Research Article

Instructional leadership and teacher professional learning in Chinese calligraphy education: The moderating role of employment status

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ABSTRACT

In the context of Chinese calligraphy education, this study investigates how principals' instructional leadership influences teacher professional learning. Based on survey data from 483 calligraphy teachers and based on social cognitive theory, the results show that in subjects with poorly institutionalised professional learning systems, instructional leadership serves more as a source of organisational meaning and support than as a technical management mechanism. In order to maintain teachers' learning engagement, leadership methods focused on fostering a healthy school climate and communicating instructional value are especially important. Crucially, the study shows that rather than being consistent, leadership impacts are structurally contingent. The link between instructional leadership and teacher professional learning is highly moderated by employment status, with full-time teachers reacting more strongly to leadership support because of their greater organisational embeddedness and more reliable access to school-based resources. This demonstrates how teachers' ability to translate leadership cues into ongoing professional development is shaped by employment frameworks. This study expands instructional leadership and teacher professional learning theory beyond core topics by emphasising the idea of subject ecology, which is characterised by curricular marginality, unequal resource allocation, and employment precarity. It emphasises how organisational settings and employment arrangements may support or restrict teacher agency and learning opportunities in disadvantaged educational areas, in addition to the leadership practices themselves.

Keywords: instructional leadership; teacher professional learning; employment status; Chinese calligraphy education

1. Introduction

It is generally accepted that improving teachers' professional skills and quality of instruction is essential to attaining educational excellence and fostering all-encompassing learning outcomes for students in the context of continuous global education reform[1]. According to research, long-term, practice-based teacher professional development can increase professional judgement and teaching competency, which will improve classroom instruction[2]. As a result, teacher professional learning is often regarded as both a systemic mechanism that connects education policy to classroom practice and an individual developmental process[3-7].

But professional development for teachers doesn't happen in a vacuum. Teachers' engagement in

professional learning is significantly influenced by school organisational conditions and leadership practices, according to a large body of research[8-11]. Among these elements, leadership serves as a crucial meso-level mechanism that translates learning cultures, institutional priorities, and resources into teachers' daily professional practices.

According to Bellibaş et al. and Dorukbaşi & Cansoy, instructional leadership has been found to be particularly influential among school-level leadership approaches because it explicitly focusses on teaching and learning through practices like defining instructional goals, managing instructional programs, and cultivating supportive school cultures[12,13]. In the Chinese context, national policy has institutionalised instructional leadership as a key mechanism for enhancing teaching quality across disciplines and further strengthened principals' accountability for curriculum leadership and teacher development[14].

Additionally, research indicates that the effects of instructional leadership are highly context-sensitive rather than universally consistent, and they may be particularly noticeable in subject areas with low curricular status, weak professional communities, or limited resources[15]. In these situations, instructional leadership can improve teachers' professional identities and agency, coordinate professional learning opportunities, and legitimise instructional priorities in order to make up for institutional disadvantages[16]. However, the majority of current empirical study has concentrated on fundamental academic topics, leaving non-examination, arts-based, and culturally rooted topics under-theorized in leadership studies.

Because Chinese calligraphy education is both institutionally disadvantaged and culturally iconic, it presents a conceptually significant case for studying instructional leadership. Despite being officially included in the required basic education curriculum, calligraphy still plays a supporting role in examination-focused school systems, which are characterised by short class periods, inadequate funding, and disjointed professional development opportunities[17]. There is a great deal of variance in professional background and instructional expertise because many schools either use a single calligraphy teacher or assign calligraphy instruction to teachers from other subject areas. These circumstances provide a "subject ecology" in which institutional structures provide little support for teachers' professional development, making them especially reliant on leadership behaviours at the school level.

Theoretically, calligraphy education challenges implicit presumptions that leadership effects are constant across curricular hierarchies by allowing instructional leadership to be examined beyond its usual use in high-stakes topics. In this way, calligraphy education serves as both a critical analytical lens and a contextual setting for comprehending how leadership functions in situations of curricular marginality and cultural importance.

Additionally, a comparatively high percentage of calligraphy teachers work part-time. Teachers' organisational commitment, access to professional resources, and involvement in professional learning activities have all been demonstrated to be influenced by their employment status[18,19]. The relationship between instructional leadership and teacher professional learning may be moderated by employment status, as part-time teachers' limited institutional embeddedness may change how leadership practices are viewed, implemented, and translated into professional learning. However, there hasn't been much empirical research done on this possible moderating mechanism, especially in contexts of arts and culturally grounded education.

