

Factors influencing primary school teachers' thriving at work amid AI-related work transformation in Beijing, China: The mediating roles of psychological capital and calling orientation

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ABSTRACT

Artificial intelligence is transforming teachers' work by altering professional tasks, competence requirements, decision-making processes, and workplace interactions. This study examined the factors influencing primary school teachers' Thriving at Work amid AI-related work transformation in Beijing, China. Drawing on Self-Determination Theory and the antecedent–mediator–outcome framework, the study investigated the effects of Autonomy Need Satisfaction, Competence Need Satisfaction, and Relatedness Need Satisfaction on Thriving at Work, with Psychological Capital and Calling Orientation examined as parallel mediators. A quantitative research design was adopted using a structured questionnaire containing 39 measurement items. Data were collected from primary school teachers in Beijing, and 547 valid responses were retained for analysis. Confirmatory factor analysis and structural equation modelling were used to assess the measurement and structural models, while bootstrapping was applied to test the indirect effects. The results supported all 17 hypotheses. Autonomy, competence, and relatedness need satisfaction positively predicted Psychological Capital, Calling Orientation, and Thriving at Work. Psychological Capital and Calling Orientation also demonstrated significant positive effects on Thriving at Work. Furthermore, both mediators significantly mediated the relationships between each psychological need and Thriving at Work. Since the direct effects remained significant, the findings indicate complementary or partial mediation. The study concludes that teachers' thriving during AI-related work transformation depends not only on technological adaptation but also on professional agency, perceived competence, supportive relationships, psychological resources, and vocational meaning. The findings provide theoretical and practical implications for developing teacher-centered AI-related workplace strategies.

Keywords: AI-related work transformation; primary school teachers; basic psychological need satisfaction; psychological capital; calling orientation; thriving at work; self-determination theory; Beijing, China.

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INTRODUCTION

Practical background

Artificial intelligence (AI) is increasingly entering teachers' everyday work, not only through classroom applications but also through changes in how professional tasks are designed and performed. AI-supported systems can assist with lesson planning, material development, assessment, feedback, learning analytics, communication, and

professional learning. Consequently, teachers are expected to use technological tools while retaining responsibility for pedagogical judgment, ethical decision-making, emotional support, and the interpretation of students' diverse needs. This process is better understood as AI-related work transformation than as a simple technological upgrade. Research on digital work shows that new technologies can reduce repetitive demands and

expand creative and autonomous work, but they can also intensify monitoring, uncertainty, skill requirements, and responsibility (Johnson et al., 2020; Langer and Landers, 2021; Parker and Grote, 2022). In education, reviews identify both substantial affordances and unresolved concerns involving accuracy, privacy, academic integrity, bias, and professional agency (Crompton and Burke, 2024; Tan et al., 2025).

For primary school teachers, these changes are especially consequential. Primary education involves continuous interaction with children, parents, colleagues, and school leaders and cannot be reduced to the delivery of information. AI may support routine preparation and instructional feedback, but teachers must still make context-sensitive decisions, establish trust, cultivate motivation, and respond to children's development. The consequences of AI-related work transformation may therefore depend less on adoption itself than on how the change is implemented and experienced. Evidence from Chinese teachers indicates that AI-supported applications can strengthen perceived autonomy and professional development while reducing digital burnout when teachers are properly introduced to their use (Duan and Zhao, 2024). Technology may nevertheless create pressure when teachers feel inadequately trained, closely evaluated, or uncertain about their professional role.

Within this study, AI-related work transformation refers to changes in teachers' task composition, skill requirements, decision responsibility, and patterns of professional coordination that may accompany the increasing use of AI-supported tools. Work-design research indicates that digital technologies do not produce a uniform experience: depending on their implementation, they may expand discretion and learning opportunities or increase monitoring, workload, and uncertainty (Gagné et al., 2022; Parker and Grote, 2022). Accordingly, the frequency of AI educational tool use reported in this study is treated as an indicator of teachers' exposure to an increasingly AI-intensive work context rather than as a complete multidimensional measure of work transformation. The structural model therefore focuses on the relationships among basic psychological need satisfaction, Psychological Capital, Calling Orientation, and Thriving at Work within that context.

This issue is important because teacher well-being is connected with the sustainability and quality of educational work. A recent meta-analysis of 173 studies found that psychological capital, autonomous motivation, and job competencies are among the strongest positive predictors of teacher well-being (Zhou et al., 2024). Research has likewise linked psychological capital with teacher well-being and occupational functioning (Zewude and Hercz, 2021; Guo et al., 2022). However, a focus on stress or burnout does not fully explain how teachers positively adapt and develop during occupational change. Thriving at work offers a more developmental perspective by examining whether teachers experience both vitality

and learning.

Theoretical background

Thriving at work refers to the joint experience of vitality and learning. Vitality captures energy and aliveness, whereas learning reflects the acquisition and application of new knowledge and skills. This combination is appropriate for studying teachers amid AI-related work transformation: teachers need energy for demanding relational work and continuous learning as tools and expectations change. A meta-analysis showed that thriving is shaped by contextual features, resources generated at work, agentic behaviors, and individual characteristics, while also varying across cultures (Liu et al., 2021). Thriving therefore reflects the interaction between work conditions and the resources that enable employees to grow.

Self-determination theory (SDT) provides the principal foundation for explaining why teachers may thrive under changing work conditions. SDT proposes that satisfaction of three basic psychological needs—autonomy, competence, and relatedness—supports internalized motivation, psychological growth, and well-being (Ryan and Deci, 2020). Here, autonomy need satisfaction refers to meaningful choice and influence over work; competence need satisfaction refers to feeling capable of performing teaching tasks; and relatedness need satisfaction refers to being respected, supported, and connected at work. These needs are directly relevant to AI-related transformation. Teachers are more likely to experience change as developmental when they can participate in decisions about AI use, acquire the competence to use new tools, and receive support from colleagues and leaders. Recent SDT scholarship argues that technology changes work design and can either support or frustrate these needs (Gagné et al., 2022). A meta-analysis further shows that self-determined motivation is associated with more favorable employee well-being, attitudes, and behavior (Van den Broeck et al., 2021).

Psychological capital represents a second mechanism in the proposed model. It is a positive, developable resource composed of hope, efficacy, resilience, and optimism. Teachers with greater psychological capital may view new demands as manageable, believe they can learn unfamiliar systems, persist after setbacks, and maintain positive expectations. Research among Chinese special education teachers found that psychological capital predicts occupational well-being, partly through work engagement (Guo et al., 2022). It also contributes to teacher well-being through adaptive coping (Zewude and Hercz, 2021), while recent evidence connects it with positive emotions and quality of work life (Erden, 2025). Need satisfaction may therefore foster thriving by strengthening teachers' personal psychological resources.

Calling orientation offers a complementary, meaning-based mechanism. It describes the extent to which

individuals understand their occupation as meaningful, socially valuable, and central to identity, rather than merely as a means of income or advancement. This orientation is relevant to teaching because the profession involves a strong service and developmental mission. Teachers who see teaching as a calling may invest effort, interpret technological change in relation to student benefit, and preserve purpose when familiar routines are disrupted. Mantler et al. (2022) found that employees with a calling orientation showed stronger work centrality and engagement than job-oriented employees, while cautioning against treating calling as universally superior. In the Chinese teaching context, Chen et al. (2025) found that career calling was associated with work engagement and operated through career adaptability in explaining teacher burnout. Calling orientation may therefore connect need satisfaction with thriving by helping teachers internalize the value and social significance of changing work.

Research gap and purpose of the study

Despite growing scholarship on AI in education, three limitations remain. First, recent literature concentrates on pedagogical affordances, student learning, assessment, or ethical governance, whereas teachers' psychological experience as workers remains comparatively underexamined (Crompton and Burke, 2024; Tan et al., 2025). Fewer studies ask under what conditions teachers can remain energetic, continue learning, and develop positively while work is transformed. Second, teacher research has emphasized burnout, stress, job satisfaction, or general well-being. These outcomes do not capture the simultaneous vitality and learning that define thriving. Moreover, evidence on psychological capital and teacher well-being has focused on university or special education teachers (Zewude and Hercz, 2021; Guo et al., 2022), leaving primary teachers in large urban Chinese settings underrepresented.

