A Study on the Relationship between Harmonious Teacher-student Relationship, Student Competence, and Learning Performance

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Abstract. The teacher-student relationship is the most basic and important interpersonal relationship in school education. Previous studies have shown that harmonious teacher-student relationships play an important role in improving students' learning performance. To explore the relationship between harmonious teacher-student relationships, student competence, and learning performance, this study constructed a theoretical model of the relationship between harmonious teacher-student relationships, student competence, and learning performance. A network questionnaire survey was used to analyze the positive impact of harmonious teacher-student relationships on student competence and learning performance using a structural equation model, Explored the mediating role of student competence. Propose to actively build a harmonious teacher-student relationship.

Keywords: Harmonious teacher-student relationship; Student competence; Learning performance; Mediation effect.

1 Introduction

The teacher-student relationship is the most basic and important interpersonal relationship in school education. Previous studies have shown that harmonious teacher-student relationships play an important role in improving students' learning performance. Harmonious teacher-student relationships are a key factor in improving students' learning performance, while conflicting teacher-student relationships are an important constraint factor for students' low learning performance [1-3]. Previous research has mainly focused on defining the concept of teacher-student relationship, the functions of teacher-student relationship, the types of teacher-student relationship, the practical problems of teacher-student relationship, the main factors affecting teacher-student relationship, and the reasonable positioning and ideal model of teacher-student relationship [4-5]. In reality, many students believe that the improvement in their academic performance in a certain subject is due to a decrease in interest in learning a particular subject due to a change in teacher they like, and it is attributed to the teacher's bad treatment of me. Even more, many parents try their best to establish good relationships with their teachers, hoping to improve the teacher-student relationship through their own efforts, thereby improving their children's academic performance. From this, it can be seen that there has been little research on the potential positive effects of harmonious teacher-student relationships, and there is a lack

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of exploration on the mechanisms and mediating factors that affect students' learning performance. The impact of teacher-student relationships on learning performance urgently needs to be clarified.

This study takes college students as the research object, constructs a theoretical framework for the relationship between harmonious teacher-student relationship, student competence, and learning performance, reveals the logical relationships of various variables in this framework, and attempts to answer the following questions: firstly, what kind of relationship exists between harmonious teacher-student relationship, student competence, and learning performance? Secondly, how can we improve learning performance and achieve high-quality educational development by building a harmonious teacher-student relationship and student competence?

2 Theoretical analysis and research hypotheses

Learning performance is an important variable for evaluating and testing the quality and effectiveness of education and teaching, and it is also a core factor that affects the quality of education. Previous studies have shown that learning performance is influenced by harmonious teacher-student relationships. Harmonious teacher-student relationships can affect students' participation and engagement, and teachers' engagement in harmonious teacher-student relationships can promote learning performance. Active learning support work, frequent participation in forum discussions, and pre class resource release can promote students' learning performance. Harmonious teacher-student relationships are positively correlated with students' learning performance [6-7]. Based on this, this study proposes the following assumptions:

Hypothesis 1: Harmonious teacher-student relationship positively affects learning performance.

The teacher-student relationship is one of the important social relationships in the process of student socialization, and a safe and harmonious teacher-student relationship is the foundation for cultivating students' competence. A harmonious teacher-student relationship is beneficial for students to form a positive emotional attitude towards the school, actively participate in class and school activities, form positive emotional relationships with classmates, and develop good personality traits and high social adaptability. Pianta's study of 490 first grade elementary school students found that students with harmonious relationships with teachers have better competence, while students with more teacher-student conflicts have relatively poorer competence [8-9]. Based on this, this study proposes the following assumptions:

Hypothesis 2: Harmonious teacher-student relationship positively affects students' competence.

Learning performance is influenced by students' competence, and students' learning performance is influenced by individuals' learning literacy, learning behavior, and skills throughout their learning careers. McClelland first proposed the concept of competence, believing that competence is a potential characteristic of individuals who clearly distinguish between excellent and mediocre students. Hackett et al. conducted research on female university faculty to explore the most important behaviors and skills that affect their learning career, and proposed the concept of student competence. Student competence can be measured through motivation, traits, self-concept, skills, and knowledge, Compared to competence, student competence focuses on the behavior and skills of individuals in this specific context of their learning career. The constituent elements of student competence mainly include knowledge,

skills, and style, while student competence emphasizes the skills and behaviors that students as a special object must possess, such as learning skills, professional knowledge, learning literacy, and communication skills [10-11]. Based on this, this study proposes the following assumptions:

Hypothesis 3: Student competence positively affects learning performance.