Building on these ideas, this study investigates the connection between calligraphy instructors' professional development and principals' instructional leadership in the context of teaching Chinese calligraphy. In addition to examining the moderating function of teachers' employment status, it methodically investigates the numerous ways that different aspects of instructional leadership exert influence. This study

expands on current leadership theory and advances a more context-sensitive understanding of teacher professional growth by placing instructional leadership within a marginalised yet culturally relevant subject domain.

The following research questions serve as the study's compass:

RQ 1) To what extent are instructional leadership and teacher professional learning evident in Chinese calligraphy education?

RQ 2) Is there a positive relationship between instructional leadership and teacher professional learning in Chinese Calligraphy Education?

RQ 3) Which IL dimensions are significant predictors of TPL in Chinese Calligraphy Education?

RQ 4) Does employment status moderate the relationship between instructional leadership and teacher professional learning in Chinese Calligraphy Education?

2. Literature review

2.1. Instructional leadership

The effective schools movement gave rise to instructional leadership, which has long been acknowledged as a leadership strategy directly related to student learning outcomes and teaching improvement[20,21]. Early definitions of instructional leadership presented it as a mostly technical and rational tool that principals might use to monitor results, supervise instruction, and explain goals in order to affect the quality of education. Its widespread adoption in accountability-driven educational institutions was facilitated by this perspective.

But there has also been persistent criticism of instructional leadership. Its focus on performance, alignment, and monitoring, according to academics, may represent a managerial logic that undervalues teachers' professional autonomy and the intricate social circumstances of teaching. Critics also point out that research on instructional leadership has a tendency to focus on core academic subjects and stable organisational settings, ignoring how leadership functions in less institutionalised or lower-status curricular domains.

More recent research has stressed the conditional and context-sensitive aspect of instructional leadership in response to these criticisms. Its positive correlations with student achievement, teacher capacity, and instructional quality are still supported by empirical evidence, but it is becoming more clear that these effects differ depending on the subject and organisational context[22-25]. This line of inquiry reframes instructional leadership as a leadership practice whose impact is contingent upon how it interacts with institutional priorities, resource distribution, and subject status rather than as a model that is uniformly effective.

The model put forward by Hallinger and Murphy (1985)—Defining the School Mission, Managing the Instructional Program, and Promoting a Positive School Climate—remains the most popular among current frameworks. Numerous studies show that it is construct valid in a variety of settings, including Asian educational systems[26,27]. However, the approach implicitly implies secure job structures, acknowledged curriculum importance, and comparatively stable organisational environments—all of which may not accurately reflect all subject areas. This restriction implies that contextual interpretation and cautious application are necessary.

Hierarchical governance systems that prioritise curriculum implementation and instructional quality institutionally support instructional leadership in the Chinese educational system[28,29]. However, because

principals must deal with a lot of administrative work and performance demands that limit their ability to engage in instructional leadership, empirical studies frequently document conflicts between policy objectives and school-level practice[14]. All of these results suggest that rather than being a universal leadership effect, instructional leadership in China is best understood as a contextually limited practice.

2.2. Teacher professional learning

A key strategy for converting educational reform into better teaching practices has long been thought to be teacher professional development[30,31]. Current research views teacher learning as a continuous, practice-embedded, socially mediated process rather than episodic instruction, building on theories of adult learning and situated learning[32].

This process-oriented thinking is captured by Liu et al.'s teacher professional learning (TPL) model, which includes collaboration, reflection, experimentation, and growth of external knowledge bases[23]. The model implicitly assumes the availability of collegial networks, institutional support, and ongoing involvement in school life, even though it has shown good explanatory power in numerous contexts. When the model is used to subjects with weaker organisational roots, these presumptions need to be examined more closely.

Access to professional learning opportunities varies across academic areas, according to empirical studies. Compared to instructors in core examination topics, teachers in arts and culture subjects frequently face fewer possibilities for subject-specific development, poorer professional communities, and lower institutional priority[33]. Professional development in these areas is therefore more likely to rely on organisational support at the school level and less likely to be self-sustaining.

These difficulties are especially noticeable while teaching Chinese calligraphy. A significant percentage of cross-disciplinary or part-time employees are calligraphy teachers, who frequently operate alone as the only subject teacher in a school[34]. Access to long-term, high-quality professional learning is hampered by professional isolation, little collaboration, and marginal curricular status[35]. In these circumstances, subject-based professional communities alone are not as important to the success of teacher professional development as the organisational environment offered by schools[36].

Although calligraphy education is receiving more policy attention, there is still a dearth of empirical research on teacher professional development in this area. This gap hinders the creation of more context-sensitive explanations of teacher learning as well as theoretical knowledge of how well-known TPL models function in disadvantaged topic contexts.