Third, the relationships among basic psychological need satisfaction, psychological capital, calling orientation, and thriving have rarely been examined in one integrated model. SDT explains how work conditions support motivation and healthy functioning; psychological capital explains personal coping resources; and calling orientation explains occupational purpose and identity. Examining these mechanisms separately offers only a partial account of thriving. A parallel mediation model can clarify whether need satisfaction relates to thriving directly and indirectly through distinct resource-based and meaning-based pathways.

Accordingly, this study investigates primary school teachers' thriving at work amid AI-related work transformation in Beijing, China. It examines the effects of autonomy, competence, and relatedness need satisfaction on psychological capital, calling orientation, and thriving,

while testing the two mediating roles. The study extends SDT to a contemporary teacher-work context, integrates psychological resources and occupational meaning into one framework, and provides evidence from an underrepresented primary-school setting. Practically, the findings may help school leaders design AI-related changes that protect agency, build competence, strengthen professional relationships, and sustain the resources and purpose necessary for teachers to thrive.

LITERATURE REVIEW

Research theory

Self-Determination Theory (SDT), particularly its Basic Psychological Need Theory (BPNT), provides the principal theoretical foundation for this study. SDT views individuals as active agents who naturally seek growth, internalization, and effective self-regulation, but whose development depends on the quality of their social and work environments (Ryan and Deci, 2020). BPNT specifies three universal psychological nutrients: autonomy, competence, and relatedness (Vansteenkiste et al., 2020). Autonomy need satisfaction refers to experiencing volition, choice, and psychological ownership of one's actions; competence need satisfaction concerns feeling effective and capable; and relatedness need satisfaction concerns feeling respected, cared for, and connected to significant others. The work-domain validation of the Basic Psychological Need Satisfaction and Frustration Scale further confirms that these needs are distinguishable and analytically relevant in organizational settings (Olafsen et al., 2021).

When these needs are satisfied, employees are more likely to internalize work values, sustain autonomous motivation, and experience positive functioning. A recent meta-analysis shows that self-determined work motivation is associated with more favorable well-being, attitudes, and behavioral outcomes (Van den Broeck et al., 2021). This logic is particularly relevant to AI-related work transformation because technology can redesign tasks, redistribute decision authority, and alter competence requirements and social interdependence (Gagné et al., 2022). For primary school teachers, autonomy may involve meaningful influence over how AI-supported tools are integrated into teaching; competence may involve confidence in learning and evaluating new systems; and relatedness may involve collegial support while professional routines are changing.

SDT positions autonomy, competence, and relatedness need satisfaction as antecedents because these experiences provide the motivational conditions that enable individuals to act with volition, feel effective, and remain socially connected. Unlike the two mediators, need satisfaction describes the quality of teachers' immediate work experience and its social environment. When these

needs are satisfied, teachers are more likely to internalize work goals, invest effort, and build the resources required for positive functioning (Ryan and Deci, 2020; Gagné et al., 2022). Psychological Capital and Calling Orientation are introduced as parallel rather than sequential mediators because they represent two conceptually different responses to need-supportive work. Psychological Capital is an agentic-resource pathway: hope, self-efficacy, resilience, and optimism concern whether teachers believe they can pursue goals, handle difficulties, and recover from setbacks (Lorenz et al., 2022). Calling Orientation is a meaning-and-identity pathway: it concerns why teaching matters to the individual and how the occupation contributes to personal purpose and social value (Willner et al., 2020). Psychological Capital therefore represents perceived capacity, whereas Calling Orientation represents perceived purpose. Both may be associated with Thriving at Work because resources help teachers sustain energy and learning under demands, while occupational meaning gives direction and significance to that effort. The model treats these mechanisms as complementary and simultaneous; it does not assume that one must precede the other. Direct associations between need satisfaction and Thriving at Work may also remain because SDT allows need satisfaction to support vitality and development through additional motivational processes not included in the model.

Research hypotheses

Autonomy need satisfaction gives teachers volition and influence over professional decisions. Agency can make new requirements feel self-endorsed, supporting efficacy and persistence. It also facilitates internalization of teaching values and active learning, which are relevant to vitality and development (Gagné et al., 2022; Martela et al., 2021).

H1a: There is a significant positive relationship between Autonomy Need Satisfaction and Psychological Capital among primary school teachers.

H1b: There is a significant positive relationship between Autonomy Need Satisfaction and Calling Orientation among primary school teachers.

H1c: There is a significant positive relationship between Autonomy Need Satisfaction and Thriving at Work among primary school teachers.

Competence need satisfaction is the feeling of effectiveness in valued work. AI-related transformation heightens its relevance because teachers must acquire new tools while maintaining teaching quality. Mastery can strengthen PCL, make teaching purpose actionable, and support the learning and vitality components of TAW (Li et al., 2024; Zhou et al., 2024).

H2a: There is a significant positive relationship between Competence Need Satisfaction and Psychological Capital among primary school teachers.

H2b: There is a significant positive relationship between Competence Need Satisfaction and Calling Orientation among primary school teachers.

H2c: There is a significant positive relationship between Competence Need Satisfaction and Thriving at Work among primary school teachers.

Relatedness need satisfaction concerns belonging, respect, and meaningful connection at work. During technological change, colleagues and school leaders can provide emotional reassurance and practical knowledge. These relational resources can strengthen PCL and support a calling to teach; SDT-based research also links need satisfaction with thriving (Jiang and Wei, 2024; Li et al., 2024).

H3a: There is a significant positive relationship between Relatedness Need Satisfaction and Psychological Capital among primary school teachers.

H3b: There is a significant positive relationship between Relatedness Need Satisfaction and Calling Orientation among primary school teachers.

H3c: There is a significant positive relationship between Relatedness Need Satisfaction and Thriving at Work among primary school teachers.

PCL provides hope, efficacy, resilience, and optimism. These capacities help teachers manage unfamiliar demands, recover from setbacks, and sustain energy while learning during AI-related work transformation. Teacher and meta-analytic evidence associate PCL with positive functioning and flourishing, supporting its contribution to TAW (Freire et al., 2020; Guo et al., 2022; Liu et al., 2021).

H4: There is a significant positive relationship between Psychological Capital and Thriving at Work among primary school teachers.

Need satisfaction is a supportive work condition, whereas PCL is a resource that can develop under that condition. Autonomy, competence, and relatedness may therefore enhance TAW partly by cultivating hope, efficacy, resilience, and optimism. Evidence linking PCL with flourishing and occupational well-being supports these indirect paths (Ho and Chan, 2022; Zewude and Hercz, 2021).

H5a: Psychological Capital mediates the relationship between Autonomy Need Satisfaction and Thriving at Work among primary school teachers.

H5b: Psychological Capital mediates the relationship between Competence Need Satisfaction and Thriving at Work among primary school teachers.

H5c: Psychological Capital mediates the relationship between Relatedness Need Satisfaction and Thriving at Work among primary school teachers.

CON frames teaching as a meaningful and socially consequential vocation rather than only a source of income or advancement. Calling-oriented employees report stronger engagement, and research on Chinese teachers links career calling with work engagement and adaptive occupational outcomes (Mantler et al., 2022; Chen et al., 2025). Although direct CON–TAW evidence remains limited, this supports the proposed positive relationship.

H6: There is a significant positive relationship between Calling Orientation and Thriving at Work among primary school teachers.

Need satisfaction can facilitate the internalization of teaching as a meaningful vocation: autonomy makes purpose self-endorsed, competence makes it actionable, and relatedness confirms its prosocial significance. Studies of Chinese teachers associate need satisfaction with career calling, while calling is linked with engagement and positive career functioning (Li et al., 2024; Liu et al., 2024; Chen et al., 2025). CON may therefore be a meaning-based pathway to TAW.

