

Article

How Teacher Learning Affects Middle School Students' Learning Motivation and Habits: An Empirical Study Based on PLS-SEM

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Abstract: There is currently a lack of sufficient empirical support regarding how teachers' learning affects students' learning motivation and habits. This research is based on a survey of teachers and students in 23 middle schools in Wenzhou City, China. Nine hundred questionnaires were distributed in this research, and 895 were returned. We used partial least squares structural equation modeling (PLS-SEM) to reveal the relationship between teacher learning and student learning motivation, learning habits. The research found that “teacher learning” has a direct and significant effect on teacher professional development, teachers' working status, and learning task design. At the same time, teacher learning indirectly affects students' learning motivation and learning habits through learning task design, teachers' working status, and teacher professional development. This research reminds educational administration agencies that they should focus on and support teacher learning, which will enhance teacher professional development, improve teachers' working status, and student learning.

Keywords: teacher learning; teacher professional development; teachers' working status; learning motivation; learning habits

1. Introduction

In the current process of teacher professional development, teachers need to not only continuously update their subject knowledge but also improve their teaching skills to respond to the diverse learning needs of students (You et al., 2025; Smit & Humpert, 2012). Teacher learning has become an integral part of modern education systems and is considered a key factor in improving teaching quality and student learning effectiveness (Darling-Hammond et al., 2017; Ruthven et al., 2004). With the development of the education system and global trends placing higher demands on teachers' professional abilities, the importance of teacher learning has become increasingly apparent. Although teacher learning is widely recognized in theory as an important means of improving educational effectiveness, there are still many unresolved issues regarding how to improve student learning effectiveness. Especially in the context of limited educational resources, how to achieve a win-win situation for teachers and students through systematic teacher learning projects still needs to be explored in depth (Borko, 2004).

First, teacher professional development demonstrates the individual growth effects of teacher learning. Avalos (2011) pointed out that teacher learning is the core of teacher professional development, and through a



combination of deep reflection and practice, it can promote the improvement of teachers' teaching abilities. Second, teachers' working status reveals the emotional motivation mechanism of teacher learning. Madigan & Kim (2021b) pointed out that teachers can enhance their sense of commitment to work and reduce the risk of professional burnout by participating in teacher learning activities. Finally, the design of student learning tasks demonstrates the application value of teacher learning. When teachers participate in training and learning about task design, they are better able to understand student needs and design learning tasks that are more suited to student abilities (Smets & Struyven, 2020).

With the increasing attention paid to the effects of teacher learning, especially the relationship between the quality of teacher learning and student learning efficiency. For example, Desimone (2009) emphasized that teacher learning can indirectly enhance students' learning motivation and engagement by affecting teaching confidence and the quality of classroom interaction. Many researchers also point out that positive learning motivation can improve students' learning engagement and achievement (Martínez et al., 2019; Wu et al., 2022; Yan et al., 2025). At the same time, positive learning habits, such as effective time management and proactive learning strategies, are also closely related to academic success (Pérez-González et al., 2022).

Previous researchers have shown that teacher professional development, teachers' working status, and learning task design are all likely to be important factors affecting students' learning motivation and learning habits (Holzberger & Prestele, 2021; Desimone, 2009; Reeve & Cheon, 2021; Guskey, 2002). However, although there has been research focusing on the effect of teacher learning on student learning, there are still some shortcomings in the research (Opfer & Pedder, 2011; Day et al., 2016). First, most research focuses on the direct effects of teacher learning and neglects its indirect effects. Second, existing research is mainly based on European and American education systems, with little research on teacher learning in other cultural contexts. For example, in the Confucian cultural context, teacher learning may have different mechanisms and effects (Huang & Asghar, 2018). Third, empirical research on teacher learning also has methodological shortcomings, such as sample size limitations and complex relationships between variables that have not been fully revealed (Zhang et al., 2024).

This research explores the mechanism of teacher learning on professional development and student learning. It uses partial least squares structural equation modeling (PLS-SEM) to reveal the direct effect of teacher learning on professional development, and the indirect effect on students through mediating variables such as teacher professional development, teachers' working status, and learning task design. Finally, it examines the moderating effects of moderating variables such as class manager and professional position. Furthermore, in the Chinese education field, class managers and professional positions will become important indicators that affect student learning and reflect teacher professional levels (Shi & Leuwerke, 2010). Therefore, the class manager and professional position were introduced as moderating variables to reveal the mechanism of teacher learning more comprehensively. Based on the above research results, this research proposes the following three important issues:

- (1) How does teacher learning directly affect professional development?
- (2) How does teacher learning indirectly affect student learning?
- (3) Do professional position and class manager have a moderating effect?

2. Literature Review and Model Development

2.1. How Does Teacher Learning Directly Affect Professional Development?

Teacher learning typically takes the form of ongoing participation in professional development programs and reflective practice, through which teachers refine their knowledge base and instructional approaches (Vescio et al., 2008). In our research, teacher learning refers to teachers participating in school-organized training, seminars, school-based teaching and research, and other activities to continuously improve their professional skills, teaching knowledge, management abilities, and learning task design abilities, with the aim of promoting professional development and student learning.