2.3. The relationship between instructional leadership and teacher professional learning

Numerous studies show that institutional norms, leadership styles, and school organisational conditions influence teacher professional learning[8,37,38]. From a social cognitive standpoint, individual beliefs, professional behaviours, and environmental circumstances interact reciprocally to produce teacher learning. Thus, leadership behaviours serve as organisational cues that influence teachers' motivation, engagement, and learning orientations.

By defining instructional priorities, organising teaching procedures, and creating supportive school environments, instructional leadership has been widely recognised as a crucial method through which principals affect teacher professional learning[10,13]. By matching organisational resources with instructional objectives, instructional leadership has a more direct impact on professional learning than more general leadership techniques[39].

Nonetheless, mounting data indicates that there is variation in the connection between teacher professional development and instructional leadership. Its impacts differ depending on topic areas, organisational settings, and teacher attributes[27]. Principals frequently act as a bridge between policy directives and school-level execution in highly centralised educational systems[24]. Leadership practices at the school level constitute a particularly significant source of professional learning opportunities when there are few external professional networks[40].

Research has focused little on how this relationship functions in marginalised or non-examination subjects, where professional isolation, little recognition, and low resources may affect leadership effectiveness, despite the considerable empirical evidence supporting a link between leadership and learning. Therefore, calligraphy education offers a useful framework for analysing how instructional leadership works in marginalised curriculum.

2.4. Employment status as a moderating condition

The percentage of part-time and contract-based teachers has risen worldwide as educational institutions deal with workforce diversification and staffing flexibility[41,42]. Teachers' access to resources, involvement in school activities, and professional commitment are all influenced by their employment status, which is becoming more widely acknowledged as a significant organisational condition[43,44].

Part-time or contract-based educators frequently have less stable career paths, less involvement in governance and professional development, and lower organisational embeddedness than full-time educators[19,45]. These structural variations imply that rather than being consistent throughout the profession, teachers' receptivity to instructional leadership may alter systematically based on their job status.

In Chinese calligraphy education, where part-time and interdisciplinary teaching arrangements are typical, this problem is especially noticeable. Teachers' exposure to instructional leadership and their ability to convert leadership support into long-term professional learning may be influenced by their job situation in addition to the subject's marginal curriculum status and inadequate professional learning infrastructure. However, there is still a dearth of empirical studies investigating this regulating process.

3. Materials and methods

This study employed a cross-sectional survey design using quantitative methods. A cross-sectional design is appropriate for examining relationships among variables at a single point in time[46]. The present study focuses on analyzing the predictive relationship between instructional leadership and teacher professional learning, using validated instruments administered through a self-report questionnaire.

3.1. Participants and sampling

Teachers of calligraphy from elementary and secondary schools in Jining City, Shandong Province, China, which is made up of twelve counties and districts, made up the participants. Jining City was chosen for both pragmatic and theoretical reasons. In theory, Jining has a long history of calligraphy and is a setting where the validity of calligraphy education is comparatively stable. The city is a good place to look at job status as a moderating variable since it has a variety of school-level employment structures for calligraphy teachers, including both full-time and part-time roles. These contextual factors are recognised as a crucial study boundary condition since they may affect how broadly the results can be applied.

A straightforward random sample technique was used to guarantee the representativeness of both primary and secondary school instructors. In particular, a comprehensive list of calligraphy instructors was acquired by working with local education authorities, and participants were chosen at random from the

population list. Out of the 661 calligraphy instructors in the population, 520 were chosen at random to take part in the study freely. The Wenjuanxing platform was used to administer an online survey that yielded 483 valid replies, representing a 92.9% response rate.

School officials' institutional support was secured, participation reminders were sent out, and the survey was presented as non-evaluative and private in order to reduce the possibility of self-selection bias. These actions were meant to lower systematic non-response and promote widespread involvement across employment levels.

A variety of teaching experiences and educational backgrounds were represented among the respondents, of whom 283 were primary school teachers and 200 were secondary school teachers. In terms of employment, 173 participants were full-time calligraphy teachers and 310 were part-time instructors.

3.2. Instruments

The survey instrument was developed based on two well-established and validated scales and was adapted to the context of Chinese calligraphy education. Instructional leadership was measured using the teacher short form of the Principal Instructional Management Rating Scale (PIMRS) developed by Hallinger and Murphy. This scale comprises three dimensions: Defining the School Mission (DSM), Managing the Instructional Program (MIP), and Promoting a Positive School Climate (PSC).

Teacher professional learning was assessed using the scale developed by Liu et al., which conceptualizes teacher professional learning as four dimensions: collaboration, reflection, experimentation, and reaching out to the knowledge base[47]. All items were rated on a five-point Likert scale ranging from 1 (almost never) to 5 (almost always).