H7a: Calling Orientation mediates the relationship between Autonomy Need Satisfaction and Thriving at Work among primary school teachers.

H7b: Calling Orientation mediates the relationship between Competence Need Satisfaction and Thriving at Work among primary school teachers.

H7c: Calling Orientation mediates the relationship between Relatedness Need Satisfaction and Thriving at Work among primary school teachers.

Conceptual framework

The conceptual framework proposes a parallel mediation model explaining how primary school teachers' work experiences may foster thriving amid AI-related work transformation. Autonomy Need Satisfaction (ANS), Competence Need Satisfaction (CNS), and Relatedness Need Satisfaction (RNS) are specified as the three independent variables derived from BPNT within SDT. They represent teachers' perceived volition, effectiveness, and social connection in their work environment. Psychological Capital (PCL) and Calling Orientation (CON) are specified as parallel mediating variables. PCL represents the personal resource pathway, through which need satisfaction may build hope, efficacy, resilience, and optimism. CON represents the meaning pathway, through which need satisfaction may strengthen teachers' perception that teaching is purposeful, socially valuable, and central to their identity.

Thriving at Work (TAW) is the dependent variable and is conceptualized as the simultaneous experience of vitality and learning. The model tests both direct paths from ANS, CNS, and RNS to TAW and indirect paths through PCL and CON. It also tests the direct effects of each need on both mediators and the direct effects of PCL and CON on TAW. AI-related work transformation defines the empirical context rather than an additional measured construct: it explains why teachers' agency, competence, social connection, psychological resources, and vocational meaning are especially consequential. Consistent with the study's A–B–C organizing logic, the framework represents an antecedent–mediator–outcome process: basic psychological need satisfaction provides the motivational foundation, PCL and CON provide complementary resource-based and meaning-based mechanisms, and TAW represents the positive developmental outcome.

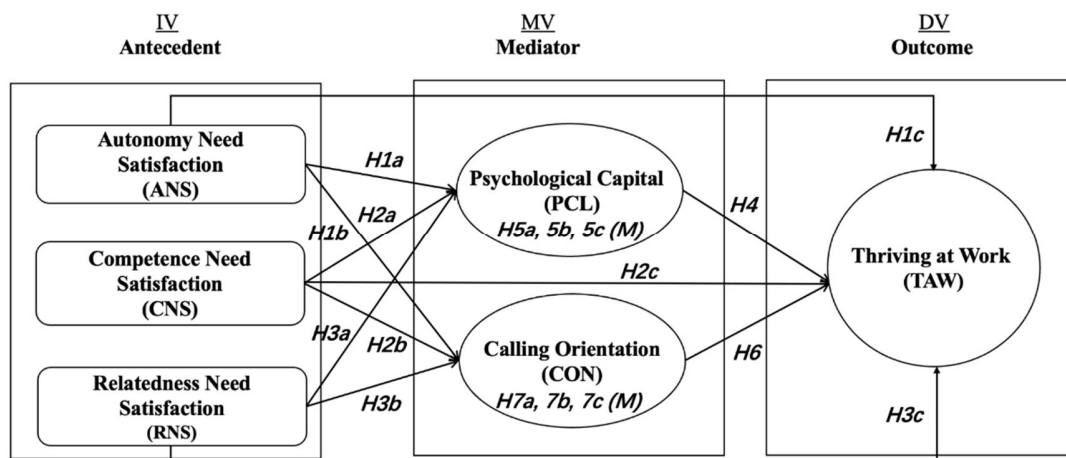


Figure 1. Conceptual framework. Source: Design by the researcher (2026).

RESEARCH METHODOLOGY

Research methods

This study adopted a quantitative research methodology to examine the factors influencing primary school teachers' Thriving at Work amid AI-related work transformation in Beijing, China. A quantitative approach was appropriate because the study aimed to measure relationships among clearly defined variables and statistically test the proposed hypotheses. The research model consisted of three independent variables—Autonomy Need Satisfaction (ANS), Competence Need Satisfaction (CNS), and Relatedness Need Satisfaction (RNS)—two mediating variables—Psychological Capital and Calling Orientation—and one dependent variable, Thriving at Work (TAW). Data were collected through a structured questionnaire comprising 39 substantive measurement items. The questionnaire was designed to obtain standardized responses from a relatively large number of primary school teachers across different areas of Beijing. The measurement items assessed teachers' perceptions of their autonomy, competence, relatedness, psychological capital, calling orientation, and thriving at work. This structure enabled the researcher to examine both the measurement properties of the constructs and the relationships proposed in the conceptual model. The research procedures included data screening, demographic analysis, descriptive statistics, reliability testing, confirmatory factor analysis (CFA), and structural equation modelling (SEM). Reliability analysis was used to assess the internal consistency of the measurement scales, while CFA was conducted to evaluate the factor structure, construct validity, convergent validity, and discriminant validity. SEM was then applied to examine the direct relationships among the variables. Finally,

bootstrapping procedures were used to test the indirect effects of Psychological Capital and Calling Orientation. Since the research employed a cross-sectional survey design, the findings were interpreted as statistical relationships rather than definitive causal effects.

Research design

This study employed a quantitative, non-experimental, cross-sectional, and explanatory research design. To improve geographical coverage, Beijing was divided into four sampling areas according to urban development level and geographical location. District-level data from the 2025–2026 Academic Year Statistical Overview of Education Development in Beijing reported 61,781 full-time primary-school teachers across the city's 16 districts (Beijing Municipal Education Commission, 2026). These population counts were aggregated into four strata and used to determine proportionate questionnaire quotas. The Central Urban Area comprised Dongcheng and Xicheng; the Main Urban Area comprised Chaoyang, Haidian, Fengtai, and Shijingshan; the Developing Suburban Area comprised Tongzhou, Shunyi, Changping, Daxing, and Fangshan; and the Outer Suburban Area comprised Mentougou, Huairou, Pinggu, Miyun, and Yanqing. Several primary schools were approached within each area; approximately 15–25 teachers were invited from each participating school, and every area covered at least two administrative districts to reduce concentration in a single district. Because schools and teachers were recruited within the predetermined quotas according to access and willingness to participate, the procedure is described as proportionate stratified quota sampling rather than probability sampling.

Table 1. Sampling allocation by Beijing area.

Sampling area	Included districts	Teacher population	Population share	Target quota
Central Urban Area	Dongcheng; Xicheng	12,498	20.23%	118
Main Urban Area	Chaoyang; Haidian; Fengtai; Shijingshan	22,412	36.28%	212
Developing Suburban Area	Tongzhou; Shunyi; Changping; Daxing; Fangshan	18,794	30.42%	178
Outer Suburban Area	Mentougou; Huairou; Pinggu; Miyun; Yanqing	8,077	13.07%	77
Total	All 16 Beijing districts	61,781	100.00%	585

Source: Calculated from district-level full-time primary-school teacher counts reported by the Beijing Municipal Education Commission (2026).

Research sampling

The target population consisted of full-time primary school teachers working in Beijing, China. The questionnaire

contained 39 substantive measurement items, and the ten-times planning rule indicated a minimum of 390 participants. A 50% allowance for non-response, incomplete questionnaires, and screening was added,

producing a target of 585. The questionnaires were allocated according to the four regional quotas shown in Table S1: 118 in the Central Urban Area, 212 in the Main Urban Area, 178 in the Developing Suburban Area, and 77 in the Outer Suburban Area. We distributed 585 questionnaires and received 561, for a response rate of 95.90%. After screening, 547 valid questionnaires were retained, representing 97.50% of returned questionnaires and 93.50% of all distributed questionnaires. Participation was voluntary, and respondents were informed that their responses would be confidential and used only for academic research. The final 547 cases were used in the descriptive, reliability, validity, structural-model, and hypothesis analyses reported in the Results section.