Based on the above theoretical analysis, the theoretical logic of existing research is mainly: harmonious teacher-student relationship - student competence - learning performance, and then construct a conceptual model as shown in Figure 1.

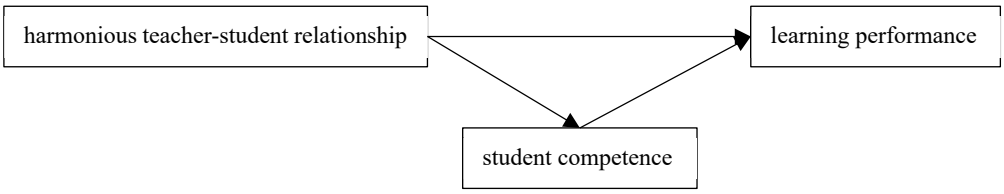

Figure 1 Conceptual model diagram of the relationship between harmonious teacher-student relationship, student competence, and learning performance

3 Data sources and research methods

3.1 Data sources and sample characteristics

This study adopts a questionnaire survey method and conducted a survey on the harmonious teacher-student relationship, student competence, and learning performance of college students from July to August 2022 using online questionnaires. The research subjects are students in higher education institutions. This study distributed a total of 200 questionnaires, excluding invalid questionnaires and duplicate responses. After sorting and screening, a total of 180 valid questionnaires were collected, with an effective response rate of 90.0%. The demographic characteristics of the sample are shown in Table 1: 100 students of male gender, accounting for 55.6%, and 80 students of female gender, accounting for 44.4%; The number of students in universities is 105, accounting for 58.3%. The number of students in colleges is 33, accounting for 18.3%. The number of students in vocational colleges is 42, accounting for 23.4%; The number of students in first grade is 60, accounting for 33.3%, in second grade is 55, accounting for 30.6%, in third grade is 45, accounting for 25.0%, and in fourth grade is 20, accounting for 11.1%.

Table 1 Descriptive Statistical Analysis of Samples

category	options	Number of samples	Proportion (%)
Gender	male	100	55.6%
	female	80	44.4%
School type	university	105	58.3%
	college	33	18.3%
	Higher vocational schools	42	23.4%
grade	first grade	60	33.3%

second grade	55	30.6%
Third grade	45	25%
fourth grade	20	11.1%

3.2 Variable measurement

The scales used in this study were developed and validated by domestic and foreign scholars.

Independent variable. In this study, the harmonious teacher-student relationship mainly adopts the teacher evaluation and overall teacher-student relationship situation questionnaire adapted by Whitaker et al. based on the Pianta simplified version of the teacher-student relationship questionnaire [12]. This scale is widely used due to its good reliability and validity. This study adopts the "harmony" dimension from the original questionnaire, which includes 5 items.

Mediating variables. The competency of middle school students in this study mainly adopts the revised questionnaire for college student competency developed by Xie Youru et al. [13]. This questionnaire mainly measures students' competence in learning based on their sense of self ability, self effort, environmental awareness, and behavioral control. It mainly includes 6 items.

Dependent variable. The learning performance in this study mainly adopts the college student learning performance questionnaire developed by Jia Bin et al. [14]. The questionnaire mainly includes five items: learning satisfaction, ability and social interaction, academic performance, personal knowledge, and input-output ratio.

3.3 Research methods

This study mainly analyzes the relationship between harmonious teacher-student relationship, student competence, and learning performance among college students. Based on the literature review and research hypotheses mentioned earlier, the study takes college students' learning performance as the dependent variable, harmonious teacher-student relationship as the independent variable, and student competence as the mediating variable. Based on the construction principle of the conceptual model diagram and structural variance model in Figure 1, the following structural equation model is constructed:

$$\eta=B\eta+\Gamma\xi+\zeta \tag{1}$$

And the following two measurement equations:

$$Y=\Lambda_y\eta+\theta_\varepsilon \tag{3}$$

$$X=\Lambda_x\xi+\theta_\delta \tag{2}$$

In equation (1), B and Γ is the path coefficient, ζ is the random error of the structural model. In equations (2) and (3), X reflects the independent and intermediate variables, and Y reflects the dependent variable, θ_ε and θ_δ represents random error.

