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Uncovering the Mediating Role of Teacher Anxiety on the Relationship between Teacher Self-Efficacy and Teacher Work Engagement in the Online Context

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ABSTRACT

Background: With the widespread adoption of synchronous online instruction, concerns have arisen regarding teachers' professional functioning in this new context. While previous studies have extensively explored teacher psychology, the control-value theory (CVT) provides additional insights into teachers' experiences. As limited research has specifically addressed the psychological experiences of primary school teachers in online teaching settings, this study investigated the relationships among teachers' online self-efficacy, anxiety, and engagement through the CVT framework. **Methods:** This study employed a quantitative research design, conducting a questionnaire survey of 1037 Chinese primary school teachers recruited through convenience and snowball sampling. Exploratory Structural Equation Modelling was first applied to validate the constructs. Subsequently, a structural equation model was developed and tested to examine the relationships between the key variables. A mediation analysis further explored the indirect effect of teacher self-efficacy on engagement through anxiety, consistent with CVT propositions. **Results:** Structural Equation Modelling results revealed that teachers' self-efficacy was a significant predictor of both anxiety ($\beta = -0.165$, $p < 0.001$) and engagement ($\beta = 0.707$, $p < 0.001$). Anxiety also significantly predicted engagement ($\beta = -0.097$, $p < 0.001$). Mediation analysis further demonstrated that anxiety partially mediated the relationship between self-efficacy and engagement ($\beta = 0.016$). **Conclusion:** While anxiety can impede teachers' full engagement in online teaching, self-efficacy appears to buffer against anxiety's negative effects, ultimately enhancing teaching effectiveness. These findings offer valuable insights for improving teachers' online teaching experiences and optimizing educational outcomes in digital environments.

KEYWORDS

Control-value theory; teacher self-efficacy; teacher anxiety; teacher work engagement; online education; mediation model

Introduction

Positive psychology, with its emphasis on human well-being [1], underscores the importance of promoting wellness among teaching professionals [2]. In school settings, teachers play a critical role in shaping students' learning and development [3,4], for instance, by providing emotional support [5–7], and their psychological well-being

significantly influences learner health, motivation, and behavior [8–10]. Therefore, fostering teachers' psychological wellness is essential for optimizing the educational process. However, teaching is widely regarded as a high-stress profession [11,12], and this stress is exacerbated in emergency remote teaching contexts where teachers face challenges such as unfamiliarity with online platforms [13], disruptions to personal lives [14], unresolved issues with online classroom management [15,16], etc. It is therefore unsurprising that moderate to high levels of anxiety have been reported among teachers during crisis-driven distance education [17,18]. Acknowledging the importance of positive factors, researchers have highlighted the role of self-efficacy in assisting educators with physical and mental crises during the pandemic [19,20]. According to Bandura's theory, self-efficacy, or efficacy beliefs, functions as a cognitive regulator of anxiety, enabling self-efficacious individuals to demonstrate strong cognitive, affective, motivational, and behavioral functioning, even amid external threats or internal disorders [21]. Self-efficacy thus plays a key role in fostering teachers' engagement and commitment [22–24].

With the growing prevalence of synchronous online education, it is pivotal to delve into the complex dynamics that underpin teachers' professional well-being and effectiveness [25]. Self-efficacy, an essential factor associated with mental wellness [26,27], warrants further investigation to understand its impact on anxiety during emergency school lockdowns and its role in motivating teachers to engage in online teaching. This helps to yield a comprehensive understanding of teacher self-efficacy and maintain teacher well-being. While considerable literature has addressed online teacher psychology [17,23], fewer studies have explored the relationships between online self-efficacy, anxiety, and engagement [28]. Furthermore, primary school teachers, in particular, merit more attention, as limited research has focused on their wellness and professional functioning within prevalent online education contexts [29].

Control-value theory (CVT) provides insight into the processes through which achievement emotions arise and affect learning and teaching outcomes [30]. Emotions are proximally activated when individuals appraise the likelihood of achieving an outcome and its significance (i.e., cognitive appraisals). Subsequently, these emotions affect individuals' working memory, information processing, motivation for learning or teaching, and self-regulation, ultimately influencing achievement outcomes such as teaching effectiveness. This lens has informed previous studies on teacher psychology [31], particularly in online settings [32,33], and provides the foundation for this study's hypotheses.

Therefore, following a quantitative approach and adopting the theoretical framework of CVT, this study specifically aimed to examine the impacts of self-efficacy on engagement via the mediation of anxiety among primary school teachers in online contexts.

Literature Review

Teacher self-efficacy in online teaching
Self-efficacy refers to individuals' beliefs in their capability to perform specific tasks and achieve desired outcomes

effectively [21]. In educational research, teacher self-efficacy —teachers' confidence in their professional capabilities—has attracted increasing scholarly attention due to its essential role in effective functioning and job fulfillment [25]. It encompasses teachers' positive evaluations of their competencies in designing, managing, delivering, and assessing instructional content and activities [34,35]. With the prevalence of distance education, teachers are expected to be well-equipped with technology-related teaching skills. Therefore, teacher self-efficacy in the online teaching context involves appraisals of their pedagogical and technological competencies in course instruction, classroom management, and student engagement [13,36,37].

Bandura's theory outlines four sources of self-efficacy, namely mastery experiences, vicarious experiences, verbal persuasion, and physiological and psychological states [21]. In the context of education, specific factors that shape teachers' self-efficacy beliefs in online settings have been identified, such as their online teaching experience [14,38]. Ma et al. [38], for instance, found that a lack of online teaching experience during the COVID-19 pandemic was a significant barrier to teacher self-efficacy. This highlights the importance of mastery experiences, further supported by Huang et al. [39], who identified technological pedagogical content knowledge (TPACK) as a strong predictor of self-efficacy. Cultural and environmental factors also play a role [40]. In Ma et al.'s [38] research, teachers' passion for teaching bolstered their self-efficacy in the high-stress online teaching environments in China. Additionally, Crompton et al. [14] identified economic and social resource accessibility as determinants of self-efficacy. In areas with limited resources, teachers developed independent, resilient personality traits that reinforced their self-efficacy.

Self-efficacy shapes how individuals think, behave, and feel, contributing to motivation and performance [21,41]. Previous research has established that teacher self-efficacy is positively related to engagement and commitment in both offline and online education [22,42]. Teachers who feel competent in their online teaching abilities tend to become more committed to their profession and remain highly engaged and motivated in online classrooms [23,24].