Measurement instruments

The questionnaire contained 39 substantive items measuring six constructs. The item wording was taken from or adapted from validated instruments, while the construct labels and codes were retained consistently throughout the analysis. Higher composite scores represented higher levels of the corresponding construct after reverse-coded items were recoded.

Autonomy Need Satisfaction, Competence Need Satisfaction, and Relatedness Need Satisfaction were measured using the satisfaction subscales of the Basic Psychological Need Satisfaction and Need Frustration at Work Scale developed and validated by Olafsen et al. (2021). Each need was represented by four items: four items assessed perceived choice and volition at work (ANS1–ANS4), four assessed confidence and effectiveness in completing work tasks (CNS1–CNS4), and four assessed care, connection, and warmth in workplace relationships (RNS1–RNS4). These three subscales contributed 12 items.

Psychological Capital was measured with the 12-item revised Compound Psychological Capital Scale (CPC-12R) validated by Lorenz et al. (2022). The scale represents the four interrelated resources of hope, self-efficacy, resilience, and optimism. The 12 items assess respondents' capacity to identify routes to goals, manage unexpected demands, recover from difficulties, and

maintain positive expectations about the future.

Calling Orientation was assessed with five items drawn from the calling-orientation component of the Work Orientation Questionnaire developed by Willner et al. (2020). The items assess the extent to which respondents view their work as a life mission, a major source of personal meaning, and a way of making a positive social contribution.

Thriving at Work was measured with 10 items representing the two components of learning and vitality. The measure followed the 10-item instrument applied among Chinese kindergarten teachers by He et al. (2023), based on the established Thriving at Work measure developed by Porath et al. (2012). Five items assessed continuous learning and development, and five assessed energy, alertness, and vitality. Two negatively worded items were reverse-coded before the composite score was calculated. Together, the six measures comprised 39 items.

DATA ANALYSIS

Descriptive Analysis

Table 2 presents the demographic characteristics of the 547 valid respondents. Female teachers constituted 55.76% of the sample, while male teachers accounted for 43.88%. The largest age group was 31–40 years (33.46%), and most respondents held either a bachelor's degree (56.49%) or a master's degree (41.13%). Level I teachers represented the largest professional-title group (40.77%). Regarding AI educational tool use, 50 teachers (9.14%) reported using such tools once per month or less, 114 (20.84%) used them two to three times per month, 178 (32.54%) used them four to six times per month, and 205 (37.48%) used them seven or more times per month. Thus, 70.02% of respondents used AI educational tools at least four times per month. This distribution indicates that AI-tool exposure was regular for a substantial majority of the sample, although the intensity of use remained heterogeneous. Frequency may reflect activities such as lesson preparation, material development, assessment, feedback, or administrative work.

Table 2. The results of the descriptive analysis.

Name	Category	Frequency	Percentage (%)
Gender	Male	240	43.88
	Female	305	55.76
	Prefer not to disclose	2	0.37
Age	30 years or younger	124	22.67
	31–40 years	183	33.46
	41–50 years	141	25.78
	51 years or older	99	18.10

Table 2. Continues.

Teaching experience	5 years or less	76	13.89
	6–10 years	120	21.94
	11–20 years	165	30.16
	21–30 years	121	22.12
	31 years or more	65	11.88
Educational background	Diploma or below	11	2.01
	Bachelor's degree	309	56.49
	Master's degree	225	41.13
	Doctoral degree	2	0.37
Professional title	Not yet rated	42	7.68
	Level II teacher	142	25.96
	Level I teacher	223	40.77
	Senior teacher	132	24.13
	Full senior teacher	8	1.46
Frequency of AI educational tool use	Once per month or less	50	9.14
	2–3 times per month	114	20.84
	4–6 times per month	178	32.54
	7 or more times per month	205	37.48
	Total	547	100.0

Reliability analysis

Table 3 reports the reliability results for the six constructs. The corrected item–total correlations ranged from 0.606 to 0.794, exceeding the commonly accepted minimum value of 0.30. Cronbach's alpha coefficients were 0.809 for Autonomy Need Satisfaction, 0.824 for Competence Need

Satisfaction, 0.838 for Relatedness Need Satisfaction, 0.941 for Psychological Capital, 0.866 for Calling Orientation, and 0.932 for Thriving at Work. All coefficients exceeded 0.70, demonstrating satisfactory to excellent internal consistency. The results also show that deleting any item would not improve the reliability of its corresponding construct.

Table 3. The results of the reliability analysis.

Variable	Item	Corrected item–total correlation (CITC)	Cronbach's α if item deleted	Cronbach's α
Autonomy Need Satisfaction	ANS1	0.640	0.754	0.809
	ANS2	0.623	0.762	
	ANS3	0.606	0.770	
	ANS4	0.634	0.757	
Competence Need Satisfaction	CNS1	0.702	0.754	0.824
	CNS2	0.635	0.784	
	CNS3	0.638	0.783	
	CNS4	0.619	0.792	
Relatedness Need Satisfaction	RNS1	0.719	0.772	0.838
	RNS2	0.653	0.801	
	RNS3	0.661	0.798	
	RNS4	0.644	0.806	

Table 3. Continues.

Psychological Capital	PCL1	0.747	0.935	0.941
	PCL2	0.753	0.935	
	PCL3	0.741	0.936	
	PCL4	0.737	0.936	
	PCL5	0.714	0.937	
	PCL6	0.756	0.935	
	PCL7	0.681	0.938	
	PCL8	0.760	0.935	
	PCL9	0.701	0.937	
	PCL10	0.725	0.936	
	PCL11	0.699	0.937	
	PCL12	0.760	0.935	
Calling Orientation	CON1	0.716	0.831	0.866
	CON2	0.653	0.846	
	CON3	0.704	0.833	
	CON4	0.678	0.840	
	CON5	0.687	0.838	
Thriving at Work	TAW1	0.794	0.921	0.932
	TAW2	0.753	0.923	
	TAW3	0.729	0.925	
	TAW4	0.746	0.924	
	TAW5	0.753	0.923	
	TAW6	0.700	0.926	
	TAW7	0.718	0.925	
	TAW8	0.664	0.928	
	TAW9	0.740	0.924	
	TAW10	0.704	0.926	

Validity analysis (confirmatory factor analysis)

Autonomy need satisfaction

Table 4 presents the CFA model-fit results for Autonomy Need Satisfaction. The chi-square value was 6.146 with 2 degrees of freedom, and the chi-square-to-degree-of-

freedom ratio was 3.073. Although the ratio was slightly above the recommended value of 3 and the p-value was 0.046, the remaining fit indices indicated an acceptable model. Specifically, GFI, AGFI, CFI, TLI, IFI, and NFI were all above 0.97, while RMSEA, RMR, and SRMR were low at 0.062, 0.012, and 0.0167, respectively. Overall, the measurement model demonstrated an acceptable fit.

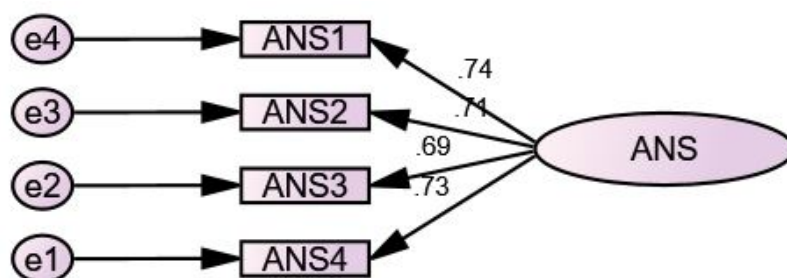


Figure 2. Confirmatory factor analysis model for autonomy need satisfaction.

Table 4. Model fit for autonomy need satisfaction.