In educational practice, teacher professional development is commonly seen in teachers' intentional efforts to refine their teaching methods, boost their instructional impact, and meet higher standards of educational excellence (Guskey, 2002). Teacher learning plays a key role in teacher professional development. Research has shown that there is a direct and significant relationship between teacher learning and teacher professional development. For example, Desimone (2009) pointed out that teachers' participation in deep learning activities such as peer collaboration, reflective teaching, and professional learning communities can directly improve their teaching practices and promote their professional development. In addition, teacher learning is closely related to the effectiveness of teacher professional development. Through continuous knowledge renewal and teaching skill enhancement, teachers can not only improve the spread of teaching content, but also enhance classroom management and the quality of teaching interaction (Desimone, 2009). According to research by Zhou et al. (2023),

continuous teacher learning, especially professional development activities that can be integrated with actual teaching issues, significantly improves teachers' teaching confidence and effectiveness. In our research, teacher professional development refers to the process by which teachers improve their knowledge and skills in subject knowledge, teaching skills, student evaluation, information technology application, classroom management, personalized teaching methods, task design, etc., according to their teaching requirements. Based on this analysis, our research proposes the following hypothesis:

H1a: *Teacher learning has a direct and significant effect on teacher professional development.*

Teachers' working status is typically manifested in their high levels of energy, dedication, and optimism when carrying out teaching and other school-related responsibilities (Schaufeli et al., 2002). Teachers' working status includes high levels of work engagement and enthusiasm for teaching activities, and this status is closely related to teachers' work performance, work satisfaction, and level of professional burnout. This not only reflects teachers' psychological commitment to their work but also involves their emotional identification with their professional role and their sustained efforts. Recent research has emphasized the substantial effect of teacher learning on teachers' working status. For example, Goldschmidt and Phelps (2010) found that through reflective learning and sustained professional training, teachers were able to not only improve their teaching efficiency but also stimulate their creativity and positivity in the teaching process. This positive working status helped reduce stress in teaching and increased teachers' professional satisfaction. Similarly, Madigan & Kim (2021b) pointed out that teachers can enhance their sense of work engagement and reduce the risk of professional burnout by participating in various forms of learning activities such as training courses, peer collaboration, reflective teaching, etc. Especially when teachers' learning is relevant to teaching work, they will significantly improve work engagement and satisfaction. In our research, teachers' working status refers to the psychological and behavioral performance of teachers who are energetic, effectively respond to issues at work, and are positively engaged in classroom teaching. Based on this analysis, our research proposes the following hypothesis:

H2a: *Teacher learning has a direct and significant effect on teachers' working status.*

Learning task design usually refers to teaching designing tasks and activities that can effectively promote student learning based on learning objectives, learner characteristics, and contextual requirements (Roure & Pasco, 2018). Extensive research has identified that teacher learning plays a crucial role in teaching design of learning tasks for students. On the one hand, Smets and Struyven (2020) argued that teachers continuously adjust and improve students' learning task design methods through practical reflection and participation in teaching activities. On the other hand, according to the research of Wake et al. (2016), teachers' decision-making in student learning task design is usually affected by their professional learning. When teachers enhance their pedagogical knowledge through participation in professional development activities, collaboration with colleagues, and self-reflection, they are able to design more challenging and meaningful learning tasks. Some researchers even claim that through professional learning and development, teachers can better understand students' learning requirements and translate these requirements into specific student learning task design solutions (Wake et al., 2016). In our research, learning task design refers to the design of homework by teachers targeting the knowledge, concepts, and skills that students learn. Based on this analysis, our research proposes the following hypothesis:

H3a: *Teacher learning has a direct and significant effect on the design of student learning tasks.*

2.2. How Does Teacher Learning Indirectly Affect Student Learning?

In educational settings, learning motivation is commonly observed when students show persistent effort, purposeful engagement, and self-directed learning, driven by internal psychological processes (Urhahne & Wijnia, 2023). In our research, learning motivation refers to the internal driving forces that enable students to set clear learning goals, take an interest in classroom activities, actively participate in classroom activities, and stimulate their initiative and positive attitude toward learning.

Learning habits are typically manifested in students' regular use of structured approaches to learning, such as time management, note-taking, and self-monitoring, which help sustain academic performance (Urhahne & Wijnia, 2023). In our research, learning habits refer to the normalization of good learning behaviors such as actively preparing learning materials before class, independent learning in class, and promptly correcting mistakes after class.

Research shows that there is a positive correlation between teacher professional development and student learning motivation. For example, Datnow & Hubbard (2015) found that the degree of teacher participation in

professional development was significantly related to student engagement and learning motivation in the classroom. On the one hand, teachers who have received professional development training are more likely to adopt student-centered teaching methods, encourage independent learning, and enhance students' intrinsic motivation. On the other hand, teacher professional development can also improve their sensitivity to student requirements and promote the improvement of classroom management skills, thereby creating a learning environment conducive to student active participation. This improvement in the environment further enhances students' learning motivation and academic achievement. Based on this analysis, our research proposes the following hypotheses:

H1b: *Teacher professional development has a direct and significant effect on student learning motivation.*

H1: *Teacher learning indirectly has a positive effect on student learning motivation by enhancing teacher professional development.*

Research shows that teachers' working status, including their professional burnout, work satisfaction, and emotional engagement, directly affects students' learning motivation. Research found that there is a significant correlation between teachers' emotions and students' emotions and motivation (Frenzel et al., 2009). When teachers display positive emotions, students are more likely to show higher learning motivation. On the other hand, teacher professional burnout has also been shown to have a negative effect on student learning motivation (Madigan & Kim, 2021a). When teachers feel tired, indifferent, or unfulfilled, students may sense these negative emotions, which can reduce their interest and engagement in learning. Based on this analysis, our research proposes the following hypotheses:

H2b: *Teachers' working status has a direct and significant effect on students' learning motivation.*

H2: *Teacher learning indirectly has a positive effect on students' learning motivation by improving teachers' working status.*

Research has shown that teachers can stimulate students' interest, enhance students' intrinsic motivation, and strengthen students' engagement and participation through effective learning task design (Guskey, 2002). Guskey (2002) pointed out that professional learning enables teachers to understand better how to design tasks that are suitable for student learning, thereby enhancing student learning motivation. When teachers are able to design challenging and engaging learning tasks based on student requirements and interests, students are more likely to develop positive learning attitudes and motivation. Based on this analysis, our research proposes the following hypotheses:

H3b: *Effective learning task design has a direct and significant effect on students' learning motivation.*