Moreover, self-efficacy is crucial for emotion regulation, enabling individuals to manage anxiety, depression, and other emotional states cognitively, behaviorally, and affectively [21,43]. Those with strong self-efficacy can direct their attention, regulate thoughts, take supportive actions, and control negative emotions, effectively "chang[ing] hazardous environments into more benign ones" [41], which reduces anxiety. Many studies supported the protective role of self-efficacy in helping teachers manage anxiety [19,20,44]. For instance, in Cadamuro et al.'s [19] study, teachers with high self-efficacy, who felt competent and in control of virtual classroom management, student engagement, and instructional strategies, experienced lower levels of anxiety, a finding echoed by Truzoli et al. [20].

Teacher anxiety in online teaching
Anxiety is "a state of anticipatory apprehension over possible deleterious happenings" [41] and often involves a fear of unpleasant experiences and potential adverse outcomes

[30,45]. For teachers, a persistent concern throughout their careers is teaching effectiveness [46]. Worries about course materials, class implementation, and post-class impacts on students contribute to teacher anxiety. In online teaching, this anxiety can be heightened due to reduced control over the instructional process, which may stem from limited online pedagogical knowledge, inadequate technological support, reduced classroom interaction, and other factors [17,47]. Therefore, teacher anxiety in online teaching can be understood as a mix of fear, apprehension, and other negative emotions related to the preparation, delivery, and outcomes of online instruction, compounded by gaps in online teaching knowledge and competence [13].

Previous studies have identified various aspects of anxiety among teachers in distance education. For example, Gao et al. [15] and Okyere et al. [16] reported that online teacher anxiety was associated with perceived difficulties in monitoring online classrooms, making effective assessments, and unfamiliarity with virtual teaching. Similar findings were obtained in Wang et al.'s [48], Hamad et al.'s [49], and Liu et al.'s [17] research, which found that anxiety often arose from student disengagement, reduced quality of classroom interactions, device and network instability, and inexperience with online instruction. Moreover, Nguyen et al. [50] reported that male teachers with a slightly higher level of TPACK than their female counterparts experienced less anxiety in online teaching, suggesting that equipping teachers with specific skills for virtual instruction can foster a more positive outlook. Additionally, insufficient or overloaded external support from schools, platforms, and policies has also been identified as an influencing factor [17]. Collectively, anxiety in online teaching can be interpreted as a result of the synergistic influences of ecological factors in both real-world and virtual environments.

Empirical evidence has supported that anxiety is a strong disincentive to professional functioning and teaching performance [51–53]. Anxious states can impair instructional quality, harm teachers' well-being [52], and hinder their ability to engage effectively in teaching tasks [53]. Given these concerns, understanding how challenges and related anxiety impact teachers' online teaching effectiveness and contribute to disengagement and demotivation is essential. However, there remains a gap in research on how teachers' online anxiety specifically affects their engagement.

Teacher work engagement in online teaching

Work engagement is a sustained, positive, and fulfilling mental state, independent of any specific object, event, person, or action [54]. Schaufeli et al. [54] proposed a well-regarded framework of engagement comprising three dimensions—vigor, dedication, and absorption—widely accepted in educational research [13,55–57]. Vigor represents teachers' energy, resilience, and commitment to hard work. Dedication reflects positive emotions like enthusiasm and pride, while absorption describes a deep focus on work, where time passes quickly, and detaching from tasks can be challenging due to strong immersion. This three-dimensional model has demonstrated consistent

reliability and validity in studies on teacher work engagement. For instance, Cao et al. [56] confirmed its reliability and validity through a survey of a group of Chinese teachers, while Tomás et al. [57] validated it within the Dominican context. Liu [13] similarly identified vigor, dedication, and absorption as defining elements of teachers' engagement in online teaching.

Several factors are known to predict teacher work engagement. Off-school activities and effective leadership have been shown to influence engagement [58,59]. Additionally, a cross-national study by Greenier et al. [55] found that emotion regulation and well-being played critical roles in fostering teacher work engagement. Zhi et al. [24] found that teachers' self-efficacy was a strong predictor of work engagement, which was found to positively impact professional development and enhance confidence in training [60,61]. Teachers with high engagement levels are also more resilient to workplace challenges [62]. While much of the existing research explored engagement factors in offline settings, some studies indicated that, in online teaching, student engagement and motivation could boost teacher work engagement and, in turn, support positive online teaching outcomes [63,64]. However, exploring teacher work engagement within online teaching contexts, especially regarding the interconnected roles of self-efficacy, anxiety, and engagement, is essential given the unique demands and opportunities of virtual education [13].

Hypothesized model of the present study

CVT delineates the underlying dynamics of emotion effects in educational contexts that shape learners' and educators' achievement performance and outcomes [30]. Within this framework, cognitive appraisals—specifically control and value appraisals—act as proximal triggers of emotions. Control appraisals relate to perceptions of competence and likelihood of achieving desired outcomes, while value appraisals concern the intrinsic and extrinsic importance of tasks and achievements. For instance, when teachers perceive low control over their teaching, this uncertainty can instigate outcome-focused anxiety. Conversely, a higher sense of control can reduce anxiety. Since self-efficacy involves subjective evaluations of one's success likelihood [21], it closely aligns with control appraisals.

This theory also categorizes achievement emotions into three dimensions: object focus, valence, and activation. Object focus identifies the aspect (i.e., the activity itself or its outcome) from which an emotion originates. For example, teachers' anxiety may stem from concerns about teaching effectiveness. Valence classifies emotions as positive (e.g., enjoyment and pride) or negative (e.g., anxiety and boredom), while activation denotes the arousal level that emotions cause where anxiety and hope are activating, but boredom is deactivating.

Furthermore, its cognitive-motivational mechanisms detail how emotions impact performance by influencing memory, motivation, information processing, and self-regulation. In this study, engagement is viewed as a component of these mechanisms given its motivational nature [65–67]. These mechanisms are closely related to the valence and activation of emotions. For example, motivation

can be enhanced by high control appraisals and the activating effects of positive emotions, whereas anxiety, a negative and activating emotion, can instigate avoidance.

While CVT provides valuable insights, research on teacher psychology in online and emergency remote teaching contexts remains limited [32,33]. For instance, Bakır-Yalçın et al. [32] found that emotions mediated the relationship between pre-service teachers' control and value appraisals and their engagement in online learning, underscoring the need to further explore teachers' emotions and reactions to enhance online teaching effectiveness and well-being.

Recognizing that anxiety can hinder teaching engagement and motivation [52,53], self-efficacy has been shown to reduce anxiety and promote job involvement in studies [19,22,23,44]. However, understanding how self-efficacy, anxiety, and engagement collectively influence teacher effectiveness in online education remains an underexplored area.