To improve applicability to Chinese primary and secondary school calligraphy instruction, small contextual changes and item reductions were made while maintaining the original conceptual framework and factor composition of both instruments. The main changes were to shorten answers with overlapping semantic substance, eliminate discipline-irrelevant instances (such as references to standardised topic examinations), and clarify the phrasing. Items pertaining to "exam-based instructional supervision," for instance, were reworded to represent instructional advice in skill-based creative learning.

Crucially, construct equivalency and comparability with earlier research employing the original scales were maintained because neither new items nor fundamental constructs were eliminated.

To guarantee content validity and face validity, the instrument was examined by three specialists in educational leadership and calligraphy education prior to official data collection. A pilot study was then carried out with 152 calligraphy instructors who were excluded from the final sample. While maintaining the basic scale structure and dimensionality, the pilot study was utilised to improve survey administration practices, including item sequencing and completion time, and to increase item wording clarity. All dimensions' Cronbach's alpha coefficients were greater than 0.80, indicating acceptable internal consistency.

3.3. Data analysis

Data analyses were conducted using SPSS 25.0 and AMOS 24.0. First, descriptive statistics were employed to examine the levels of instructional leadership and teacher professional learning. Mean scores of 1.00–2.33 were categorised as low, 2.34–3.66 as intermediate, and 3.67–5.00 as high levels of the measured variables in order to make interpretation easier.

Second, Structural Equation Modeling was used to test the direct effects of instructional leadership on teacher professional learning, as well as the effects of instructional leadership dimensions on teacher

professional learning. Finally, Multi-group Analysis was conducted to examine the moderating effect of employment status on the relationship between instructional leadership and teacher professional learning.

Throughout the entire research procedure, ethical issues were carefully taken into account. Before beginning the study, participants were made aware of its objectives, electronically gave their informed consent, and were reassured that their participation was entirely voluntary. No personally identifiable information was gathered, and all information was used only for research, protecting anonymity.

4. Results

4.1. The level of IL and TPL in Chinese Calligraphy Education

To address the first research question, descriptive statistical analyses were conducted, and the results are presented in **Table 1**. The findings indicate that principals' instructional leadership in Chinese calligraphy education was perceived to be at a moderately high level (M = 3.486, SD = 0.776). Among the three dimensions, Managing the Instructional Program (MIP) received the highest mean score (M = 3.517, SD = 0.932), followed by Promoting a Positive School Climate (PSC) (M = 3.478, SD = 0.909) and Defining the School Mission (DSM) (M = 3.463, SD = 0.963).

Teacher professional learning was also found to be at a moderately high level (M = 3.434, SD = 0.783). Among its dimensions, reflection obtained a relatively higher mean score, indicating that calligraphy teachers tend to promote their professional growth primarily through reflective practices and everyday instructional exchanges, while showing comparatively greater caution toward instructional experimentation and engagement with external knowledge sources.

Table 1. Descriptive Statistics and Level Interpretation.

Variable and construct	Mean	SD	Skewness	Kurtosis	Level
Instructional Leadership	3.486	0.776	-0.093	-1.315	Moderately High
	Mean	**SD**			
Defining the School Mission	3.463	0.963	-0.366	-0.991	Moderately High
Managing the Instructional Program	3.517	0.932	-0.380	-0.803	Moderately High
Promoting School Climate	3.478	0.909	-0.383	-1.027	Moderately High
	Mean	**SD**			
Teacher Professional Learning	3.434	0.783	-0.068	-1.381	Moderately High
	Mean	**SD**			
Collaboration	3.448	0.980	-0.239	-1.138	Moderately High
Reflection	3.460	0.962	-0.362	-0.916	Moderately High
Experimentation	3.367	0.984	-0.288	-1.134	Moderately High
Reach Out to the Knowledge Base	3.459	0.927	-0.318	-0.880	Moderately High

Taken together, these patterns reflect the distinctive subject ecology of calligraphy education, in which the subject's marginal curricular status, limited institutional resource allocation, and a relatively high proportion of part-time employment jointly shape both leadership enactment and teachers' learning behaviours. Within this ecology, instructional leadership is present but tends to prioritise procedural coordination, while teacher professional learning remains individualised and constrained, reflecting broader organisational and structural conditions rather than fully developed professional learning systems.

4.2. Measurement models

Prior to testing the structural relationships, CFA was conducted to assess the measurement model and to examine the reliability and validity of the latent constructs. The results indicated that the measurement model demonstrated good overall fit to the data (χ^2/df = 1.254, RMSEA = 0.023, CFI = 0.997, TLI = 0.996).