Index	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI
Criterion Value	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9
	6.146	2	0.046	3.073	0.994	0.062	0.012	0.994

Index	TLI	AGFI	IFI	PGFI	PNFI	PCFI	SRMR	NFI
Criterion Value	>0.9	>0.9	>0.9	>0.5	>0.5	>0.5	<0.1	>0.9
	0.982	0.971	0.994	0.199	0.330	0.331	0.0167	0.991

Table 5 shows the convergent validity results for Autonomy Need Satisfaction. The standardized factor loadings ranged from 0.675 to 0.750, indicating that all four items made meaningful contributions to the latent construct. The squared multiple correlations ranged from

0.456 to 0.562. The average variance extracted was 0.515, exceeding the recommended threshold of 0.50, while the composite reliability was 0.809. These findings demonstrate that the ANS measurement items possessed adequate convergent validity and reliability.

Table 5. Convergent validity of autonomy need satisfaction.

Latent variable	Item	Standardized factor loading	SMC	AVE	CR
Autonomy need satisfaction	ANS1	0.750	0.562	0.515	0.809
	ANS2	0.703	0.495		
	ANS3	0.675	0.456		
	ANS4	0.739	0.546		

Competence need satisfaction

Table 6 presents the CFA model-fit results for Competence Need Satisfaction. The model produced a chi-square value of 3.674 with 2 degrees of freedom and a chi-square-to-degree-of-freedom ratio of 1.837. The p-value was 0.159, indicating no statistically significant

discrepancy between the observed and estimated covariance matrices. The GFI, AGFI, CFI, TLI, IFI, and NFI values were all above 0.98, while RMSEA, RMR, and SRMR were 0.039, 0.012, and 0.0120, respectively. These results indicate that the CNS measurement model achieved an excellent overall fit.

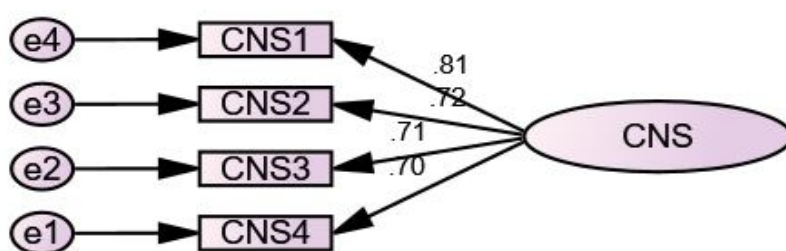


Figure 3. Confirmatory factor analysis model for competence need satisfaction.

Table 6. Model fit for competence need satisfaction.

Index	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI
Criterion Value	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9
	3.674	2	0.159	1.837	0.997	0.039	0.012	0.998

Index	TLI	AGFI	IFI	PGFI	PNFI	PCFI	SRMR	NFI
Criterion Value	>0.9	>0.9	>0.9	>0.5	>0.5	>0.5	<0.1	>0.9
	0.993	0.984	0.998	0.199	0.332	0.333	0.0120	0.995

Table 7 presents the convergent validity results for Competence Need Satisfaction. The standardized factor loadings ranged from 0.700 to 0.800, and the corresponding squared multiple correlations ranged from 0.490 to 0.641. The average variance extracted was 0.543, which exceeded the recommended value of 0.50.

The composite reliability coefficient was 0.826, indicating strong internal consistency. Therefore, all four CNS items adequately represented the underlying competence need satisfaction construct and demonstrated satisfactory convergent validity.

Table 7. Convergent validity of competence need satisfaction.

Latent variable	Item	Standardized factor loading	SMC	AVE	CR
Competence Need Satisfaction	CNS1	0.800	0.641	0.543	0.826
	CNS2	0.720	0.518		
	CNS3	0.723	0.523		
	CNS4	0.700	0.490		

Relatedness need satisfaction

Table 8 reports the CFA model-fit results for Relatedness Need Satisfaction. The chi-square statistic was 2.529 with 2 degrees of freedom, producing a ratio of 1.264 and a p-value of 0.282. The GFI, AGFI, CFI, TLI, IFI, and NFI

values were all greater than 0.997. In addition, RMSEA was 0.022, RMR was 0.009, and SRMR was 0.0096. These indices demonstrate that the hypothesized measurement structure fitted the observed data very well. Overall, the RNS measurement model showed excellent goodness of fit.

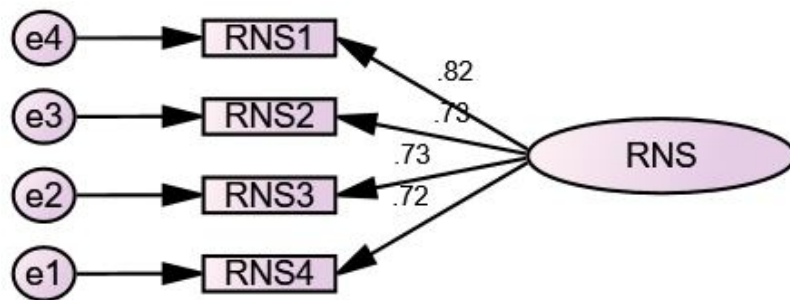


Figure 4. Confirmatory factor analysis model for relatedness need satisfaction.

Table 8. Model fit for relatedness need satisfaction.

Index	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI
Criterion	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9
Value	2.529	2	0.282	1.264	0.998	0.022	0.009	0.999
Index	TLI	AGFI	IFI	PGFI	PNFI	PCFI	SRMR	NFI
Criterion	>0.9	>0.9	>0.9	>0.5	>0.5	>0.5	<0.1	>0.9
Value	0.998	0.989	0.999	0.200	0.332	0.333	0.0096	0.997

Table 9 presents the convergent validity results for Relatedness Need Satisfaction. The standardized factor loadings ranged from 0.730 to 0.801, with squared multiple correlations between 0.533 and 0.642. The average variance extracted was 0.566, exceeding the recommended threshold of 0.50, and the composite

reliability was 0.839. These results indicate that the four RNS items shared sufficient variance and consistently measured the intended latent construct. Accordingly, the Relatedness Need Satisfaction scale demonstrated satisfactory convergent validity and composite reliability.

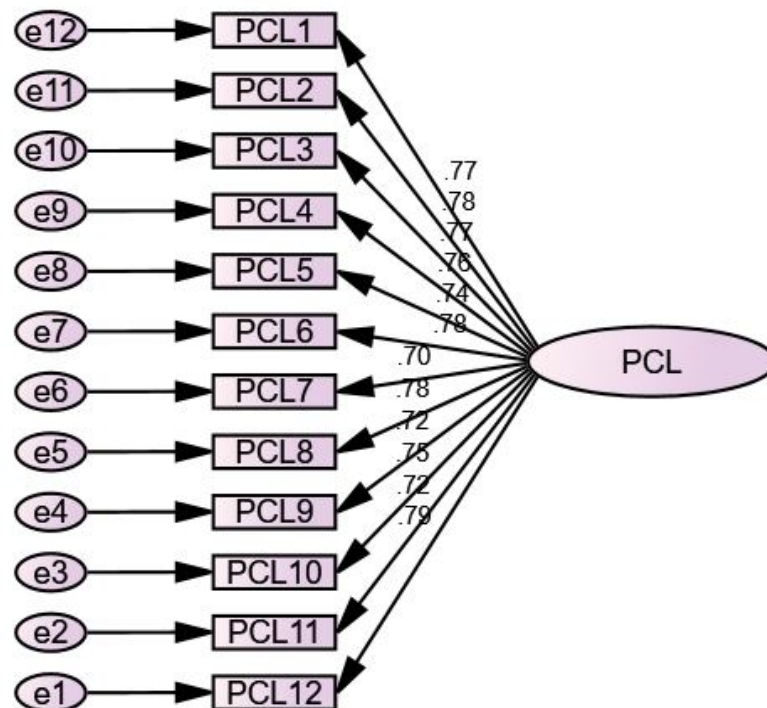
Table 9. Convergent validity of relatedness need satisfaction.