H3: *Teacher learning indirectly has a positive effect on students' learning motivation by affecting learning task design.*

Research shows that teachers play a key role in cultivating students' learning habits (Darling-Hammond et al., 2017; Smets & Struyven, 2020). On the one hand, Darling-Hammond et al. (2017) believed that teachers learning how to design effective learning tasks helped students form positive learning habits. On the other hand, when designing learning tasks, teachers could enhance students' learning motivation and further consolidate good learning habits by combining students' interests and real-life situations. Smets and Struyven's (2020) research showed that contextualized learning task design could enhance student engagement and learning effectiveness. Based on this analysis, our research proposes the following hypotheses:

H3c: *Effective learning task design has a direct and significant effect on students' learning habits.*

H4: *Teacher learning indirectly has a positive effect on students' learning habits by affecting learning task design.*

In this research, we attempted to use class manager and professional position as moderating variables because relevant research has pointed out that the multiplicity of teachers' identities significantly expands their scope of responsibilities. For example, in the Chinese education system, class managers usually play multiple roles, including teaching, student management, and home-school communication, which contrasts sharply with the single role of subject teachers. Clifton and Jordan (2019) pointed out that teachers with mixed identities, such as class managers, are more likely to adopt innovative strategies to satisfy diverse requirements. Therefore, the class manager's identity will have an effect on teacher professional development and learning task design. Wettstein et

al. (2021) found that class managers need to devote more energy to switching roles when balancing discipline management, emotional support, and subject teaching. Therefore, the class manager's identity has an effect on teachers' working status and a moderating effect. In addition, Zheng et al. (2023) found that teacher quality, as measured by academic qualifications and professional titles, significantly affects students' cognitive achievement. It shows that professional experience accumulated during the professional position promotion process directly affects teaching innovation capability and the depth of teaching practice. Therefore, our research proposes to use class manager and professional position as moderating variables. These two moderating variables may affect the model predictors and the direct effect of teacher learning on teacher professional development, teachers' working status, and learning task design, thereby further affecting the indirect effect of teacher learning on students' learning motivation and learning habits.

Based on the above hypothesis, this research model includes one predictive variable (teacher learning), three mediating variables (teacher professional development, teachers' working status, and learning task design), two dependent variables (learning motivation and learning habits), and two moderating variables (professional position and class manager). A model of teacher learning affecting students will be formed. As shown in Figure 1.

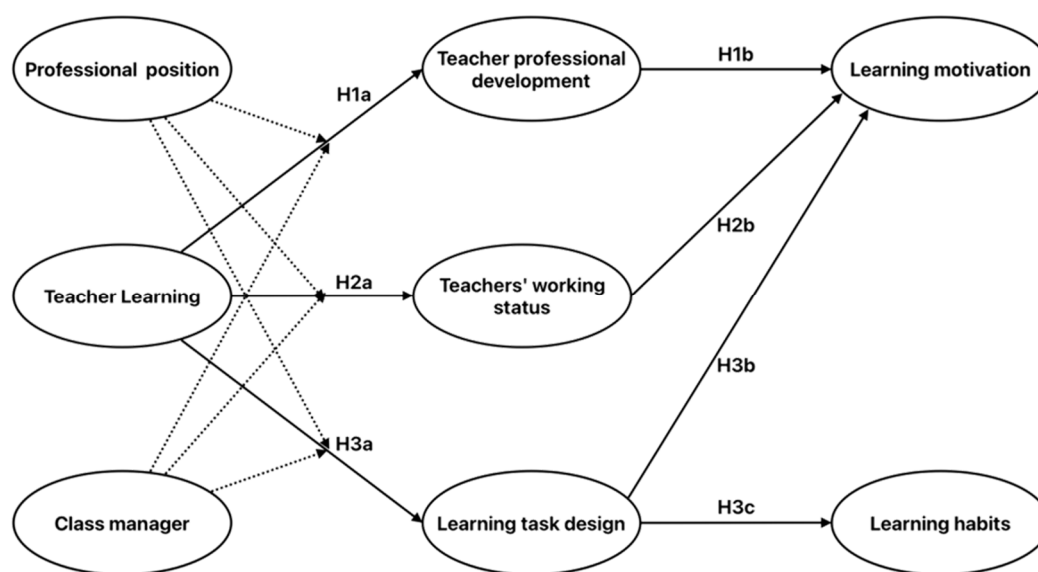


Figure 1. Model of teacher learning affecting students.

3. Method

3.1. Sample Selection and Data Collection

In terms of sample selection size, some researchers suggest that the ratio of sample size to indicators should be at least 5:1 or 10:1 or that the sample size should be at least 100–200 observations (Kock, 2018). For this research, since 27 indicators were used, a critical sample size of at least 270 observations was required. Therefore, this research selected a sample size of 895.

The survey questionnaire was distributed in 2024 via Wenjuanxing (<https://www.wjx.cn>, a widely used online survey platform). A total of 23 middle schools in Wenzhou City, China, were surveyed. The survey participants consisted of teachers and the students they teach. The survey lasted for approximately one month. A total of 895 valid responses were collected, with a response rate of 94.91%. The teacher sample included 353 class managers (39.4%) and 542 non-class managers (60.5%). In terms of professional positions, 60 teachers had junior professional positions (6.7%), 221 teachers had second-level professional positions (24.6%), 370 teachers had first-level professional positions (41.3%), and 244 teachers had senior professional positions (27.2%). The student sample included 456 female students (50.9%) and 439 male students (49.1%), with a roughly equal gender ratio overall. Participants obtained consent prior to participation and were informed of the purpose of the research, their rights, and data protection measures.

3.2. Measurement Scale

The measurement tool uses a five-point Likert scale. To standardize the model estimates for each option and make them consistent with the five-point Likert scale, we created a numerical scale from 1 to 5 for each option. Detailed results of measurement scales and descriptive statistical information are shown in Table 1.