All standardized factor loadings were statistically significant and exceeded the recommended threshold of 0.70. In addition, the values of CR for all constructs were above 0.70, and AVE values exceeded 0.50, indicating satisfactory convergent validity (see **Table 2**). Discriminant validity was assessed using the Fornell–Larcker criterion, and the results showed that the square root of the AVE for each construct was greater than its correlations with other constructs, supporting adequate discriminant validity. Overall, the measurement model exhibited acceptable reliability and validity, and was therefore deemed suitable for subsequent structural model analysis.

Table 2. Overall measurement of validity and model fit.

	ROKB	EX	RE	CO	PSC	MIP	DSM
ROKB	**0.752**						
EX	0.629	**0.774**					
RE	0.608	0.607	**0.769**				
CO	0.643	0.642	0.620	**0.773**			
PSC	0.385	0.385	0.372	0.393	**0.758**		
MIP	0.400	0.399	0.385	0.408	0.587	**0.763**	
DSM	0.406	0.406	0.392	0.414	0.596	0.619	**0.770**
AVE	0.566	0.599	0.591	0.597	0.574	0.582	0.592
CR	0.786	0.817	0.810	0.816	0.861	0.802	0.811
Index	CMIN/DF	RMSEA	GFI	AGFI	TLI	CFI	NFI
Indexed Value	1.254	0.023	0.997	0.950	0.996	0.997	0.987

The bold diagonal denotes to the square root of AVE($\sqrt{\text{AVE}}$), while the other values represent the correlation among the latent constructs.

4.3. The relationship between IL and TPL in Chinese Calligraphy Education

To address the second research question, structural equation modeling was employed to examine the predictive effect of instructional leadership on teacher professional learning(**Figure 1**). As shown in **Table 3**, instructional leadership had a significant and positive direct effect on teacher professional learning in the context of calligraphy education (β = 0.645, SE = 0.071, CR = 10.257, p < .001, 95% BCa CI [0.589, 0.882]). In addition, instructional leadership accounted for 41.6% of the variance in teacher professional learning (R^2 = 0.416), suggesting substantial explanatory power.
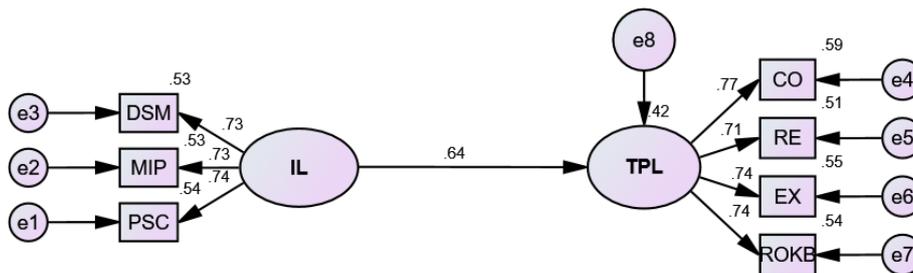

Figure 1. Structural Model of IL-TPL.

Table 3. Structural Path Analysis of IL-TPL Results.

Structural path	Std. Reg. Weight(β)	S.E.	C.R	95% Bootstrap CI		p
				Lower	Upper	
IL→TPL	0.645	0.071	10.257	0.589	0.882	***

*** *P＜.001 extremely significant （2-tailed）*

4.4. The Effects of IL Dimensions on TPL in Chinese Calligraphy Education

To address the third research question, SEM was conducted to examine the predictive effects of the three dimensions of instructional leadership, Defining the School Mission (DSM), Managing the Instructional Program (MIP), and Promoting School Climate (PSC), on teacher professional learning (see **Figure 2**). The model demonstrated good overall fit to the data (χ^2/df = 1.709, CFI = 0.974, GFI = 0.935, RMSEA = 0.038).