Latent variable	Item	Standardized factor loading	SMC	AVE	CR
Relatedness Need Satisfaction	RNS1	0.801	0.642	0.566	0.839
	RNS2	0.733	0.537		
	RNS3	0.743	0.551		
	RNS4	0.730	0.533		

Psychological capital

Table 10 presents the CFA model-fit results for Psychological Capital. The chi-square statistic was 84.513 with 54 degrees of freedom, and the chi-square-to-degree-of-freedom ratio was 1.565. Although the p-value was

0.005, the other fit indices demonstrated a strong model fit. GFI was 0.975, CFI was 0.992, TLI was 0.991, AGFI was 0.964, IFI was 0.992, and NFI was 0.979. The RMSEA, RMR, and SRMR values were 0.032, 0.016, and 0.0189, respectively. Thus, the PCL measurement model was considered acceptable.

**Figure 5.** Confirmatory factor analysis model for psychological capital.**Table 10.** Model fit for psychological capital.

Index	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI
Criterion	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9
Value	84.513	54	0.005	1.565	0.975	0.032	0.016	0.992

Index	TLI	AGFI	IFI	PGFI	PNFI	PCFI	SRMR	NFI
Criterion	>0.9	>0.9	>0.9	>0.5	>0.5	>0.5	<0.1	>0.9
Value	0.991	0.964	0.992	0.675	0.801	0.812	0.0189	0.979

Table 11 reports the convergent validity results for Psychological Capital. The standardized factor loadings for the twelve items ranged from 0.703 to 0.787, while the squared multiple correlations ranged from 0.495 to 0.619. The average variance extracted was 0.572, demonstrating

that more than half of the variance in the indicators was explained by the latent construct. The composite reliability was 0.941, indicating excellent reliability. Overall, the PCL items demonstrated strong factor representation, convergent validity, and measurement consistency.

Table 11. Convergent validity of psychological capital.

Latent variable	Item	Standardized factor loading	SMC	AVE	CR
Psychological capital	PCL1	0.769	0.591	0.572	0.941
	PCL2	0.784	0.615		
	PCL3	0.765	0.585		
	PCL4	0.765	0.585		
	PCL5	0.736	0.541		
	PCL6	0.778	0.606		
	PCL7	0.703	0.495		
	PCL8	0.787	0.619		
	PCL9	0.728	0.530		
	PCL10	0.748	0.560		
	PCL11	0.720	0.518		
	PCL12	0.786	0.617		

Calling orientation

Table 12 presents the CFA model-fit results for Calling Orientation. The model yielded a chi-square value of 7.066 with 5 degrees of freedom, a chi-square-to-degree-of-freedom ratio of 1.413, and a p-value of 0.216. The GFI,

AGFI, CFI, TLI, IFI, and NFI values were all above 0.985. The RMSEA was 0.028, RMR was 0.012, and SRMR was 0.0124, indicating very small residual errors. Although some parsimony indices were comparatively modest, the main absolute and incremental fit indices confirmed that the CON measurement model fitted the data well.

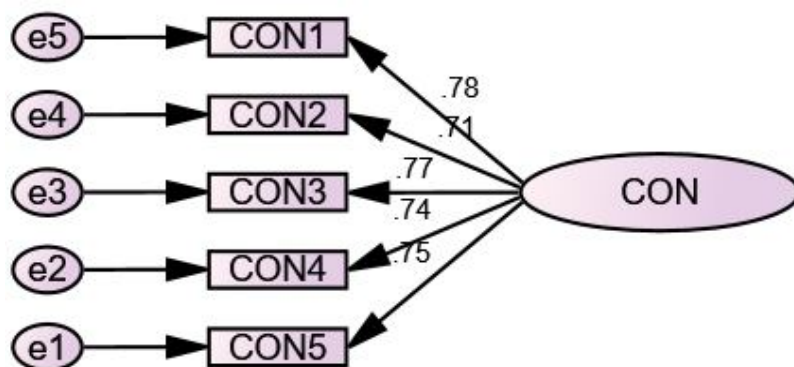


Figure 6. Confirmatory factor analysis model for calling orientation.

Table 12. Model fit for calling orientation.

Index	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI
Criterion	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9
Value	7.066	5	0.216	1.413	0.995	0.028	0.012	0.998
Index	TLI	AGFI	IFI	PGFI	PNFI	PCFI	SRMR	NFI
Criterion	>0.9	>0.9	>0.9	>0.5	>0.5	>0.5	<0.1	>0.9
Value	0.996	0.985	0.998	0.332	0.497	0.499	0.0124	0.994

Table 13 presents the convergent validity results for Calling Orientation. The standardized factor loadings ranged from 0.710 to 0.777, and the squared multiple correlations ranged from 0.503 to 0.604. The average variance extracted was 0.565, exceeding the

recommended threshold of 0.50. The composite reliability coefficient was 0.866, indicating good internal consistency among the five items. These results confirm that the indicators adequately represented the Calling Orientation construct and achieved satisfactory convergent validity.

Table 13. Convergent validity of calling orientation.

Latent variable	Item	Standardized factor loading	SMC	AVE	CR
Calling Orientation	CON1	0.777	0.604	0.565	0.866
	CON2	0.710	0.503		
	CON3	0.767	0.588		
	CON4	0.744	0.554		
	CON5	0.757	0.573		

Thriving at work

Table 14 reports the CFA model-fit results for Thriving at Work. The chi-square value was 52.656 with 35 degrees of freedom, and the chi-square-to-degree-of-freedom ratio was 1.504. Although the p-value was 0.028, the remaining

fit indices indicated a strong model fit. GFI was 0.982, CFI was 0.995, TLI was 0.993, AGFI was 0.971, IFI was 0.995, and NFI was 0.984. The RMSEA, RMR, and SRMR values were 0.030, 0.015, and 0.0176, respectively. Therefore, the TAW measurement model was considered acceptable.

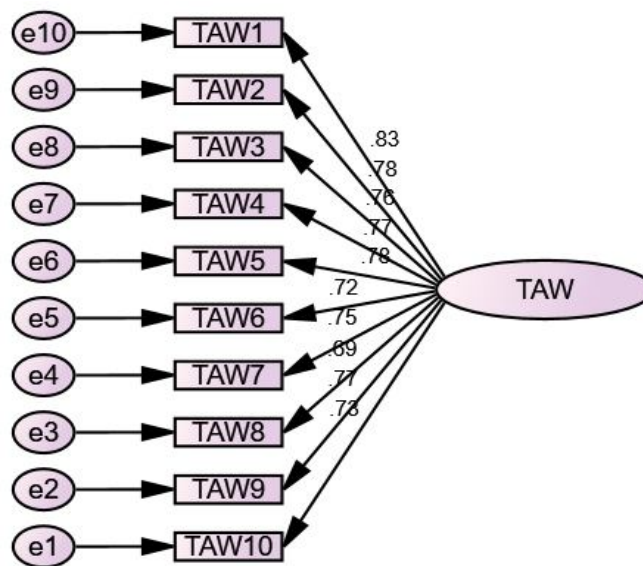


Figure 7. Confirmatory factor analysis model for thriving at work.

Table 14. Model fit for thriving at work.

Index	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI
Criterion Value	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9
	52.656	35	0.028	1.504	0.982	0.030	0.015	0.995

Index	TLI	AGFI	IFI	PGFI	PNFI	PCFI	SRMR	NFI
Criterion Value	>0.9	>0.9	>0.9	>0.5	>0.5	>0.5	<0.1	>0.9
	0.993	0.971	0.995	0.625	0.765	0.774	0.0176	0.984

Table 15 presents the convergent validity results for Thriving at Work. The standardized factor loadings ranged from 0.688 to 0.825, indicating generally strong relationships between the ten observed items and the latent construct. The squared multiple correlations ranged from 0.473 to 0.680. The average variance extracted was 0.578, while the composite reliability was 0.932. Both values exceeded the recommended thresholds. Although one loading was slightly below 0.70, it remained acceptable in conjunction with the strong AVE and CR values. Overall, the TAW scale demonstrated adequate convergent validity and excellent reliability.