Taken together, this study sought to examine the direct and indirect effects of self-efficacy among primary school teachers on their engagement in online teaching, with anxiety positioned as a mediator. The hypothesized model is presented in Fig. 1, followed by four research hypotheses:

H1: Primary school teachers' self-efficacy positively and significantly predicts engagement in online teaching.

H2: Primary school teachers' self-efficacy negatively and significantly predicts anxiety in online teaching.

H3: Primary school teachers' anxiety negatively and significantly predicts engagement in online teaching.

H4: Primary school teachers' anxiety mediates the effect of self-efficacy on engagement in online teaching.

Methodology

Research participants

In recent years, the Chinese government and educational bureau have collaboratively endeavored to improve the quality of education. Under the guidelines of China's recent National Strategy for Educational Digitization, smart education and online teaching have been emphasized, with digitization as a fundamental approach to enhancing education [68]. Additionally, the national curriculum standard for primary education has advocated for integrating information technology into instruction [13]. Despite the call for digitization, teachers face barriers in responding to nationwide policies. The COVID-19 pandemic, in particular, accelerated the extensive application of online education, but the sudden transition from in-person classroom instruction to virtual education exposed teachers to numerous challenges, including the uneven distribution of social resources. This situation calls for proper attention to exploring approaches to improving online teaching effectiveness and teachers' online teaching competencies in primary schools. To address this gap, the current study focused on a sample of 1037 Chinese primary school teachers across different subjects, including Chinese, Mathematics, English, Science, Moral Education and Rule of Law, Music, Art, and Physical Education. This sample comprised 904 females (87.2%) and 133 males (12.8%). These teachers came from over 20 provincial-level administrative units in China, among whom 129 were from urban schools (12.4%), 393 from rural schools (37.9%), 511 from county schools (49.3%), and 4 from others (0.4%). This study does not involve intervention and it is low risk. Therefore, the ethics approval was waived. The informed consents were obtained from the participants.

Research instrument

To obtain a comprehensive profile of teacher self-efficacy, anxiety, and engagement among primary school teachers in online teaching and further explore the intricate interplay of the three variables, a questionnaire was used in this study for data collection. The questionnaire, which came from the prior literature, related theories, and interviews of some teachers, was comprised of four parts. In the first part, items were designed to collect personal information of participant teachers such as gender, age, years of teaching, and online teaching experiences. The other parts consisted of three sub-scales measuring the levels of primary school teachers' self-efficacy, anxiety, and engagement in online teaching, with participants rating items on a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree). Cronbach's alpha was used to evaluate the reliability of these sub-scales, with a threshold of 0.7 or higher indicating satisfactory reliability [69].

The 7-item scale of self-efficacy among primary school teachers in an online teaching context was based on Bandura's [70], Wang et al.'s [71], and Lin et al.'s [72]. After Exploratory Structural Equation Modelling (ESEM), the scale included 4 items and demonstrated good reliability (α = 0.818). To measure online anxiety among primary school teachers, we employed a 21-item scale with reference to Capel's [73], Kim et al.'s [74], and Yoon's [75] studies. Following ESEM, 13 items were retained and extracted into four dimensions, namely, network and teaching equipment anxiety (n = 3, α = 0.873), online teaching effect anxiety (n = 3, α = 0.852), TPACK anxiety (n = 3, α = 0.910) and social environment anxiety (n = 4, α = 0.840). We used the well-established 9-item Utrecht Work Engagement Scale [76] to evaluate teachers' vigor, dedication, and absorption, the three teacher work engagement components. After ESEM, no item was discarded and each factor included three items, with higher reliability, namely, 0.839 for vigor, 0.934 for dedication, and 0.937 for absorption. All three subscales won satisfactory reliabilities and fit indices (see Table 1).
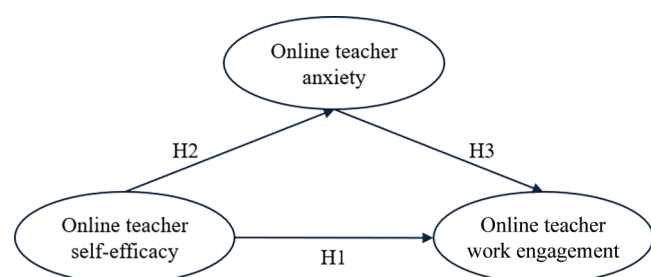

FIGURE 1. The hypothesized model of the mediation of online teacher anxiety between self-efficacy and engagement.

TABLE 1

Reliablity coefficients (α) and model fit indices of each variable

Variables	χ^2/df	RMSEA	SRMR	TLI	CFI	α
Benchmarks [69,77]	<5.000	<0.080	<0.100	>0.900	>0.900	≥0.700
Teacher self-efficacy	3.339	0.047	0.014	0.983	0.994	0.818
Teacher anxiety	3.700	0.051	0.011	0.977	0.990	0.919
Teacher work engagement	3.942	0.053	0.012	0.978	0.993	0.954

Note: RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Squared Residual; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index.

Data collection

The questionnaire for this study was distributed online through Wenjuanxing (https://www.wjx.cn/, accessed on 20 June 2024), a Chinese online questionnaire system. The participants, all primary school teachers teaching all disciplines, were invited to fill in the electronic questionnaire, using convenience and snowball sampling strategies. Prior to the survey, we informed the participants that the process of filling out the questionnaire was completely anonymous, and the data would be used solely for research analysis, with no disclosure of their personal information. Participants chose whether or not to take part in the research at their will.

Data analysis

First, we conducted ESEM using Mplus 8.30 to examine the validity of the scales. ESEM allows for the simultaneous execution of exploratory factor analysis and confirmative factor analysis, thereby combining the strengths of both approaches [78]. As a result, ESEM has seen an increase in applications for scale validation in recent years [79,80].

Second, we performed descriptive statistics and correlation analysis on the sample using SPSS 27.0 to calculate the mean, standard deviation, skewness, kurtosis, and correlations of the data. Finally, we employed Structural Equation Modelling (SEM) in AMOS 26.0 to test our research hypotheses. SEM addresses the limitations of traditional regression methods, allowing for the modeling and testing of complex relationships among variables [81]. A mediation analysis was conducted with 5000 bootstrap samples using the bias-corrected percentile method.

Before applying SEM, we verified several prerequisites. First, according to the guidelines by Bagozzi et al. [82], our sample size of 1037 was deemed adequate for SEM. Second, the variables under study generally followed a normal distribution, as indicated by skewness and kurtosis values close to 0 (see Table 2) [69]. Finally, the variance inflation factors were 1.794 for engagement, 1.775 for self-efficacy, and 1.018 for anxiety, indicating no significant multicollinearity concerns [69].