Table 1. Measurement scale and factor loadings.

Construct	Item	Items	Loading	Mean	St.dev.	Adapted from
Teacher Learning	TL1	How often do schools organize training and lecture activities on teachers' professional skills?	0.836	0.182	0.006	Desimone (2009)
	TL2	How often do the teaching and research groups and lesson planning groups conduct seminars on teaching and learning topics?	0.876	0.188	0.005	
	TL3	Teaching and research teams organize training and learning for teachers on the design of learning tasks for students.	0.850	0.174	0.005	
	TL4	Teaching and research teams regularly check students' implementation of learning tasks.	0.833	0.163	0.005	
	TL5	Teachers will comply with the school. Management system for teaching and learning.	0.756	0.155	0.007	
	TL6	Teaching and research groups showcase teachers' teaching performance.	0.767	0.155	0.006	
	TL7	My school conducts regular school-based workshops on teaching and learning.	0.866	0.189	0.005	
Teacher professional development	TPD1	Please select the extent to which you currently need professional development in terms of knowledge and teaching skills in the subject area you are teaching.	0.868	0.237	0.013	Guskey (2002)
	TPD2	Please select the extent to which you currently need to evaluate student approach expertise.	0.884	0.207	0.010	
	TPD3	Please select the extent to which you currently need professional development in multimedia information technology and big data technology.	0.765	0.147	0.015	
	TPD4	Please select the extent to which you currently need professional development in student behavior and classroom management.	0.844	0.197	0.014	
	TPD5	Please select the extent to which you currently need professional development in teaching methods for personalized learning.	0.880	0.205	0.010	
	TPD6	Please select the extent to which you currently require professional development in assignment research and design.	0.833	0.182	0.012	
Teachers' working status	TWS1	I feel energized on workdays.	0.735	0.223	0.014	Toropova et al. (2021)
	TWS2	I can effectively deal with issues brought to me by students and coworkers during the workday.	0.828	0.261	0.012	
	TWS3	I engage my students in the classroom with a positive state of mind.	0.789	0.254	0.013	
	TWS4	I believe my work positively impacts others	0.823	0.269	0.012	
	TWS5	I like my current workplace and workmates.	0.758	0.261	0.014	
Learning task design	LTD1	I assign tasks that require students to think critically	0.777	0.391	0.017	Roure & Pasco (2018)
	LTD2	I give students the necessary scaffolding for assignments based on the difficulty of the assignment.	0.796	0.409	0.017	
	LTD3	I transfer the theoretical knowledge I have learned about assignment design to actual assignment design practice.	0.814	0.455	0.018	
Learning motivation	LM1	I know exactly what the learning objectives are	0.747	0.351	0.019	Pintrich et al. (1993)
	LM2	I am interested and willing to participate in classroom learning activities.	0.913	0.388	0.012	
	LM3	My learning initiative and motivation will be stimulated during the learning process.	0.930	0.412	0.011	
Learning habit	LH1	Before each lesson, I will prepare my own textbook and school supplies.	0.775	0.414	0.035	Zimmerman (2002)
	LH2	In class, even if the teacher is not there, I will read or do my homework carefully.	0.819	0.400	0.032	
	LH3	I will check for errors and correct them as soon as I get my homework back.	0.821	0.427	0.030	

Among them, teacher learning (TL) contains seven items adapted from Desimone's (2009) research. The response options and their corresponding definitions are as follows: "Always" corresponds to 5, "Often" corresponds to 4, "Sometimes" corresponds to 3, "Rarely" corresponds to 2, and "Never" corresponds to 1.

Teacher professional development (TPD) contains six items adapted from Guskey's (2002) research. The response options and their corresponding definitions are as follows: "Not needed at all" corresponds to 1, "Not needed at present" corresponds to 2, "Low level of need" corresponds to 3, "Moderate level of need" corresponds to 4, and "High level of need" corresponds to 5.

Teachers' working status (TWS) contains five items adapted from the research of Toropova et al. (2021). The response options and their corresponding definitions are as follows: "Always" corresponds to 5, "Often" corresponds to 4, "Sometimes" corresponds to 3, "Rarely" corresponds to 2, and "Never" corresponds to 1.

Learning task design (LTD) contains three items adapted from Roure & Pasco's (2018) research. The response options and their corresponding definitions are as follows: "Always" corresponds to 5, "Often" corresponds to 4, "Sometimes" corresponds to 3, "Rarely" corresponds to 2, and "Never" corresponds to 1.

Learning motivation (LM) contains three items, adapted from the research of Pintrich et al. (1993); Learning habit (LH) contains three items, adapted from the research of Zimmerman (2002). The response options and their corresponding definitions are as follows: "Very much agree" is 5, "Agree" is 4, "Somewhat agree" is 3, "Disagree" is 2, and "Strongly disagree" is 1. Detailed results of measurement scales and descriptive statistical information are shown in Table 1.

3.3. Data Analysis

The PLS-SEM method was used for data analysis in the research. To estimate the model, we used the PLS-SEM algorithm with the weighting path scheme in SmartPLS 4 software (Version 4.1.0.9) with a maximum of 3000 iterations and default initial weights, and employed bootstrapping, a nonparametric procedure, running 5000 samples, to determine the statistical significance of the PLS-SEM results, as recommended by Ringle et al. (2022). Reflectively specified constructs were analyzed using the indicator loadings, and an indicator loading above 0.7 suggested that the construct accounted for more than 50% of the variance in the indicator, indicating an acceptable level of item reliability. Therefore, the loadings of this research meet the criteria. See Table 1 for details.