Table 15. Convergent validity of thriving at work.

Latent variable	Item	Standardized factor loading	SMC	AVE	CR
Thriving at Work	TAW1	0.825	0.680	0.578	0.932
	TAW2	0.787	0.619		
	TAW3	0.755	0.570		
	TAW4	0.776	0.602		
	TAW5	0.783	0.613		
	TAW6	0.722	0.522		
	TAW7	0.751	0.564		
	TAW8	0.688	0.473		
	TAW9	0.773	0.598		
	TAW10	0.732	0.537		

Structural equation modeling

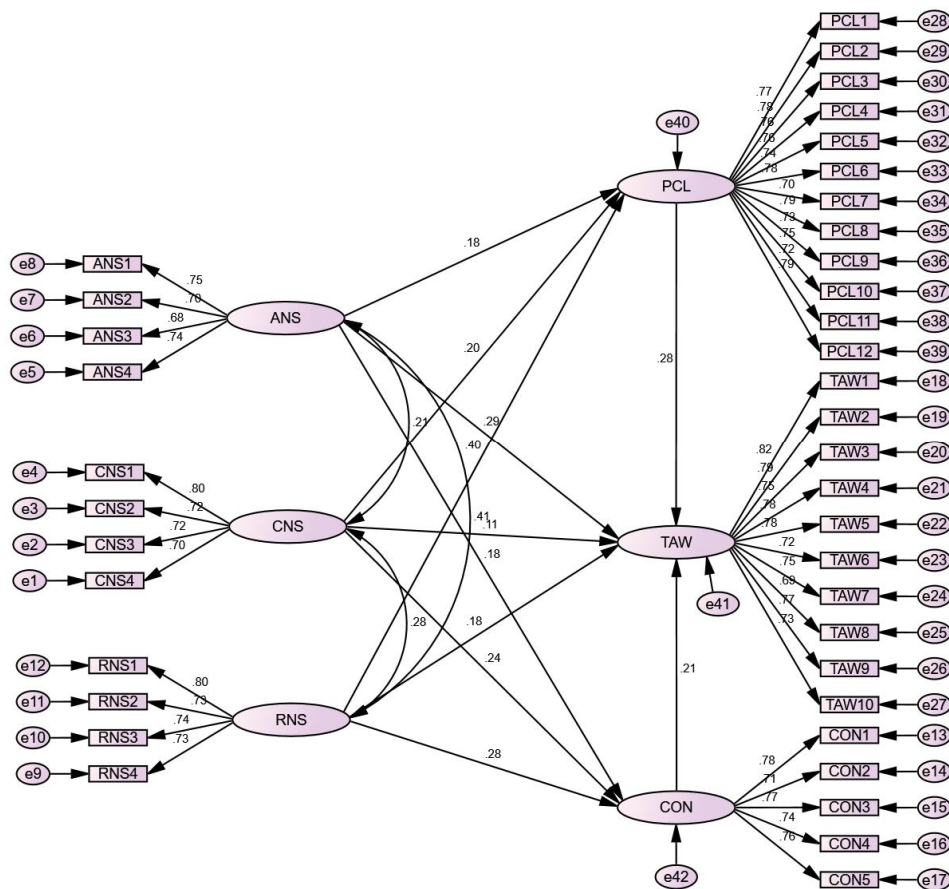


Figure 8. Structural equation modeling.

Model fit

Table 16 presents the overall model-fit results for the structural equation model. The chi-square value was 995.980 with 688 degrees of freedom, producing a chi-square-to-degree-of-freedom ratio of 1.448. Although the chi-square p-value was below 0.001, this statistic is

sensitive to sample size. The remaining indices demonstrated a good overall fit: GFI was 0.914, AGFI was 0.903, CFI was 0.974, TLI was 0.972, IFI was 0.974, and NFI was 0.921. RMSEA was 0.029, RMR was 0.029, and SRMR was 0.0334. Therefore, the structural model was suitable for hypothesis testing.

Table 16. The results of model fit.

Index	χ^2	df	p	χ^2/df	GFI	RMSEA	RMR	CFI
Criterion Value	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9
	995.980	688	0.000	1.448	0.914	0.029	0.029	0.974

Index	TLI	AGFI	IFI	PGFI	PNFI	PCFI	SRMR	NFI
Criterion Value	>0.9	>0.9	>0.9	>0.5	>0.5	>0.5	<0.1	>0.9
	0.972	0.903	0.974	0.806	0.855	0.904	0.0334	0.921

Path analysis

Table 17 reports the path analysis results. All eleven structural paths were positive and statistically significant. Autonomy, competence, and relatedness need satisfaction significantly predicted Psychological Capital, with standardized coefficients of 0.180, 0.204, and 0.397, respectively. These three variables also significantly

predicted Calling Orientation, with coefficients of 0.178, 0.239, and 0.285. Their direct effects on Thriving at Work were also significant, with coefficients of 0.295, 0.113, and 0.177. Psychological Capital significantly predicted TAW ($\beta = 0.280$), as did Calling Orientation ($\beta = 0.213$). Relatedness Need Satisfaction had the strongest effect on Psychological Capital.

Table 17. The results of path analysis.

X	→	Y	Unstandardized coefficient	S.E.	C.R.	P	Standardized coefficient
Autonomy Need Satisfaction	→	Psychological Capital	.191	.051	3.724	***	.180
Competence Need Satisfaction	→	Psychological Capital	.194	.043	4.536	***	.204
Relatedness Need Satisfaction	→	Psychological Capital	.360	.047	7.601	***	.397
Autonomy Need Satisfaction	→	Calling Orientation	.203	.060	3.366	***	.178
Competence Need Satisfaction	→	Calling Orientation	.244	.051	4.808	***	.239
Relatedness Need Satisfaction	→	Calling Orientation	.278	.053	5.226	***	.285
Autonomy Need Satisfaction	→	Thriving at Work	.371	.055	6.789	***	.295
Competence Need Satisfaction	→	Thriving at Work	.127	.044	2.880	**	.113
Relatedness Need Satisfaction	→	Thriving at Work	.190	.050	3.798	***	.177
Psychological Capital	→	Thriving at Work	.332	.051	6.474	***	.280
Calling Orientation	→	Thriving at Work	.235	.046	5.136	***	.213

Mediation analysis

Table 18 presents the mediation analysis results. All six indirect effects were statistically significant, and each bootstrap confidence interval excluded zero.

Psychological Capital mediated the relationships between Autonomy Need Satisfaction and TAW (estimate = 0.050, 95% CI [0.014, 0.094]), Competence Need Satisfaction and TAW (estimate = 0.057, 95% CI [0.026, 0.100]), and Relatedness Need Satisfaction and TAW (estimate =

0.111, 95% CI [0.067, 0.159]). Calling Orientation also significantly mediated the three relationships, with estimates of 0.038, 0.051, and 0.061, respectively. Since

all corresponding direct effects were significant, the findings indicate complementary or partial mediation.

Table 18. The results of the mediation analysis.

Mediation path	Estimate	Lower	Upper	P
Autonomy Need Satisfaction → Psychological Capital → Thriving at Work	.050	.014	.094	.005
Competence Need Satisfaction → Psychological Capital → Thriving at Work	.057	.026	.100	.000
Relatedness Need Satisfaction → Psychological Capital → Thriving at Work	.111	.067	.159	.000
Autonomy Need Satisfaction → Calling Orientation → Thriving at Work	.038	.007	.081	.012
Competence Need Satisfaction → Calling Orientation → Thriving at Work	.051	.023	.085	.000
Relatedness Need Satisfaction → Calling Orientation → Thriving at Work	.061	.029	.100	.000

Results of hypothesis testing

Table 19 summarizes the results of the research hypotheses. All 17 hypotheses were supported. The direct-effect hypotheses H1a–H4 and H6 were confirmed, demonstrating significant positive relationships among the three psychological needs, Psychological Capital, Calling

Orientation, and Thriving at Work. In addition, H5a–H5c were supported, confirming the mediating role of Psychological Capital. H7a–H7c were also supported, confirming the mediating role of Calling Orientation. These findings provide comprehensive empirical support for the proposed antecedent–mediator–outcome model among primary school teachers in Beijing, China.