Results

Profiles of teacher self-efficacy, anxiety, and engagement in online teaching

Descriptive statistics were employed to reveal participants' levels of self-efficacy, anxiety, and engagement. Pearson's correlation analysis was conducted to examine the relationships among the studied variables. As shown in Table 2, teachers' self-reported self-efficacy and engagement were at a relatively high level, both surpassing 3.5 points on a 5-point Likert scale. The level of anxiety was moderately high. The skewness and kurtosis values of the three variables fell within the range of −2 and 2, indicating that the data

TABLE 2

Profiles of teacher self-efficacy, anxiety, and engagement in online teaching

Variables	M	SD	Skew	Kurt	1	2	3	4	5	6	7	8	9
1 SE	4.095	0.619	−0.556	1.446	—								
2 NetAnx	3.844	0.980	−0.960	0.614	0.067*	—							
3 EffAnx	3.970	0.871	−1.102	1.372	0.006	0.617**	—						
4 TpaAnx	3.085	1.181	−0.170	−1.028	−0.150**	0.494**	0.474**	—					
5 SocAnx	3.129	1.034	−0.110	−0.733	−0.161**	0.475**	0.495**	0.741**	—				
6 Anx	3.507	0.830	−0.419	0.091	−0.091**	0.762**	0.752**	0.857**	0.871**	—			
7 Vig	4.133	0.656	−0.456	0.172	0.646**	−0.001	−0.024	−0.189**	−0.184**	−0.138**	—		
8 Ded	4.119	0.735	−0.816	1.069	0.630**	−0.004	−0.039	−0.191**	−0.191**	−0.144**	0.870**	—	
9 Abs	4.281	0.636	−0.723	0.922	0.573**	0.023	0.019	−0.185**	−0.155**	−0.108**	0.771**	0.784**	—
10 Eng	4.178	0.632	−0.539	0.406	0.661**	0.009	−0.017	−0.201**	−0.190**	−0.140**	0.942**	0.952**	0.907**

Note: N = 1037, *p < 0.05, **p < 0.01; SE = self-efficacy; NetAnx = network and teaching equipment anxiety; EffAnx = online teaching effect anxiety; TpaAnx = TPACK anxiety; SocAnx = social environment anxiety; Anx = anxiety; Vig = vigor; Ded = dedication; Abs = absorption; Eng = engagement.

adhered to a normal distribution. Moreover, the correlations among the variables ($r_{\text{self-efficacy-anxiety}}$ = −0.091, p < 0.01; $r_{\text{self-efficy-engagement}}$ = 0.661, p < 0.01; $r_{\text{anxiety-engagement}}$ = −0.140, p < 0.01) demonstrated small to medium levels [83]. Consequently, the data was deemed suitable for further analysis.

Results of the structural equation modelling
We examined the mediating role of teacher anxiety between self-efficacy and engagement via SEM. After some modifications, the model fit indices for the mediation model indicated acceptable fits: χ^2/df = 7.520, RMSEA = 0.079, SRMR = 0.061, TLI = 0.947, and CFI = 0.962. Thus, the model was accepted for further analysis.

According to Table 3 and Fig. 2, concerning direct effects, self-efficacy had a significant negative effect on anxiety (β = −0.165, p < 0.001), suggesting that when the levels of self-efficacy increased by 1, the levels of anxiety decreased by 0.165. Self-efficacy accounted for 2.7% of the variance in anxiety. Therefore, H2 was accepted. Self-efficacy also played a significant and positive role in predicting engagement (β = 0.707, p < 0.001), accepting H1. Specifically, when the levels of self-efficacy increased by 1, the levels of engagement rose by 0.707. Moreover, anxiety was found to negatively predict engagement (β = −0.097, p < 0.001), with the levels of engagement declining by 0.097 as the levels of anxiety escalated by 1. Therefore, H3 was accepted. Altogether, self-efficacy and anxiety explained 53.2% of teacher work engagement. Thus, we confirmed the mediating role of anxiety in the relationship between self-efficacy and teacher work engagement, accepting H4.

The indirect effect of teacher self-efficacy on engagement was 0.016. This means that when considering the mediated effect of teacher anxiety, an increase of 1 unit in teacher self-efficacy led to a 0.016 increase in engagement. Consequently, the total effect of teacher self-efficacy on engagement reached 0.723.

Discussion

Effect of teacher self-efficacy on anxiety
The results of the SEM indicated that self-efficacy could negatively influence anxiety among teachers in online contexts. Teachers who positively and optimistically appraised their own online pedagogical knowledge and skills were less likely to experience apprehension or nervousness related to the process of teaching virtually or show concerns
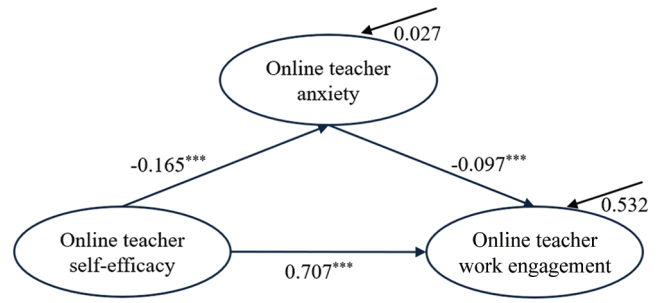
χ^2/df = 7.520, RMSEA = 0.079, SRMR = 0.061, TLI = 0.947, CFI = 0.962; ***p < 0.001.

FIGURE 2. The final model of the mediating role of online teacher anxiety between self-efficacy and engagement.

about potentially unsatisfying instructional effects. This echoes the findings of Cadamuro et al. [19] and Truzoli et al. [20]. According to Bandura [41], anxiety is instigated by perceived threats in a given environment, which are actually mismatches between self-evaluated coping capacities and hazardous aspects of the environment. By optimistically self-judging with self-efficacy as a cognitive regulator, this mismatch can be resolved. Notably, the efficacy impact on anxiety was weak in this study, which might be attributed to the buffering effects of positive emotions. In Zhou et al.'s study [27], self-efficacy nurtured teacher enjoyment in distance education. Thus, it is possible that efficacious teachers adapt well to the new teaching environment and enjoy teaching virtually, and this enjoyment, in turn, surpasses concerns about undesired outcomes and alleviates anxiety to a large extent.