As shown in **Table 4**, all three instructional leadership dimensions had significant positive effects on teacher professional learning. Among them, Promoting School Climate exhibited the strongest predictive effect (β = 0.282, p < .001), followed by Defining the School Mission (DSM) (β = 0.264, p < .001) and Managing the Instructional Program (MIP) (β = 0.248, p < .001).
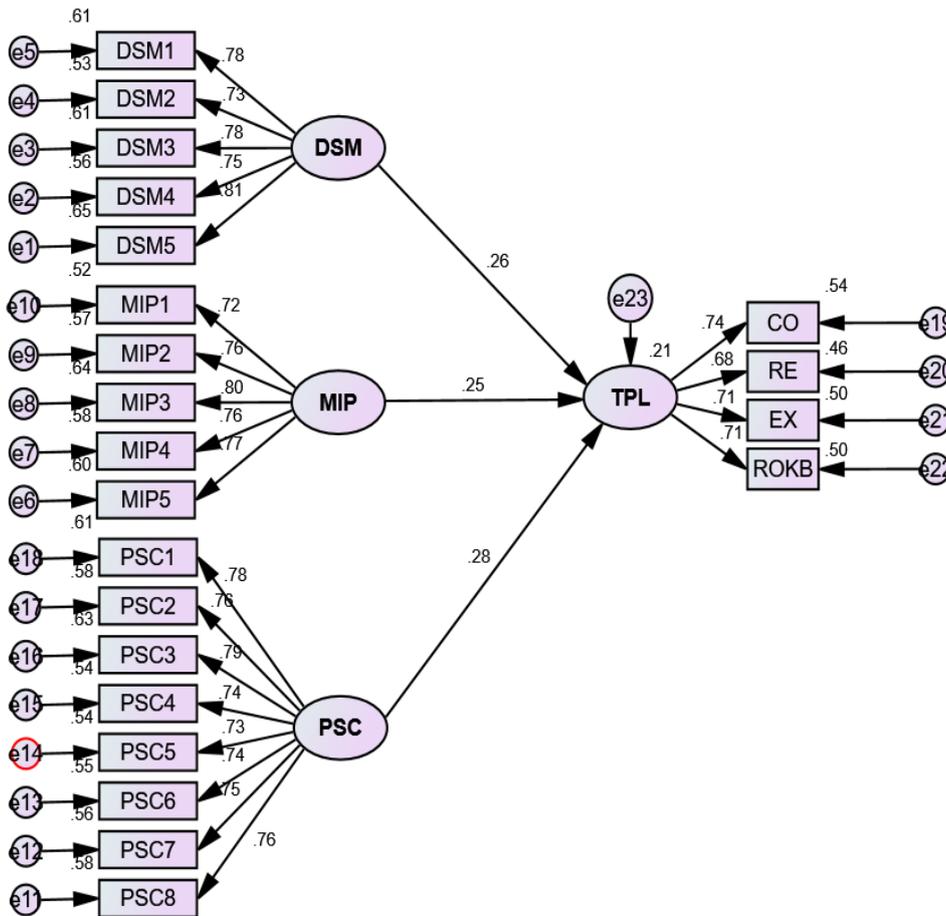

Figure 2. Structural Model of Components of IL -TPL.

Table 4. Structural Path Analysis of Components of IL-TPL Results.

Structural path	Unstd.	Std. （β）	S.E.	C.R.	P
DSM→TPL	0.186	0.264	0.045	4.112	***
MIP→TPL	0.192	0.248	0.051	3.803	***
PSC→TPL	0.217	0.282	0.049	4.411	***

*** P＜.001 extremely significant （2-tailed）

4.5. Multiple-groups analysis for moderating role of employment status

To examine whether employment status moderates the relationship between instructional leadership and teacher professional learning, multi-group analysis was conducted. Prior to testing structural differences between groups, an unconstrained baseline model was estimated. The results indicated that the baseline model demonstrated good fit to the data (χ^2 = 30.63, df = 26, χ^2/df = 1.178, CFI = 0.996, TLI = 0.994, RMSEA = 0.019), suggesting that the model was suitable for multi-group analysis.

Subsequently, structural invariance was tested by constraining the path from instructional leadership to teacher professional learning to be equal across full-time and part-time teacher groups. Although the constrained model exhibited acceptable overall fit (χ^2 = 49.644, df = 32, CFI = 0.985, RMSEA = 0.034), a significant deterioration in model fit was observed when compared with the unconstrained model. The chi-square difference test indicated a significant difference between the two models ($\Delta\chi^2$ = 19.014, Δdf = 6, p = .004), and the change in comparative fit index exceeded the recommended threshold (ΔCFI = 0.011). These results indicate that the effect of instructional leadership on teacher professional learning is not invariant across groups, confirming the moderating role of employment status (**Table 5**).

Table 5. Multi-group model comparison for the moderating effect of employment status on the effect of instructional leadership on teacher professional learning.

Model	χ^2	DF	χ^2/df	CFI	RMSEA	ΔCFI	Δχ^2 (Δdf)	p
M1 Unconstrained	30.63	26	1.178	0.996	0.019			
M2 Structuralweights	49.644	32	1.551	0.985	0.034	0.011	19.014 （6）	0.004

Further comparison of structural paths revealed that the effect of instructional leadership on teacher professional learning was significantly stronger among full-time teachers (β = 0.905) than among part-time teachers (β = 0.413) (see **Table 6**). The critical ratio difference (CR = –3.895) further supported the statistical significance of this difference. These findings suggest that full-time teachers are more responsive to principals' instructional leadership in promoting professional learning, whereas part-time teachers benefit to a lesser extent.