4 Research results and analysis

4.1 Reliability and validity testing

This study used SPSS 22.0 to test the reliability of the data scale, and the results showed that the Cronbach's alpha value for harmonious teacher-student relationship was 0.874, the Cronbach's alpha value for student competence was 0.767, and the Cronbach's alpha value for learning performance was 0.756. DeVellis found that if Cronbach's alpha value reaches the range of 0.7 to 0.8, it indicates that the scale has considerable reliability, and reaching 0.8 to 0.9 indicates that the scale has very good reliability. From this, it can be seen that the internal consistency between the various scales in this study is good and has high reliability. Meanwhile, the scales used in this study are all developed and validated by domestic and foreign scholars, and each scale has high content validity.

4.2 Analysis of the relationship between harmonious teacher-student relationship, student competence, and learning performance

Based on the research framework, research hypotheses, and model settings mentioned earlier, this article adopts the maximum likelihood estimation method and uses AMOS22.0 to establish a structural equation model for the relationship between harmonious teacher-student relationship, student competence, and learning performance. X^2/df, PNFI, PGFI, IFI, TLI, CFI, GFI, RMSEA and other indicators are selected to calculate and test the model's reduced goodness of fit, value-added goodness of fit, and absolute goodness of fit, The goodness of fit of the initial model is shown in Table 2. Wen Zhonglin proposed that the closer the relative index is to 1, the better the fitting effect of the model. If it is 0.9 or above, the model is acceptable. If the RMSEA is less than 0.05, it indicates good fitting of the model. If it is between 0.05 and 0.08, it indicates that the model is basically acceptable. Due to some fitting indices of the initial model being lower than the minimum evaluation criteria, the model needs to be modified. This article modifies the initial model by deleting observation variables with weaker correlation with variable paths and increasing the correlation between residual terms, and obtains the goodness of fit of the final modified model as shown in Table 2. From Table 2, it can be seen that compared with the initial model, the modified model has optimized various goodness of fit evaluation indicators and ultimately meets the evaluation criteria for structural equation goodness of fit. The final standardized correction model path analysis diagram and path coefficient table are shown in Figure 2 and Table 3.

Table 2 Model goodness of fit

Fitting index	Minimalist Fit			Compare fitness			Absolute Fit		
	PCFI	PNFI	PGFI	IFI	TLI	CFI	x^2/df	GFI	RMSEA
Evaluation criteria	>0.5	>0.5	>0.5	>0.9	>0.9	>0.9	<3	>0.9	<0.08
initial model	0.764	0.728	0.691	0.853	0.835	0.852	3.914	0.840	0.079
Revised model	0.758	0.736	0.661	0.954	0.942	0.954	2.507	0.936	0.057

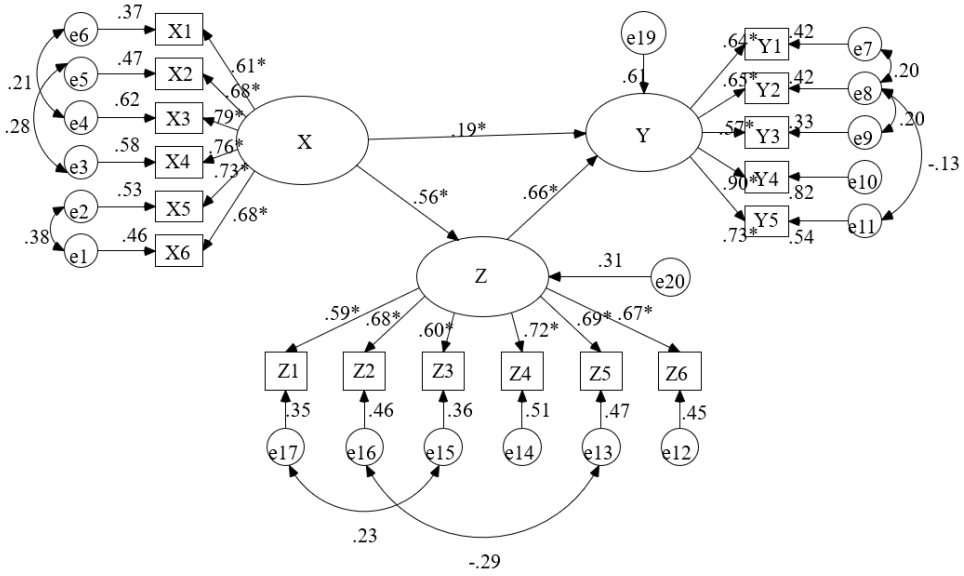

Figure 2 Path Analysis Diagram

Note: All estimated values of path coefficients are significant at the statistical level of 0.01, so "*" is used to indicate their significance results; All path coefficients are standardized coefficients.