Effect of teacher self-efficacy on engagement
It was revealed that self-efficacy directly predicted online engagement, echoing previous studies [23,84]. This may be explained in two ways. Firstly, educators with high self-efficacy levels demonstrate belief in their online teaching abilities, such as tackling technical issues and imparting knowledge. Therefore, they are more likely to feel capable of performing instructional tasks, which motivates them to invest effort even in challenging situations [44]. Researchers also suggested that teachers with high levels of self-efficacy exhibit passion for engaging in teaching practice [24]. Moreover, confident teachers often possess positive psychological capital, such as resilience and buoyancy [23,85], which may also contribute to a high level of engagement. As Bandura noted, an optimistic sense of efficacy enables

TABLE 3

Results of the mediation analysis using bootstrap with bias-corrected percentile method

Pathway	R^2	Standardized estimate	95% CI		p
			Lower	Upper	
Self-efficacy → anxiety	0.027	−0.165	−0.240	−0.086	<0.001
Self-efficacy → engagement	0.532	0.707	0.645	0.762	<0.001
Anxiety → engagement		−0.097	−0.150	−0.048	<0.001

individuals to translate their knowledge into real-world actions that influence certain events and even their lives [41]. This optimism also "sustain[s] the motivation needed for personal and social accomplishments" [41]. Therefore, efficacious and confident teachers are highly motivated and have the fullest potential and incentive to express their pedagogical knowledge through effective online teaching practices, evidencing high levels of teacher work engagement.

Effect of teacher anxiety on engagement
Our results have revealed the role of anxiety in diminishing engagement among teachers. In online contexts, high levels of anxiety were a disincentive to teachers' effectiveness. Specifically, they displayed a decline in resource investment, derived meager enthusiasm and motivation from online teaching, and could barely get cognitively and affectively involved. This finding partially resonates with a previous study that found that teachers' math anxiety led to reduced engagement in conducting math-related activities [51]. On the one hand, representing a detrimental emotional state marked by enduring and sustained features [86], anxiety may lead teachers to withdraw from ongoing teaching tasks in an attempt to alleviate this uncomfortable psychological state. On the other hand, individuals experiencing anxiety often exhibit reduced attention control [87,88], making it challenging for them to focus on specific tasks. Consequently, their level of engagement may suffer in such circumstances.

Acknowledging anxiety as a threat to teachers' teaching performance, its negative effect on engagement was weak in this study. This can be explained by considering the moderate level of global anxiety reported by teacher participants. Despite uncertainty and insecurity at the very beginning of emergency remote teaching, teachers gradually became accustomed to online classrooms and gained confidence and belief in returning to campuses as they were then afforded and empowered through training programs for distance education with substantial social and policy support [17]. This caused a decrease in anxiety over time. Moreover, TPACK anxiety among teachers is relatively low in comparison with other online teacher anxiety components. This indicated that the teachers were well-equipped because of training programs for online teaching, and they had a good knowledge of how to integrate technologies into distance instruction. With this certainty, the negative effects of anxiety on teacher work engagement might be reduced.

The mediating effect of teacher anxiety between self-efficacy and engagement
This study has also confirmed the mediating effect of anxiety on the link between self-efficacy and engagement among teachers in online settings. This mechanism of anxiety arousal and effect is supported by CVT [30]. Self-efficacy, a cognitive appraisal of control, aids teachers in shaping an optimistic concept of online teaching competencies and anticipates successful achievement progress, thereby lowering the probability of anxious agitation. This, in turn, motivates teachers to invest more greatly in teaching online and display high enthusiasm and absorption.

Limitations and recommendations for future studies
Though the current study uncovered the less-researched topic, the mediating role of teacher anxiety on the links between self-efficacy and engagement in the online context, there are still some limitations to be addressed. First, while this study involves participants from more than 20 provinces in China, a majority of participants worked in northeastern provinces. Therefore, the generalizability of the findings should be cautiously considered. Future studies may extend the setting and sampling scope to obtain a more comprehensive profile of teacher psychology in online settings. Second, this study investigated online teacher self-efficacy, anxiety, and engagement among primary school teachers using a quantitative research design. A qualitative approach would also be valuable to yield a more in-depth understanding and insights into teachers' psychology in online contexts. Third, future studies may benefit from exploring the complex dynamics of teacher psychology in online education using a longitudinal methodology to capture the temporal development of online teaching competence and professional commitment among teachers.

Conclusion and Implications

In conclusion, the present study sought to examine the intricate interplay between teacher self-efficacy, anxiety, and engagement in online teaching settings among primary school teachers. Our results have supported the direct and indirect predictive role of teacher self-efficacy in engagement. Specifically, self-efficacy held by teachers was a positive predictor of engagement and emerged as a negative predictor of anxiety. Moreover, with the negative effects of anxiety on engagement identified, anxiety partially mediated the relationship between self-efficacy and engagement in online education. This study also provided empirical support for CVT by investigating how self-efficacy, a control-appraisal factor, and anxiety, an achievement emotion, synergistically function in shaping teacher work engagement in distance education. Self-efficacy, constructed as a cognitive factor that features teachers' highly positive evaluations of self-competencies, could help reduce anxiety among teachers who encounter a complexity of challenges in emergency remote teaching contexts. By accepting uncertainties in online classrooms and continually building up online teaching skills over time, an increase in motivation and enthusiasm for teaching could be observed in teachers.

Our findings have also yielded meaningful insights into the prevalent online education nowadays and produced several implications for teacher training programs. First, the crucial role of self-efficacy beliefs among teachers in reducing negative emotions and contributing to their professional commitment highlights the importance of fostering teachers' positive self-concepts of teaching competence for teacher educators and pre-service teacher training programs. With prior experiences identified as one essential source of self-efficacy [41], programs should not only equip pre-and in-service teachers with necessary skills in designing online teaching materials and activities, and mastering how to conduct, manage, and promote ongoing

online classrooms via information technology, but also provide opportunities for teachers to practice virtual education with successful experiences optimally elicited. Second, the role of teacher anxiety as a partial mediator of self-efficacy effects emphasizes the necessity for teachers to develop skills and strategies for emotion regulation. For instance, with multiple challenges and impediments identified in the process of conducting online education, teachers can improve their affective positivity by accepting uncertainties to positively adapt to online environments. Third, CVT also underscores constructing a supportive and fulfilling environment for teachers. School leaders and administrators should fully respect teachers' needs for autonomy, for example, by allowing them to develop online course materials and participate in training in online teaching of their own accord. Besides, social expectations for teachers from significant others in the work environment (e.g., colleagues and parents) should be realistic to prevent stress and negative emotions.