Table 6. Path comparison.

Path	Full-time (β)	Part-time (β)	CR difference
IL → TPL	0.905	0.413	–3.895

5. Discussions

5.1. Levels of instructional leadership and teacher professional learning

The results of this study show that teacher professional development and instructional leadership in Chinese calligraphy instruction have both reached a reasonably high level. This pattern shows a type of policy-responsive engagement where professional learning activities and leadership practices are present but are still limited by organisational and structural factors, rather than signifying maturity or complete institutionalisation. This pattern is consistent with more general observations of teacher development and

leadership enactment in Chinese basic education, where restricted professional autonomy frequently coexists with compliance-oriented involvement.

Additionally, the research findings support the idea that governance structures and accountability procedures have a significant influence on leadership practices when compared to decentralised education systems. Instructional leadership often prioritises coordination, monitoring, and procedural alignment in highly centralised institutions, which may limit its ability to support professional development and meaning-making, especially in non-examination topics.

The dimensional profile of instructional leadership makes this tendency clear. While defining the educational objective and creating a pleasant learning environment were less important, principals rated best on managing instructional programs. This disparity implies that administrative and procedural tasks, rather than value articulation or cultural leadership, are the main ways that instructional leadership in calligraphy education is implemented. In marginal subjects, where instructional legitimacy is not immediately apparent and requires symbolic validation to maintain teacher commitment, this pattern is especially essential.

Teacher professional learning follows a similar structural logic. Teachers indicated a reasonable level of participation in professional learning, but this engagement was mostly focused on knowledge acquisition and introspection, with little experimentation or teamwork. This suggests that professional learning is more influenced by individual coping mechanisms than by group research, which reflects limited organisational circumstances rather than a lack of professional drive. The subject's marginal status restricts prospects for instructional innovation and collaboration, which in turn limits the breadth of professional learning.

5.2. The relationship between instructional leadership and teacher professional learning

The results show that calligraphy instructors' professional development is greatly aided by principals' instructional leadership. According to social cognition theory, this link can be seen as leadership affecting teachers' learning behaviour through motivational beliefs, perceived agency, and contextual factors. Instead than relying only on direct supervision, instructional leadership creates a learning environment where educators can witness behaviours that are valued, understand expectations, and assess if it is feasible to devote time to professional development.

Teachers of calligraphy frequently lack external learning tools and stable professional groups, in contrast to teachers of core disciplines. Principals' instructional leadership becomes a prominent environmental cue that conveys the legitimacy and expected value of professional learning in these situations. These signals affect teachers' self-efficacy and outcome expectations, which in turn affects how relevant and achievable professional learning is seen to be. Teachers modify their learning behaviour by observing leadership priorities and allocating resources and attention appropriately.

This process explains why instructional leadership has such a strong impact on calligraphy instruction. Leadership serves as a compensating strategy that facilitates observational learning and strengthens motivation in situations where professional learning methods are not well institutionalised. Teachers in fields with established professional infrastructures are therefore less responsive to leadership techniques than those in marginal subjects.

It's also crucial to remember that a significant but incomplete amount of the variation in teacher professional learning can be explained by instructional leadership. This result supports the social cognitive theory, which holds that learning behaviour results from the interplay of human agency, organisational context, and leadership impact rather than from leadership influence alone.

5.3. Differential effects of instructional leadership dimensions

According to this study, managing the instructional program has a relatively weaker predictive effect than fostering a positive school climate, which is the most influential instructional leadership dimension in fostering sustained teacher professional learning. This is followed by defining the school mission. This pattern suggests that rather than technical or procedural management, teachers' participation in professional learning is more receptive to relational and value-oriented leadership methods.

From a motivational standpoint, instructors must feel psychologically protected, acknowledged, and purposeful in order to engage in professional learning. Monitoring or compliance, focused leadership techniques are less successful in maintaining learning engagement than those that foster trust, validate subject value, and promote cooperative norms. These emotive and cultural factors are particularly important for calligraphy instruction, since results are hard to measure and subject status is rather low.

These results also show that the impacts of leadership vary depending on the discipline. The organisational placement of a subject mediates how various aspects of instructional leadership transfer into teacher learning behaviour, even within the same institutional environment. This emphasises how important it is to take subject-specific circumstances into account when assessing leadership effectiveness.

5.4. Employment status as a moderator

The results also show that the association between instructional leadership and teacher professional learning is considerably moderated by job status. Principals' instructional leadership has a greater facilitative influence on full-time calligraphy teachers than on part-time teachers. This implies that rather than being evenly dispersed among employees, leadership effectiveness depends on teachers' level of organisational embeddedness.