Table 3 shows the path coefficients and corresponding P-values between various variables. The results show that the impact of harmonious teacher-student relationship on learning performance has a path coefficient of 0.189, and the impact of harmonious teacher-student relationship on student competence has a path coefficient of 0.560. The impact of student competence on learning performance has a path coefficient of 0.659, and the P-values have reached a significant level. The corresponding hypotheses are all valid.

Table 3 Revised Model Path Coefficients Table

Relationship between variables			Standardized path coefficient	P-value	Correspondence hypothesis	Inspection results
Learning performance	<--	Harmonious teacher-student relationship	0.189	***	Hypothesis 1	Support
Student Competence	<--	Harmonious teacher-student relationship	0.560	***	Hypothesis 2	Support
Learning performance	<--	Student Competence	0.659	***	Hypothesis 3	Support

Table 4 shows the test of direct and indirect effects between various variables. The results show that the direct effect value of harmonious teacher-student relationship on learning performance is 0.189, the indirect effect value is 0.369, the direct effect value on student competence is 0.560,

and the direct effect value of student competence on learning performance is 0.659. Using the Bootstrap confidence interval test method, the results showed that the confidence intervals did not include 0, and the P-values were all significant at the statistical level of 0.01. Therefore, the direct effect of harmonious teacher-student relationship on learning performance was significant, the indirect effect was significant, the direct effect on student competence was significant, and the direct effect of student competence on learning performance was significant, Further verification suggests that student competence plays a mediating role between harmonious teacher-student relationships and learning performance.

Table 4 Test for Direct and Indirect Effects

Relationship between variables			Direct effect	Indirect effect	Total effect
Learning performance	<--	Harmonious teacher-student relationship	0.189	0.369	0.558
Student Competence	<--	Harmonious teacher-student relationship	0.560	——	0.560
Learning performance	<--	Student Competence	0.659	——	0.659

Relationship between variables			Bootstrap confidence interval test					
			Bias		Percentile		P-value	Inspection results
Learning performance	<--	Harmonious teacher-student relationship	0.467	0.660	0.463	0.654	0.002	significant
Student Competence	<--	Harmonious teacher-student relationship	0.466	0.646	0.468	0.647	0.002	significant
Learning performance	<--	Student Competence	0.532	0.765	0.531	0.765	0.002	significant

Analysis of the direct effects of harmonious teacher-student relationship on learning performance and student competence. The results in Figure 2 show that the path coefficient of harmonious teacher-student relationship on learning performance is 0.19, indicating a significant positive impact of harmonious teacher-student relationship on learning performance. The path coefficient of harmonious teacher-student relationship on student competence is 0.56, indicating that harmonious teacher-student relationship also has a significant positive impact on student competence. By improving harmonious teacher-student relationships, students' competence and learning performance can be improved.

Analysis of the direct effect of student competence on learning performance. The path coefficient of student competence on learning performance is 0.66, indicating that student competence has a significant positive impact on learning performance.

Analysis of the mediating effect of student competence on harmonious teacher-student relationships and learning performance. Harmonious teacher-student relationships have a significant impact on both learning performance and student competence, and student competence also has a significant impact on learning performance. Moreover, harmonious teacher-student relationships can have an impact on learning performance through student

competence. Therefore, student competence plays a partial mediating role between harmonious teacher-student relationships and learning performance.

5 Conclusions

This study explored the relationship between harmonious teacher-student relationship, student competence, and learning performance through a questionnaire survey using a structural equation model. It was found that harmonious teacher-student relationship positively affects student competence and learning performance, and student competence plays a mediating role between harmonious teacher-student relationship and learning performance. Therefore, teachers should strive to establish a positive and harmonious teacher-student relationship with students. On the one hand, it is necessary to be close to students and understand their true behavioral motivations. The explicit behavior of students has its underlying reasons and inner desires. Teachers should pay attention to students who exhibit abnormal behavior, identify their real problems, and provide targeted support without negative evaluation. On the other hand, communicate fully with students and establish emotional connections. Positive communication between teachers and students is an important medium for enhancing emotions between teachers and students. Through teacher-student interaction, students can establish self-esteem and confidence, correctly understand themselves and monitor their own behavior, understand others' emotions, and solve conflicts. Smooth teacher-student interaction can provide positive examples for students to handle relationships with peer groups.

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