4. Results

4.1. Questionnaire Validity and Reliability Analysis

Composite reliability is a standard for evaluating reliability, with results ranging from 0.70 to 0.95, indicating acceptable to good levels of reliability (Hair et al., 2022). Internal consistency reliability was measured using Cronbach's alpha, which uses similar thresholds as composite reliability (ρ_c). Another reliability coefficient (ρ_A), based on Dijkstra (2010), was also used to provide an exact and consistent alternative. The average variance extracted (AVE) from all items linked to a specific reflective variable was used to assess the convergent validity of the measurement models, and an AVE threshold of 0.50 or higher was deemed acceptable (Sarstedt et al., 2022). The Cronbach's alpha, Reliability coefficient, Composite reliability, and AVE values of this research model meet the standards. See Table 2 for details.

The preferred method for analyzing discriminant validity in PLS-SEM is the heterotrait–monotrait ratio of correlations (HTMT) introduced by Henseler et al. (2015). A HTMT threshold of 0.90 is recommended to ensure discriminant validity, particularly when constructs are conceptually similar, whereas a threshold of 0.85 is more appropriate for more distinct constructs. In Table 3, all values fall below the 0.85 threshold, indicating good discriminant validity.

Table 2. Construct reliability and validity.

	Cronbach's Alpha	Reliability Coefficient (ρ_A)	Composite Reliability (ρ_c)	AVE
Learning habit	0.728	0.729	0.847	0.648
Learning motivation	0.830	0.841	0.900	0.753
Learning task design	0.711	0.715	0.838	0.633
Teacher learning	0.923	0.927	0.938	0.684
Teacher professional development	0.921	0.932	0.938	0.717
Teachers' working status	0.846	0.849	0.891	0.620

Table 3. HTMT values.

	LH	LM	LTD	TL	TPD	TWS
LH						
LM	0.256					
LTD	0.458	0.527				
TL	0.496	0.553	0.735			
TPD	0.291	0.320	0.248	0.209		
TWS	0.414	0.423	0.624	0.528	0.107	

Note: LH: Learning habit; LM: Learning motivation; LTD: Learning task design; TL: Teacher Learning; TPD: Teacher professional development; TWS: Teachers' working status.

4.2. The Significance Tests of the Structural Model Path Coefficients and Hypothesis Verification

The coefficient of determination (R^2) is then assessed to determine the explanatory power of each construct and the overall model. R^2 ranges from 0 to 1, and higher values indicate larger explanatory power. As a general rule of thumb, R^2 values of 0.25, 0.50, and 0.75 are considered weak, moderate, and substantial, respectively (Hair et al., 2011). To determine the effect size of a variable, f^2 values of 0.35, 0.15, and 0.02 correspond to large, medium, and small effects, respectively, and values below 0.02 suggest an absence of impact (Sarstedt et al., 2022).

Figure 2 shows the results of the PLS-SEM analysis. Through the analysis of standardized regression coefficients, the results show that the standardized regression coefficient of teacher learning on learning task design is the highest, with a value of 0.620, followed by teachers' working status (0.465) and teacher professional development (0.195). The strongest predictor of learning motivation is learning task design, with a standardized regression coefficient of 0.253, followed by teachers' working status (0.219) and teacher professional development (0.217). Therefore, the analysis results show that teacher learning has the most significant indirect effect on students' learning motivation through its effect on learning task design. Similarly, the standardized regression coefficient of learning task design on learning habits is 0.332, indicating that teacher learning also has a positive indirect effect on students' learning habits through its effect on learning task design.

The R^2 value of learning motivation in Figure 2 is 0.240, which indicates that teacher learning has a weak positive explanatory power on learning motivation through "teacher professional development, teachers' working status, and learning task design. The R^2 value of learning habits in Figure 2 is 0.110, which indicates that teacher learning has a weak positive explanatory power on learning habits through teacher professional development, teachers' working status, and learning task design.

The commonly used significance levels for p -values are 0.05, 0.01, and 0.001. These levels correspond to the standards of * $p < 0.05$ (statistically significant), ** $p < 0.01$ (highly significant), and *** $p < 0.001$ (extremely significant) (Biau et al., 2010; Wasserstein & Lazar, 2016). Table 4 shows that, except for H1, whose p -value is 0.001, the p -values of the remaining hypotheses are all less than 0.001, which means that each hypothesis is extremely significant.

The analysis results indicate that all hypotheses are valid and significant. Table 4 lists the significance tests of the structural model path coefficients and hypothesis verification.

We have incorporated moderating relationships of class manager and professional position into the model, which were hypothesized a priori and specifically tested. The results of the moderating effect of class manager and professional position are presented in Table 5. The results show that neither of the two moderating variables had a significant effect on the relationships between the predictors and the criterion variables across the hypothesized paths.

Table 4. Path coefficients and the results of the significance tests.

Hypothesis	Path	Coefficient	p Values	f^2	Confirmed
H1a	TL→TPD	0.195	0.000	0.025	Yes
H2a	TL→TWS	0.465	0.000	0.169	Yes
H3a	TL→LTD	0.620	0.000	0.359	Yes
H1b	TPD→LM	0.217	0.000	0.059	Yes
H2b	TWS→LM	0.219	0.000	0.048	Yes
H3b	LTD→LM	0.253	0.000	0.062	Yes
H3c	LTD→LH	0.332	0.000	0.124	Yes
H1	TL→TPD→LM	0.042	0.001	/	Yes
H2	TL→TWS→LM	0.102	0.000	/	Yes
H3	TL→LTD→LM	0.157	0.000	/	Yes
H4	TL→LTD→LH	0.206	0.000	/	Yes

Note: LH: Learning habit; LM: Learning motivation; LTD: Learning task design; TL: Teacher Learning; TPD: Teacher professional development; TWS: Teachers' working status.