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References

1. Carr A. Positive psychology: the science of wellbeing and human strengths. 3rd ed. Abingdon: Routledge; 2022. doi:10.4324/9781003082866.

2. Sadeghi K, Pourbahram R. Exploring factors affecting English language teacher wellbeing: insights from positive psychology. System. 2024;122:103274. doi:10.1016/j.system.2024.103274.

3. Anderson LW. Increasing teacher effectiveness. 2nd ed. Paris: International Institute for Educational Planning; 2004.

4. Darling-Hammond L. Doing what matters most: investing in quality teaching. New York: National Commission on Teaching & America's Future; 1997.

5. Liu H, Li X, Yan Y. Demystifying the predictive role of students' perceived foreign language teacher support in foreign language anxiety: the mediation of L2 grit. J Multiling Multicult Dev. 2023:1–14. doi:10.1080/01434632.2023.2223171.

6. Liu H, Li X. Unravelling students' perceived EFL teacher support. System. 2023;115:103048. doi:10.1016/j.system.2023.103048.

7. Li X, Duan S, Liu H. Unveiling the predictive effect of students' perceived EFL teacher support on academic achievement: the mediating role of academic buoyancy. Sustainability. 2023; 15(13):10205. doi:10.3390/su151310205.

8. Brackett MA, Palomera R, Mojsa-Kaja J, Reyes MR, Salovey P. Emotion-regulation ability, burnout, and job satisfaction among British secondary-school teachers. Psychol Schools. 2010;47(4):406–17. doi:10.1002/pits.20478.

9. Frenzel AC, Goetz T, Lüdtke O, Pekrun R, Sutton RE. Emotional transmission in the classroom: exploring the relationship between teacher and student enjoyment. J Educ Psychol. 2009; 101(3):705–16. doi:10.1037/a0014695.

10. Gu Q, Day C. Teachers resilience: a necessary condition for effectiveness. Teach Teach Educ. 2007;23(8):1302–16. doi:10.1016/j.tate.2006.06.006.

11. Aslrasouli M, Vahid MSP. An investigation of teaching anxiety among novice and experienced Iranian EFL teachers across gender. Procedia Soc Behav Sci. 2014;98:304–13. doi:10.1016/j.sbspro.2014.03.421.

12. Ferguson K, Frost L, Hall D. Predicting teacher anxiety, depression, and job satisfaction. J Teach Learn. 2012;8(1):27–42. doi:10.22329/jtl.v8i1.2896.

13. Liu H. Language teacher psychology in the online teaching context. London: Routledge; 2024. doi:10.4324/9781003490722.

14. Crompton H, Chigona A, Burke D. Teacher resilience during COVID-19: comparing teachers' shift to online learning in South Africa and the United States. TechTrends. 2023;40:32. doi:10.1007/s11528-022-00826-6.

15. Gao LX, Zhang LJ. Teacher learning in difficult times: examining foreign language teachers' cognitions about online teaching to tide over COVID-19. Front Psychol. 2020;11:549653. doi:10.3389/fpsyg.2020.549653.

16. Okyere E, Salusalu M, Goundar R, Marfoh K. Online teaching during COVID-19 pandemic in Fiji: challenges, facilitators and improvement strategies. Qual Res J. 2022;23:62–82. doi:10.1108/qrj-03-2022-0041.

17. Liu H, Yan C, Fu J. Exploring livestream English teaching anxiety in the Chinese context: an ecological perspective. Teach Teach Educ. 2022;111:103620. doi:10.1016/j.tate.2021.103620.

18. Peng R, Hu Q. Measuring EFL teachers' teaching anxiety in the online teaching environment. Asia Pac J Educ. 2024;33:1–17. doi:10.1080/02188791.2024.2326202.

19. Cadamuro A, Bisagno E, Rubichi S, Rossi L, Cottafavi D, Crapolicchio E, et al. Distance learning and teaching as a consequence of the COVID-19 pandemic: a survey of teachers and students of an Italian high school taking into account technological issues, attitudes and beliefs toward distance learning, metacognitive skills. J e-Learn Knowl Soc. 2021;17(1):81–9. doi:10.20368/1971-8829/1135463.

20. Truzoli R, Pirola V, Conte S. The impact of risk and protective factors on online teaching experience in high school Italian

teachers during the COVID-19 pandemic. J Comput Assist Learn. 2021;37(4):940–52. doi:10.1111/jcal.12533.

21. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychol Rev. 1977;84(2):191–215. doi:10.1037/0033-295X.84.2.191.

22. Gao Y, Wong SL, Khambari MNM, Noordin NBT, Geng J. Assessing the relationship between English as a Foreign Language (EFL) teachers' self-efficacy and their acceptance of online teaching in the Chinese context. Sustainability. 2022;14(20):13434. doi:10.3390/su142013434.

23. Liu H, Chen B, Li X, Zhou X. Exploring the predictive role of self-efficacy in engagement among EFL teachers in online teaching: the mediation of buoyancy. Asia-Pac Educ Res. 2024;33:879–88. doi:10.1007/s40299-02400820-x.

24. Zhi R, Wang Y, Derakhshan A. On the role of academic buoyancy and self-efficacy in predicting teachers' work engagement: a case of Chinese English as a foreign language teachers. Percept Mot Skills. 2023;131(2):612–29. doi:10.1177/00315125231222398.

25. Yang X, Du J. The effect of teacher self-efficacy, online pedagogical and content knowledge, and emotion regulation on teacher digital burnout: a mediation model. BMC Psychol. 2024;12:51. doi:10.1186/s40359-024-01540-z.

26. Zee M, Koomen HMY. Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: a synthesis of 40 years of research. Rev Educ Res. 2016;86(4):981–1015. doi:10.3102/0034654315626801.

27. Zhou X, Zheng S. Psychological capital relates with teacher enjoyment: the mediating role of reappraisal. Front Psychol. 2022;13:879312. doi:10.3389/fpsyg.2022.879312.

28. Pressley T, Ha C. Teacher exhaustion during COVID-19: exploring the role of administrators, self-efficacy, and anxiety. Teach Educ. 2022;57(1):61–78. doi:10.1080/08878730.2021.1995094.

29. Jevsikova T, Stupurienė G, Stumbrienė D, Juškevičienė A, Dagienė V. Acceptance of distance learning technologies by teachers: determining factors and emergency state influence. Informatica. 2021;32(3):517–42. doi:10.15388/21-INFOR459.

30. Pekrun R, Perry RP. Control-value theory of achievement emotions. In: Pekrun P, Linnenbrink-Garcia L, editors. International handbook of emotions in education. New York: Routledge; 2014.

