redmond, C. (2022). Key tips to providing a psychologically safe learning environment in the clinical setting. *BMC Medical Education*, 22(1), 816.
- [16].Kedia, P., & Mishra, L. (2023). Exploring the factors influencing the effectiveness of online learning: A study on college students. *Social Sciences & Humanities Open*, 8(1), 100559.
- [17].Kong, L. N., Yao, Y., Chen, S. Z., & Zhu, J. L. (2023). Prevalence and associated factors of burnout among nursing students: A systematic review and meta-analysis. *Nurse Education Today*, 121, 105706.
- [18].Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607–610.
- [19].Li, H. (2025). Impact of collaborative learning on student engagement in college English programs: Mediating effect of peer support and moderating role of group size. *Frontiers in Psychology*, 16, 1525192.
- [20].Li, J., & Xue, E. (2023). Dynamic interaction between student learning behaviour and learning environment: Meta-analysis of student engagement and its influencing factors. *Behavioral Sciences*, 13(1), Article 59.
- [21].McLeod, E., & Gupta, S. (2023). The role of psychological safety in enhancing medical students' engagement in online synchronous learning. *Medical science educator*, 33(2), 423-430.
- [22].Nembhard, I. M., & Edmondson, A. C. (2006). Making it safe: The effects of leader inclusiveness and professional status on psychological safety and improvement efforts in health care teams. *Journal of Organizational Behavior*, 27(7), 941-966.
- [23].Palmer, R. H., Moulton, M. K., Stone, R. H., Lavender, D. L., Fulford, M., & Phillips, B. B. (2022). The impact of synchronous hybrid instruction on students' engagement in a pharmacotherapy course. *Pharmacy practice*, 20(1), 1-8.
- [24].Urdan, T., & Schoenfelder, E. (2006). Classroom effects on student motivation: Goal structures, social relationships, and competence beliefs. *Journal of School Psychology*, 44(5), 331-349.
- [25].Vermeulen, E. J., & Volman, M. L. L. (2024). Promoting student engagement in online education: Online learning experiences of Dutch university students. *Technology, Knowledge and Learning*, 29(2), 941–961.
- [26].Wang, Y. P., Zhao, C. X., Zhang, S. E., Li, Q. L., Tian, J., Yang, M. L., ... & Cao, D. P. (2022). Proactive personality and critical thinking in Chinese medical students: The moderating effects of psychological safety and academic self-efficacy. *Frontiers in psychology*, 13, 1003536.
- [27].Wentzel, K. R. (2012). Socio-cultural contexts and social competencies for student achievement. In J. Hattie & E.M. Anderman (Eds.), *International handbook of student achievement* (pp. 361–363). Routledge.
- [28].Wentzel, K. R. (2012). Socio-cultural contexts and social competencies for student achievement. In J. Hattie & E.M. Anderman (Eds.), *International handbook of student achievement* (pp. 361–363). Routledge.
- [29].Zimmerman, B. J., & Kitsantas, A. (2002). Acquiring writing revision and self-regulatory skill through observation and emulation. *Journal of Educational Psychology*, 94(4), 660-668.