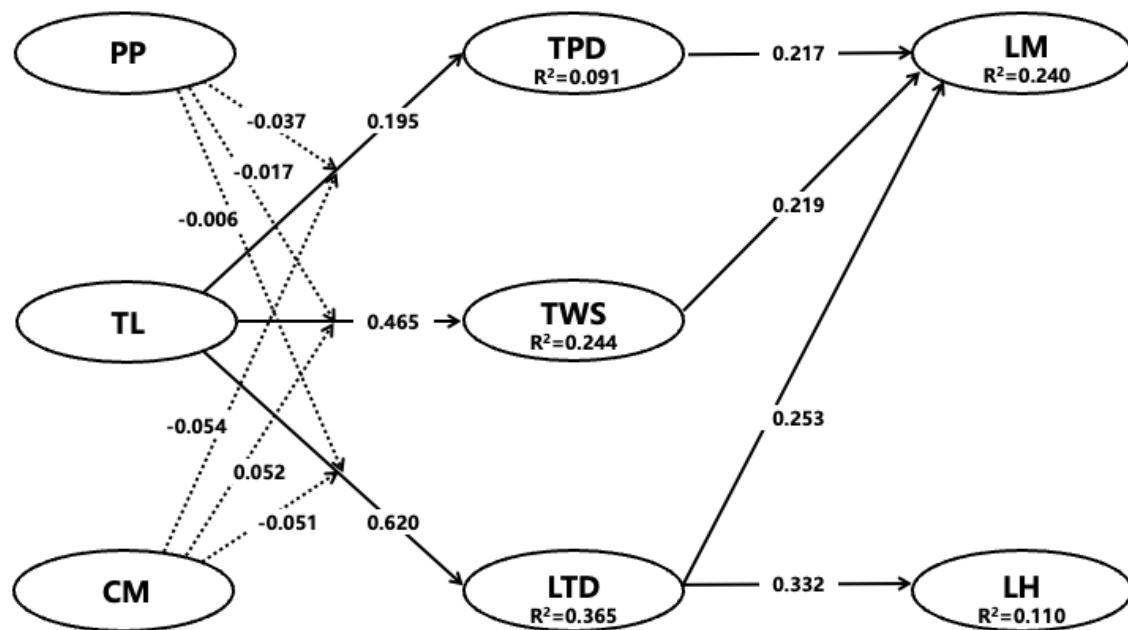


Figure 2. The results for the Teacher Learning Effect Model. Note: LH: Learning habit; LM: Learning motivation; LTD: Learning task design; TL: Teacher Learning; TPD: Teacher professional development; TWS: Teachers' working status; CM: Class manager; PP: Professional position.

Table 5. Moderating effects.

Path	Coefficient	<i>p</i> Values	<i>f</i> ²	Moderating Effect
CM × TL → TPD	−0.054	0.442	0.001	No
CM × TL → TWS	0.052	0.416	0.001	No
CM × TL → LTD	−0.051	0.375	0.001	No
PP × TL → TPD	−0.037	0.283	0.001	No
PP × TL → TWS	−0.017	0.532	0.000	No
PP × TL → LTD	−0.006	0.827	0.000	No
CM × TL → TPD → LM	−0.012	0.453	/	No
CM × TL → TWS → LM	0.011	0.426	/	No
CM × TL → LTD → LM	−0.013	0.367	/	No
CM × TL → LTD → LH	−0.017	0.365	/	No
PP × TL → TPD → LM	−0.008	0.288	/	No
PP × TL → TWS → LM	−0.004	0.538	/	No
PP × TL → LTD → LM	−0.001	0.829	/	No
PP × TL → LTD → LH	−0.002	0.829	/	No

Note: LH: Learning habit; LM: Learning motivation; LTD: Learning task design; TL: Teacher Learning; TPD: Teacher professional development; TWS: Teachers' working status; CM: Class manager; PP: Professional position.

5. Discussion

5.1. How Does Teacher Learning Directly Affect Professional Development

The results of our research indicate that teacher learning has a significant effect on teacher professional development ($p = 0.000 < 0.001$), which means that hypothesis H1a is valid. This research also confirms the view of Xie et al. (2021) that the teacher learning process, including formal professional development activities and informal practice learning, provides teachers with the necessary knowledge and skills to respond more effectively to challenges in teaching practice and promote student learning outcomes. Research has shown that when teachers engage in continuous learning and reflection in different practices, they are better able to exercise leadership, which is of great significance in promoting educational reform and improving teaching quality (Oppi & Eisenschmidt, 2022). In the context of Confucian culture in China, teachers' continuous learning and professional recognition are considered important factors in promoting successful education reform (Huang & Asghar, 2018). This result indicates that teacher learning plays an indispensable role in both individual professional development and systemic educational reform.

The results of our research indicate that teacher learning has a significant effect on teachers' working status ($p = 0.000 < 0.001$, $f^2 = 0.169 > 0.15$), which means that hypothesis H2a is valid. When teachers participate in meaningful learning experiences, they are more likely to develop innovative teaching methods, experience higher work satisfaction, and demonstrate stronger professional commitment (Opfer & Pedder, 2011). At the same time, professional communities for teachers, as a collaborative learning environment, can significantly enhance teachers' motivation and sense of belonging (Vangrieken et al., 2017). Obviously, participation in professional communities for teachers not only enriches teachers' teaching abilities but also alleviates feelings of isolation and professional burnout, thereby improving their overall working status. These studies demonstrate the key role of professional development through teacher learning in enhancing teacher performance, satisfaction, and overall professional effectiveness.

The results of our research indicate that teacher learning has a significant effect on learning task design ($p = 0.000 < 0.001$, $f^2 = 0.359 > 0.35$), which means that hypothesis H3a is valid. First, teacher learning enables them to design more targeted and effective learning tasks by promoting the improvement of professional knowledge and skills. Darling-Hammond et al. (2017) pointed out that effective teacher professional development can provide teachers with in-depth subject knowledge and teaching strategies, thereby enhancing their ability to design learning tasks. Second, teacher learning not only enhances teachers' teaching confidence but also changes their educational philosophy, thereby further promoting innovation in learning task design. As described by Borko (2004), professional development activities provide teachers with a platform for reflection and collaboration, enabling them to critically examine their teaching practices and learning tasks that are more suited to students' requirements. Obviously, this reflective practice helps teachers to more effectively combine teaching objectives and students' actual circumstances, thereby optimizing the content and form of learning tasks.