31. Goetz T, Botes E, Resch LM, Weiss S, Frenzel AC, Ebner M. Teachers emotionally profit from positive school leadership: applying the PERMA-Lead model to the control-value theory of emotions. Teach Teach Educ. 2024;141:104517. doi:10.1016/j.tate.2024.104517.

32. Bakır-Yalçın E, Koçak-Usluel Y. Investigating the antecedents of engagement in online learning: do achievement emotions matter? Educ Inf Technol. 2023;29:3759–91. doi:10.1007/s10639-023-11995-z.

33. Zhang D, Gao S, Liu R. A study on the mechanisms of teachers' academic emotions and motivational beliefs on learning engagement in the context of online training. Front Psychol. 2023;14:1255660. doi:10.3389/fpsyg.2023.1255660.

34. Choi E, Lee J. EFL teachers' self-efficacy and teaching practices. ELT J. 2017;72(2):175–86. doi:10.1093/elt/ccx046.

35. Tschannen-Moran M, Hoy AW. Teacher efficacy: capturing an elusive construct. Teach Teach Educ. 2001;17(7):783–805. doi:10.1016/S0742-051X(01)00036-1.

36. Robinia KA, Anderson ML. Online teaching efficacy of nurse faculty. J Prof Nurs. 2010;26(3):168–75. doi:10.1016/j.profnurs.2010.02.006.

37. Liu H, Chu W, Wang Y. Unpacking EFL teacher self-efficacy in livestream teaching in the Chinese context. Front Psychol. 2021;12:717129. doi:10.3389/fpsyg.2021.717129.

38. Ma K, Chutiyami M, Zhang Y, Nicoll S. Online teaching self-efficacy during COVID-19: changes, its associated factors and moderators. Educ Inf Technol. 2021;26:6675–97. doi:10.1007/s10639-021-10486-3.

39. Huang S, Yin H, Jin Y, Wang W. More knowledge, more satisfaction with online teaching? examining the mediation of teacher efficacy and moderation of engagement during COVID-19. Sustainability. 2022;14(8):4405. doi:10.3390/su14084405.

40. Hoang T, Wyatt M. Exploring the self-efficacy beliefs of Vietnamese pre-service teachers of English as a foreign language. System. 2021;96:102422. doi:10.1016/j.system.2020.102422.

41. Bandura A. Self-efficacy: the exercise of control. New York: W. H. Freeman; 1997.

42. Burić I, Macuka I. Self-efficacy, emotions and work engagement among teachers: a two wave cross-lagged analysis. J Happiness Stud. 2017;19:1917–33. doi:10.1007/s10902-017-9903-9.

43. Kostić-Bobanović M. Perceived emotional intelligence and self-efficacy among novice and experienced foreign language teachers. Econ Res-Ekon Istraz. 2020;33(1):1–14. doi:10.1080/1331677X.2019.1710232.

44. Zhong Z, Feng S, Jin S. Investigating the influencing factors of teaching anxiety in virtual reality environments. Educ Inf Technol. 2023;29:8369–91. doi:10.1007/s10639-023-12152-2.

45. Papi M, Khajavy H. Second language anxiety: construct, effects, and sources. Annu Rev Appl Linguist. 2023;43:127–39. doi:10.1017/S0267190523000028.

46. Fraschini N, Park H. Anxiety in language teachers: exploring the variety of perceptions with Q methodology. Foreign Lang Ann. 2021;54(2):341–64. doi:10.1111/flan.12527.

47. Liu H, Li H, Fang F. "Behind the screen, I still care about my students!": exploring the emotional labour of English language teachers in online teaching during the COVID-19 pandemic. Int J Appl Linguist. 2024;34(2):450–65. doi:10.1111/ijal.12501.

48. Wang Y, Wang R, Lu J. Exploring the impact of university student engagement on junior faculty's online teaching anxiety and coping strategies during COVID-19. Educ Sci. 2022;12(10):664. doi:10.3390/educsci12100664.

49. Hamad MM, Dafaallah AS, Alhaj AA. The challenges of online English language teaching from EFL instructors' point of view in KKU, Tehama Campus during COVID 19 period. J Lang Teach Res. 2021;12(4):543–56. doi:10.17507/jltr.1204.04.

50. Nguyen TMH, Do THT, Nguyen QN. Factors contributing to Vietnamese university lecturers' burnout in online emergency classrooms amidst the COVID-19 pandemic. Turk Online J Distance Educ. 2023;24(2):64–92. doi:10.17718/tojde.1020442.

51. Park J, Ramirez G, Park D. Effect of preschool teacher's math anxiety on teaching efficacy and classroom engagement in math. Psychol Schools. 2024;61(6):2600–11. doi:10.1002/pits.23182.

52. Ameen EC, Guffey DM, Jackson C. Evidence of teaching anxiety among accounting educators. J Educ Bus. 2002;78(1):16–22. doi:10.1080/08832320209599692.

53. Gorospe JD. Pre-service teachers' teaching anxiety, teaching self-efficacy, and problems encountered during the practice teaching course. J Educ Learn. 2022;11(4):84–91. doi:10.5539/jel.v11n4p84.

54. Schaufeli WB, Salanova M, González-romá V, Bakker AB. The measurement of engagement and burnout: a two sample confirmatory factor analytic approach. J Happiness Stud. 2002;3:71–92. doi:10.1023/A:1015630930326.

55. Greenier V, Derakhshan A, Fathi J. Emotion regulation and psychological well-being in teacher work engagement: a case of British and Iranian English language teachers. System. 2021; 97:102446. doi:10.1016/j.system.2020.102446.

56. Cao J, Zhang W. Investigating the impact of value congruence on work engagement in EFL teachers: the role of teacher enthusiasm. Front Psychol. 2023;14:1264126. doi:10.3389/fpsyg.2023.1264126.

57. Tomás JM, de los Santos S, Georgieva S, Enrique S. Utrecht work engagement scale in Dominican teachers: dimensionality, reliability, and validity. J Work Organ Psychol. 2018;34(2):89–93. doi:10.5093/jwop2018a11.

58. Garrick A, Mak AS, Cathcart S, Winwood PC, Bakker AB, Lushington K. Non-work time activities predicting teachers' work-related fatigue and engagement: an effort-recovery approach. Aust Psychol. 2017;53(3):243–52. doi:10.1111/ap.12290.

59. Zeng J, Xu G. Ethical leadership and young university teachers' work engagement: a moderated mediation model. Int J Environ Res Public Health. 2019;17(1):21. doi:10.3390/ijerph17010021.