From a social cognitive standpoint, teachers' perceived returns on professional investment, exposure to leadership techniques, and access to learning opportunities are all influenced by their employment status. Full-time educators are more likely to notice, absorb, and respond to leadership cues pertaining to professional development because they are better integrated into school procedures and decision-making processes. On the other hand, part-time teachers frequently encounter role marginalisation and fragmented participation, which limits the conversion of leadership support into long-term learning engagement.

By showing that structural job factors moderate how leadership affects motivation and learning behaviour, this finding expands on previous leadership research. Leadership support may not be enough to create momentum for professional development when instructors deal with job instability or unclear roles.

6. Conclusion

This study methodically investigated the connection between calligraphy teachers' professional development and principals' instructional leadership within the framework of Chinese calligraphy education. This study emphasises how instructional leadership serves as a crucial organisational mechanism in disadvantaged subjects, where professional learning systems are poorly institutionalised and subject legitimacy is not self-sustaining, rather than restating empirical findings. The results imply that instructional leadership functions not just as a management instrument but also as a source of environmental structuring and value affirmation that facilitates teacher learning in challenging circumstances.

This study improves instructional leadership theory by demonstrating that subject positioning and organisational environment affect leadership effectiveness and that leadership techniques focused on school atmosphere and mission have greater effects than procedural management. Technical supervision alone is not

as important for maintaining teacher professional learning in marginal topics like calligraphy as leadership techniques that foster recognition, trust, and cultural legitimacy.

Differential organisational embeddedness shapes teacher professional learning, as demonstrated by the moderating influence of job position. While part-time instructors encounter institutional obstacles that hinder this process, full-time teachers are more likely to convert leadership support into long-term learning engagement. By include employment structure as a contextual factor that mediates how leadership affects motivation, agency, and learning behaviour, this finding expands the theory of teacher professional learning.

These revelations have significant ramifications for practice and policy. At the policy level, support for instructional leadership should go beyond curriculum conformity to include differentiated support for teachers across employment arrangements and leadership capacity building for subjects other than exams. Reducing structural barriers to teacher growth in cultural subjects requires improving access to professional learning resources and job security.

Principals at the school level are urged to promote the development of inclusive learning environments and shared instructional meaning for disadvantaged disciplines, rather than sticking to management logics focused on inspection and procedural control. To make sure that professional learning assistance is dispersed fairly rather than concentrated among a small number of instructors, it is also essential to pay attention to unequal participation opportunities across employment statuses.

Overall, this study contributes a context sensitive refinement of instructional leadership and teacher professional learning theory by demonstrating that leadership effects are conditional upon subject marginality and employment structures. It underscores that sustained teacher learning in noncore subjects emerges not from leadership presence alone, but from the alignment of leadership practices, organisational conditions, and teachers' structural positions within schools.

7. Limitations and directions for future research

Although this study provides new empirical evidence regarding the relationship between instructional leadership and teacher professional learning in the context of Chinese calligraphy education, several issues warrant further investigation. First, the use of a cross-sectional research design facilitates the examination of structural relationships among variables but limits the ability to capture the dynamic evolution of instructional leadership practices and teacher professional learning over time. Future studies could employ longitudinal or follow-up designs to explore the sustained effects of instructional leadership on calligraphy teachers' learning trajectories.

Second, as the sample was drawn from a single city, the generalizability of the findings requires further validation. Subsequent research may conduct comparative analyses across regions or educational contexts to enhance the robustness and explanatory power of the results. Third, this study primarily examined the organizational conditions of teacher professional learning from a leadership perspective. Future research could incorporate individual-level psychological and professional variables, or adopt multi-source data and mixed-methods approaches, to more comprehensively uncover the underlying pathways through which instructional leadership influences teacher professional learning. Finally, given the significant moderating role of employment status identified in this study, future research could further differentiate teacher characteristics, such as employment stability, cross-school teaching experience, or professional background, to deepen understanding of structural differences within the teaching workforce.

Author contributions

Conceptualization, Xinkun Xie, Bity Salwana Alias and Mohamed Yusoff Mohd Nor; methodology, Xinkun Xie; software, Xinkun Xie; validation, Xinkun Xie, Bity Salwana Alias and Mohamed Yusoff Mohd Nor; formal analysis, Xinkun Xie; investigation, Xinkun Xie; resources, Xinkun Xie; data curation, Xinkun Xie; writing—original draft preparation, Xinkun Xie; writing—review and editing, Bity Salwana Alias, Mohamed Yusoff Mohd Nor; visualization, Xinkun Xie; supervision, Bity Salwana Alias, Mohamed Yusoff Mohd Nor; project administration, Bity Salwana Alias, Mohamed Yusoff Mohd Nor. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare no conflicts of interest.

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