5.2. How Does Teacher Learning Indirectly Affect Student Learning

The results of our research indicate that teacher learning has a significant effect on learning motivation through teacher professional development ($p = 0.001 < 0.01$), which means that hypothesis H1 is valid.

Although our research did not directly demonstrate the effect of teacher learning on learning motivation, it provides indirect evidence of a positive effect via improvements in teachers' professional abilities and teaching levels. Avalos (2011) pointed out that this enhancement of professional capacity not only improved teachers' instructional practice but also affected how they motivated students through their teaching behavior. At the same time, Desimone (2009) pointed out that the effectiveness of teacher professional development is often closely related to the depth and continuity of teacher learning. Teacher learning helps them update teaching content and methods, thereby enhancing the quality of classroom interaction. This positive teaching atmosphere can stimulate students' interest and enhance their learning motivation. Hattie and Timperley (2007) further pointed out that the quality of teacher feedback is related to teacher learning. Through learning, teachers can better understand students' requirements and provide more accurate and constructive feedback. This high-quality feedback enhances students' self-efficacy and promotes their engagement and interest in learning (Zhang et al., 2025). Therefore, teacher learning indirectly enhances students' learning motivation by improving the quality of teacher feedback and classroom interaction.

The results of our research indicate that teacher learning has a significant effect on learning motivation through teachers' working status ($p = 0.000 < 0.001$), which means that hypothesis H2 is valid.

This is consistent with previous research findings that teachers' working status directly affects their teaching effectiveness and indirectly affects students' learning motivation. For example, Banerjee et al. (2017) found that there was a significant positive relationship between teachers' work satisfaction and students' learning motivation. Improving teachers' working status can help teachers maintain high enthusiasm for teaching and a positive classroom atmosphere, which is crucial for stimulating students' learning motivation. The process of teacher learning is often accompanied by an increase in self-efficacy, which in turn enhances teachers' working status and enables them to respond to challenges and pressures in teaching with a more positive attitude (Tschannen-Moran & Hoy, 2001). On the other hand, Schaufeli and Bakker (2004) noted that teachers' professional burnout is negatively associated with the quality of instruction and students' learning motivation. When teachers experience poor working conditions, they are more likely to suffer from excessive stress and burnout, which in turn undermines students' learning experiences. In this sense, teacher learning can play a crucial role in alleviating professional burnout, enabling teachers to regain enthusiasm for their work, thereby enhancing instructional quality and fostering students' learning motivation. Teacher learning, therefore, is not only an improvement of individual professional skills but also an indirect pathway to promoting students' motivation to learn (Schaufeli & Bakker, 2004). Such improvement not only advances teachers' instructional effectiveness but also fosters both

pedagogical and emotional support for students, thereby serving as a crucial mechanism for enhancing their learning motivation.

The results of our research indicate that teacher learning has a significant effect on learning motivation through learning task design ($p = 0.000 < 0.001$), which means that hypothesis H3 is valid.

Teacher learning not only has a direct effect on learning task design but also has an indirect effect on learning motivation. Therefore, we need to focus on how teachers can enhance their task design abilities through learning methods, thereby improving students' learning motivation. On the one hand, teacher learning provides both theoretical grounding and practical support for the design of student learning tasks. Through such learning, teachers can adjust task difficulty in line with students' learning characteristics and cognitive levels, thereby improving the effectiveness of these tasks. You et al. (2025) argue that by engaging in professional learning activities, teachers not only strengthen their instructional abilities but also build confidence in designing learning tasks. Such confidence allows them to develop tasks that align more closely with students' cognitive development, which in turn stimulates students' interest and fosters their self-directed motivation. On the other hand, Wijnia et al. (2024) further demonstrate that when teachers design learning tasks that are both challenging and attainable, students' learning motivation is significantly enhanced.

The results of our research indicate that teacher learning has a significant effect on learning habits through learning task design ($p = 0.000 < 0.001$), which means that hypothesis H4 is valid.

Teacher learning not only has a direct effect on learning task design but also has an indirect effect on learning habits. Specifically, this indirect effect is reflected in teachers' improvement of teaching strategies and task design skills through learning. Such improvement enables them to provide students with more structured and challenging learning tasks. This task design not only enhances students' engagement but also develops students' effective learning habits. For example, Borko (2004) argues that teacher learning enables teachers to design tasks that go beyond knowledge acquisition. These tasks also promote students' autonomous learning and self-management, which contribute to the development of effective learning habits. When students engage in tasks that are both challenging and aligned with their cognitive development, they are more likely to adopt positive learning behaviors, thereby enhancing the consistency and regularity of learning. Obviously, teacher learning can strengthen the cultivation of students' learning habits in task design. Hattie (2008) pointed out that learning task design is not only related to students' academic achievement, but also helps them develop effective learning habits by promoting reflection and self-regulation. Teacher learning encourages teachers to pay more attention to the long-term effects of task design, thereby helping students form long-term effective learning habits and self-management skills (Michalsky, 2024). These factors play a crucial role in the development of students' learning habits.

5.3. Do Professional Position and Identity of Class Manager Have a Moderating Effect

In PLS-SEM, moderating effects are tested by introducing interaction terms between independent variables and moderator variables. Moderating effects are crucial for understanding the boundary conditions of relationships between variables (Hair et al., 2014). The advantage of this method is that it handles non-normal data and complex models containing composite constructs (Shmueli et al., 2019).