60. Zhang X, Yang L, Proietti Ergün AL. Exploring the predictive power of EFL teachers' work engagement and buoyancy in their professional development. Porta Linguarum. 2023;2023c:159–76. doi:10.30827/portalin.vi2023c.29634.

61. Fiorilli C, Buonomo I, Romano L, Passiatore Y, Iezzi DF, Santoro PE, et al. Teacher confidence in professional training: the predictive roles of engagement and burnout. Sustainability. 2020;12(16):6345. doi:10.3390/su12166345.

62. Azari Noughabi M, Ghonsooly B, Jahedizadeh S. Modeling the associations between EFL teachers' immunity, L2 grit, and work engagement. J Multiling Multicult Dev. 2022;45(8):3158–73. doi:10.1080/01434632.2022.2088766.

63. Obrad C, Circa C. Determinants of work engagement among teachers in the context of teleworking. Amfiteatru Econ. 2021; 23(58):718–35. doi:10.24818/EA/2021/58/718.

64. An T, Wu P, Wang J, Zhang H, Chen Z. The relationship between teaching experience and teaching outcomes in online teaching during the COVID-19 pandemic: the mediating role of teaching engagement. Psychol School. 2024;61(8):3071–86. doi:10.1002/pits.23204.

65. Klassen RM, Yerdelen S, Durksen TL. Measuring teacher engagement: development of the engaged teachers scale (ETS). Frontline Learn Res. 2013;1(2):33–52. doi:10.14786/flr.v1i2.44.

66. Ma Y. A Lenz into the predictive power of language teacher emotion regulation and self-evaluation on L2 grit, teaching style preferences, and work engagement: a case of Chinese EFL instructors. BMC Psychol. 2023;11:330. doi:10.1186/s40359-023-01356-3.

67. Peng SL, Cherng BL. Interaction effects of control-value appraisals on enjoyment/boredom and motivational engagement. J Res Educ Sci. 2023;68(4):1–33. doi:10.6209/JORIES.202312_68(4).0001.

68. Ministry of Education of the People's Republic of China. MOE launches special action plan for integrated, intelligent, and internationalized digital education. 2024. Available from: http://en.moe.gov.cn/news/press_releases/202404/t20240401_1123434.html. [Accessed 2024].

69. Hair JF, Black WC, Babin BJ, Anderson R. Multivariate data analysis. 7th ed. Hampshire: Pearson Education Limited; 2014.

70. Bandura A. Guide for constructing self-efficacy scales. In: Pajares F, Urdan T, editors. Self-efficacy beliefs of adolescents. Greenwich: Information Age Publishing; 2006.

71. Wang L, Ertmer PA, Newby TJ. Increasing preservice teachers' self-efficacy beliefs for technology integration. J Res Technol Educ. 2004;36(3):231–50. doi:10.1080/15391523.2004.10782414.

72. Lin CH, Zheng B. Teaching practices and teacher perceptions in online world language courses. J Online Learn Res. 2015;1(3):275–303.

73. Capel SA. Anxieties of beginning physical education teachers. Educ Res. 1993;35(3):281–9. doi:10.1080/0013188930350308.

74. Kim SY, Kim J. When the learner becomes a teacher: foreign language anxiety as an occupational hazard. English Teach. 2004;59(1):165–85.

75. Yoon T. Teaching English through English: exploring anxiety in non-native pre-service ESL teachers. Theor Pract Lang Stud. 2012;26(2):1099–107. doi:10.4304/tpls.2.6.1099-1107.

76. Schaufeli WB, Bakker AB, Salanova M. The measurement of work engagement with a short questionnaire: a cross-national study. Educ Psychol Meas. 2006;66(4):701–16. doi:10.1177/0013164405282471.

77. Marsh HW, Hocevar D. Application of confirmatory factor analysis to the study of self-concept: first- and higher order factor models and their invariance across groups. Psychol Bull. 1985;97(3):562–82. doi:10.1037/0033-2909.97.3.562.

78. Marsh HW, Muthén B, Asparouhov T, Lüdtke O, Robitzsch A, Morin AJS, et al. Exploratory structural equation modeling, integrating CFA and EFA: application to students' evaluations of university teaching. Struct Equ Model. 2009;16(3):439–76. doi:10.1080/10705510903008220.

79. Lou NM, Chaffee KE, Noels KA. Growth, fixed, and mixed mindsets: mindset system profiles in foreign language learners and their role in engagement and achievement. Stud Second Lang Acquis. 2021;44(3):607–32. doi:10.1017/S0272263121000401.

80. Wang X, Liu H. Exploring the moderating roles of emotions, attitudes, environment, and teachers in the impact of motivation on learning behaviours in students' English learning. Psychol Rep. 2024;22:81. doi:10.1177/00332941241231714.

81. Hair JF, Hult GTM, Ringle CM, Sarstedt M, Danks NP, Ray S. An introduction to structural equation modeling. In: Partial least squares structural equation modeling (PLS-SEM) using R. Cham: Springer; 2021.

82. Bagozzi RP, Yi Y. On the evaluation of structural equation models. J Acad Mark Sci. 1988;16:74–94. doi:10.1007/BF02723327.

83. Sullivan GM, Feinn R. Using effect size—or why the p value is not enough. J Grad Med Educ. 2012;4(3):279–82. doi:10.4300/JGME-D-12-00156.1.

84. Love AMA, Findley JA, Ruble LA, McGrew JH. Teacher self-efficacy for teaching students with autism spectrum disorder: associations with stress, teacher engagement, and student IEP outcomes following COMPASS consultation. Focus Autism Other Dev Disabil. 2019;35(1):47–54. doi:10.1177/1088357619836767.

85. Yada A, Björn PM, Savolainen P, Kyttälä M, Aro M, Savolainen H. Pre-service teachers' self-efficacy in implementing inclusive

practices and resilience in Finland. Teach Teach Educ. 2021;105:103398. doi:10.1016/j.tate.2021.103398.

86. MacIntyre PD. An overview of language anxiety research and trends in its development. In: Gkonou C, Daubney M, Dewaele JM, editors. New insights into language anxiety. Bristol: Multilingual Matters; 2017. doi:10.21832/9781783097722-003.

87. Bishop SJ. Trait anxiety and impoverished prefrontal control of attention. Nat Neurosci. 2008;12:92–8. doi:10.1038/nn.2242.

88. Qi S, Ding C, Li H. Neural correlates of inefficient filtering of emotionally neutral distractors from working memory in trait anxiety. Cogn Affect Behav Neurosci. 2013;14:253–65. doi:10.3758/s13415-013-0203-5.