Table 19. The results of research hypothesis.

No.	Hypothesis	Result
H1a	There is a significant positive relationship between Autonomy Need Satisfaction and Psychological Capital among primary school teachers.	Supported
H1b	There is a significant positive relationship between Autonomy Need Satisfaction and Calling Orientation among primary school teachers.	Supported
H1c	There is a significant positive relationship between Autonomy Need Satisfaction and Thriving at Work among primary school teachers.	Supported
H2a	There is a significant positive relationship between Competence Need Satisfaction and Psychological Capital among primary school teachers.	Supported
H2b	There is a significant positive relationship between Competence Need Satisfaction and Calling Orientation among primary school teachers.	Supported
H2c	There is a significant positive relationship between Competence Need Satisfaction and Thriving at Work among primary school teachers.	Supported
H3a	There is a significant positive relationship between Relatedness Need Satisfaction and Psychological Capital among primary school teachers.	Supported
H3b	There is a significant positive relationship between Relatedness Need Satisfaction and Calling Orientation among primary school teachers.	Supported
H3c	There is a significant positive relationship between Relatedness Need Satisfaction and Thriving at Work among primary school teachers.	Supported
H4	There is a significant positive relationship between Psychological Capital and Thriving at Work among primary school teachers.	Supported
H5a	Psychological Capital mediates the relationship between Autonomy Need Satisfaction and Thriving at Work among primary school teachers.	Supported
H5b	Psychological Capital mediates the relationship between Competence Need Satisfaction and Thriving at Work among primary school teachers.	Supported
H5c	Psychological Capital mediates the relationship between Relatedness Need Satisfaction and Thriving at Work among primary school teachers.	Supported
H6	There is a significant positive relationship between Calling Orientation and Thriving at Work among primary school teachers.	Supported

Table 19. Continues.

H7a	Calling Orientation mediates the relationship between Autonomy Need Satisfaction and Thriving at Work among primary school teachers.	Supported
H7b	Calling Orientation mediates the relationship between Competence Need Satisfaction and Thriving at Work among primary school teachers.	Supported
H7c	Calling Orientation mediates the relationship between Relatedness Need Satisfaction and Thriving at Work among primary school teachers.	Supported

DISCUSSION

The findings were consistent with the proposed antecedent–mediator–outcome framework. Because the data were cross-sectional, however, the coefficients should be interpreted as associations rather than evidence that need satisfaction caused subsequent changes in the mediators or Thriving at Work. Autonomy, competence, and relatedness need satisfaction were each positively associated with Psychological Capital, Calling Orientation, and Thriving at Work. This pattern is compatible with SDT, which proposes that experiences of volition, effectiveness, and belonging provide motivational conditions for positive functioning (Ryan and Deci, 2020; Gagné et al., 2022).

Relatedness Need Satisfaction had the largest observed coefficients with Psychological Capital ($\beta = 0.397$) and Calling Orientation ($\beta = 0.285$). One plausible explanation lies in the socially embedded character of primary-school teaching. Teachers coordinate curriculum implementation, exchange lesson knowledge, discuss pupils' needs, communicate with families, and rely on colleagues and school leaders when responding to uncertainty. These interdependencies may be especially salient in Beijing's large and administratively differentiated school system, where schools vary in resources, development priorities, and access to professional support. Chinese kindergarten-teacher research likewise indicates that the quality of workplace relationships and the interpersonal climate is closely associated with teachers' opportunities to retain vitality and continue learning (He et al., 2023). Nevertheless, the coefficients were not subjected to formal pairwise equality tests, so relatedness is described as the largest observed association rather than a statistically stronger predictor than autonomy or competence.

Autonomy Need Satisfaction showed the largest observed direct association with Thriving at Work ($\beta = 0.295$). Teachers who perceive greater discretion may be better able to adapt new tools to pupils' needs while preserving professional judgment, which could coincide with greater vitality and learning. Competence Need Satisfaction had a smaller but still positive direct coefficient ($\beta = 0.113$) and was also positively associated with both mediators. This pattern suggests that perceived competence may be connected with thriving partly through confidence, resilience, and vocational meaning. An alternative interpretation is also possible: teachers who already feel energetic and are actively learning may subsequently evaluate their autonomy, competence,

and workplace relationships more positively.

Psychological Capital ($\beta = 0.280$) and Calling Orientation ($\beta = 0.213$) were both positively associated with Thriving at Work, supporting their conceptual treatment as parallel but distinct mechanisms. Psychological Capital concerns teachers' perceived capacity to identify routes to goals, remain confident, recover from difficulties, and maintain positive expectations (Lorenz et al., 2022). Calling Orientation concerns the personal and social significance attached to teaching (Willner et al., 2020). The significant indirect associations through both mediators, together with the remaining direct paths, are consistent with complementary partial statistical mediation. They do not, however, establish a temporal transmission process.

The AI-use distribution provides useful contextual information for interpreting these relationships. Although 70.02% of respondents used AI educational tools at least four times per month, frequency alone does not indicate whether use increased autonomy, intensified workload, improved competence, or altered workplace relationships. School policy, subject assignment, access to training, leadership support, and individual interest could influence both frequency of use and teachers' psychological evaluations. Future longitudinal and multilevel studies should therefore measure the content and consequences of AI-related work change directly and separate teacher-level associations from school-level conditions.

Conclusion

This study examined the relationships among basic psychological need satisfaction, Psychological Capital, Calling Orientation, and Thriving at Work among primary school teachers in Beijing within an AI-related work-transformation context. Autonomy, competence, and relatedness need satisfaction were positively associated with both mediators and with Thriving at Work. Psychological Capital and Calling Orientation were also positively associated with Thriving at Work, and the significant indirect associations were consistent with complementary partial mediation. The findings suggest an integrated pattern in which teachers' work experiences, psychological resources, vocational meaning, vitality, and learning coexist. Because the study was cross-sectional and based on self-reported data, the conclusions are limited to the observed statistical relationships and do not establish causal or temporal ordering.

Implications

Theoretically, the findings support the usefulness of distinguishing two complementary pathways between need satisfaction and Thriving at Work: an agentic-resource pathway represented by Psychological Capital and a meaning-and-identity pathway represented by Calling Orientation. Practically, the results identify areas that Beijing primary schools may consider rather than interventions whose effectiveness has already been established. Schools could review whether teachers have meaningful discretion in selecting and adapting AI-supported tools, adequate opportunities to develop competence, and access to supportive collegial relationships. Professional-development activities may also incorporate goal setting, constructive feedback, peer learning, and reflection on the social purpose of teaching. Any such initiatives should be piloted and evaluated before causal benefits are assumed.

Limitations and future research

Several limitations should be acknowledged. First, the cross-sectional design cannot establish temporal order, and reverse or reciprocal relationships remain possible. Future studies should use longitudinal, diary, or experimental designs. Second, all focal variables were self-reported in one questionnaire, so common-method variance and socially desirable responding may have affected the associations. Third, proportionate stratified quota sampling improved geographical coverage but remained non-probabilistic; the participating schools and teachers may differ from those who did not participate. Teachers were also nested within schools, but school-level identifiers were not modeled. Fourth, AI educational tool use was measured only by frequency. This indicator does not capture the purposes, complexity, voluntariness, workload consequences, or quality of AI-related work transformation. Future research should employ a multidimensional measure of changes in tasks, decision authority, competence requirements, monitoring, and professional interaction. Finally, longitudinal multilevel research should test additional school-level conditions, including organizational support, leadership, training provision, and school type.

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