The results of our research show that neither identity of class manager nor professional position has a moderating effect. Institutional roles and formal positions may not directly affect teachers' psychological or behavioral mechanisms in educational environments. For example, Mansfield et al. (2016) found that in research on values-based education, teacher attitudes and school culture (rather than administrative roles) were the main drivers of teaching outcomes. The results indicate that identity of class manager and professional position may lack direct psychological significance. Therefore, they cannot moderate the relationship chain of "teacher learning → teacher professional development."

Beyond internal psychological mechanisms, the absence of moderating effects may also reflect structural features of the Chinese middle-school system (Zhang et al., 2024). Because all schools operate under unified national curriculum standards (e.g., the 2022 Compulsory Education Curriculum Standards) and are evaluated through standardized, high-stakes metrics, the pedagogical environment is relatively homogeneous across teachers regardless of whether they serve as class managers or hold different professional positions. Such standardization can flatten between-teacher variation in instructional practice, leaving less room for institutional roles to condition how teacher learning translates into professional development, working status, or task design. This contextual reading complements the psychological explanation above and is consistent with the cross-cultural stability of the model noted in Section 5.4.

In addition, empirical research in the field of teacher learning has found many other factors that do not have a moderating effect, such as years of teaching experience (Hair et al., 2017), school type (public vs. private)

(Rigdon et al., 2017), gender (Venkatesh et al., 2003), and so on. These factors further support the rationality of the insignificant moderating effect in this research, emphasizing that institutional and demographic variables may not be able to reshape the core mechanisms of teacher learning.

However, some have pointed out that teacher learning is related to teacher professional development, teachers' working status, and learning task design, as well as the following factors: peer guidance and interdisciplinary cooperation (Shand & Goddard, 2025), expectations and motivation (Rubie-Davies et al., 2006), emotional resilience, and institutional trust (Mansfield et al., 2016).

5.4. Cross-Cultural Implications: Confucian Context versus Western Findings

A central question is whether the mechanisms identified here are distinctive to the Confucian cultural context or consistent with research conducted in Western systems. Importantly, the core pathway—teacher learning enhancing student outcomes via teachers' professional development, working status, and learning task design—aligns closely with studies from Europe and North America (e.g., Desimone, 2009; Guskey, 2002; Reeve & Cheon, 2021; Darling-Hammond et al., 2017), suggesting that this indirect mechanism is largely universal rather than culturally specific. At the same time, the Confucian heritage of China (Huang & Asghar, 2018) may accentuate certain links: a strong societal valuation of education and collectivist, school-based learning traditions (e.g., lesson-study and teaching-research groups) can amplify the translation of teacher learning into classroom practice. We therefore conclude that the fundamental mechanism generalizes across cultural contexts, while its strength and expression are shaped by local institutional and cultural conditions—a point underscored by the limited moderating role of formal teacher roles discussed below.

6. Conclusions

This research focuses on the mechanism of teacher learning's effect on teachers' self-development and student learning. First, regarding the research question, "How does teacher learning directly affect their own development?". The research found that teacher learning has a significant direct effect on teacher professional development, working status, and learning task design. Second, with respect to the research question, "How does teacher learning indirectly affect student learning?". The path analysis indicates that teacher learning indirectly promotes students' learning motivation and learning habits through three mediating paths. Among these, the mediating effect of learning task design is the strongest, highlighting its central role in transforming teacher learning outcomes into observable student behaviors. Finally, concerning the research question, "Do professional positions and identity of class manager have a moderating effect," neither class manager identity nor professional positions showed a significant moderating effect on the examined paths. This suggests that the core mechanism of teacher learning may depend more on teachers' internal psychological motivations, such as self-efficacy and work engagement, rather than differences in institutional roles.

This research reveals the multilevel effect pathways of teacher learning on student development from an empirical perspective. It provides important insights for education policymakers: First, priority should be given to supporting teacher professional development projects, ensuring the continuity of project implementation through institutional safeguards, and providing special training to strengthen learning task design. Second, attention should be paid to teacher learning and the establishment of cross-school learning communities to promote the sharing of teaching experience and professional growth. Finally, school-based teaching and research systems should be strengthened. Online teaching research and virtual teaching research should be promoted. Additionally, technology-supported teaching and research models should be developed to facilitate the integration of resources.

To make this recommendation concrete, two exemplars are worth highlighting. First, a school-based lesson-study cycle in which teachers collaboratively design, teach, observe, and revise a single learning task—explicitly targeting critical-thinking prompts and differentiated scaffolding (Roure & Pasco, 2018; Smets & Struyven, 2020)—directly strengthens the learning task design pathway identified as the strongest mediator in our model. Second, a short workshop module can train ordinary middle-school teachers to translate task-design principles into daily assignments by (a) formulating tasks that require students to think critically, (b) providing scaffolding matched to task difficulty, and (c) transferring design theory into practice—the exact behaviors captured by our learning task design items. Such practical, low-cost training turns the abstract recommendation into an actionable routine.

7. Limitations

First, the research sample is relatively concentrated and regional, and the results may not be consistent with those of other regions. It is recommended that future research be expanded to other cultural contexts and educational systems to explore the cross-cultural applicability of teacher learning. Second, longitudinal research designs can be

further integrated to reveal the long-term effects of teacher learning. Finally, the study emphasizes quantitative statistical analysis and cannot provide further insight into the inner thoughts and feelings of teachers during the learning process. Therefore, in future research, qualitative data can be obtained through semi-structured interviews with special samples randomly selected from the total sample for a more comprehensive and in-depth analysis.

Author Contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by J.Y., J.L., H.Z., X.L. and J.X. Project administration were performed by J.Y. Methodology and supervision were performed J.Y. and J.L. The first and final draft of the manuscript was written by J.Y. and J.L. All authors commented on previous versions of the manuscript. All authors have read and agreed to the published version of the manuscript.

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The participants all agreed to take part in this study.

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Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

No AI tools were utilized for this paper.

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