



Reciprocal Relationships Between Early Childhood Education Teachers' Well-Being and Self-efficacy: A Cross-Lagged Panel Design

Alfred S. Y. Lee¹ · Wing Kai Fung² ·
Kevin Kien Hoa Chung^{3,1}

Accepted: 3 July 2023 / Published online: 13 July 2023
© De La Salle University 2023

Abstract Teachers' well-being and self-efficacy are two important factors linked to quality education. Recent research examining their bidirectionality has revealed inconsistent findings, while those examining the relationships among pre-service and in-service teachers are scarce. This study investigates the reciprocal relationships between teachers' well-being and self-efficacy in a sample of Hong Kong early childhood education teachers. Participants were 155 pre-service ($n = 77$) and in-service ($n = 78$) teachers ($M_{age} = 23.97$, $SD = 4.46$, female = 92.9%). Participants reported their teachers' well-being (PERMA model including positive emotion, engagement, relationship, meaning, and accomplishment) and teachers' self-efficacy at two-time points. The results from the cross-lagged panel model revealed that teachers' self-efficacy at baseline significantly predicted all aspects of prospective well-being except for engagement. In contrast, none of the teachers' well-being components significantly predicted later teachers' self-efficacy, except for accomplishment. The associations between teachers' self-efficacy and well-being were invariant across pre-service and in-service teachers. The results underscored the importance of teachers' self-efficacy in facilitating

teachers' well-being. The findings also highlight the utility of intervention efforts targeting teachers' self-efficacy and well-being, especially in promoting teachers' accomplishment, at an early stage of their careers.

Keywords Positive psychology · Mental health · PERMA model of well-being · Kindergarten · Quality education

Introduction

To improve the quality of early childhood education (ECE), attention has been paid to promoting ECE teachers' well-being and self-efficacy (Zee & Koomen, 2016). ECE teachers have a vital role in shaping young minds, but the heavy workload can negatively impact their well-being and, in turn, affect education quality (Grant et al., 2019). Teachers' self-efficacy is another significant predictor of children's academic achievement, engagement, and motivation (Zee & Koomen, 2016). Emerging evidence suggests the reciprocity between teachers' well-being and self-efficacy, and the two factors may mutually influence one another (Burić et al., 2020; Zee & Koomen, 2016).

Teachers' well-being was suggested to predict self-efficacy (Burić et al., 2020; Zee & Koomen, 2016) since individuals' self-evaluation or perception could be influenced by their mood (i.e., mood-congruent information processing; Mayer et al., 1992). For example, individuals with better emotional well-being (i.e., positive mood) are more likely to recall positive memories and report positive self-efficacy beliefs (Thelwell et al., 2007). Teachers' self-efficacy would also predict well-being because self-efficacious teachers are more capable of teaching and are less stressed (Zee & Koomen, 2016). Yet, little attempt has been made to examine the links between well-being and self-efficacy among

✉ Wing Kai Fung
fungw@hope.ac.uk

Alfred S. Y. Lee
alfredlee@eduhk.hk

Kevin Kien Hoa Chung
kevin@eduhk.hk

¹ Centre for Child and Family Science, The Education University of Hong Kong, Hong Kong, China

² Early Childhood, School of Education, Liverpool Hope University, Liverpool, UK

³ Department of Early Childhood Education, The Education University of Hong Kong, Hong Kong, China

ECE teachers, a potentially vulnerable group characterized by a high turnover rate, exceptional levels of stress, and poor well-being (Grant et al., 2019). The primary aim of this study is to investigate the reciprocal relationships between ECE teachers' well-being and self-efficacy using a cross-lagged panel design, drawing on the PERMA model of well-being (Seligman, 2011, 2018).

PERMA Model of Teachers' Well-Being

The PERMA model is a multidimensional framework to conceptualize well-being, and this framework includes five positive psychological components, namely positive emotion, engagement, relationship, meaning, and accomplishment (Seligman, 2011, 2018). The PERMA model integrates two major perspectives characterizing an individual's well-being: subjective (i.e., positive emotion; Diener et al., 1999) and psychological well-being (i.e., engagement, relationship, meaning and accomplishment; Ryff, 1989). Positive emotion can be defined as optimistic beliefs or experiences characterized by desirable emotional states such as joy, excitement, happiness, and peace (Watson et al., 1988). Engagement refers to the experience of deep immersion or absorption in a specific activity (Schaufeli et al., 2006). Relationships represent the connection with others, being supported by others, and caring for others. Teachers' positive relationships can be developed with colleagues, students, and parents (Lee et al., 2023). Meaning touches on one's desire to contribute something bigger than oneself (Seligman, 2018). Teachers' meaning can be related to nurturing students' well-being, raising a respectable future generation, or contributing to a well-functioning society. Accomplishment often involves the pursuit and achievement of goals and striving for success. It is manifested in the pride that teachers take when they have accomplished something in their lives that strengthens their self-esteem and confidence (Seligman, 2011, 2018). PERMA is a comprehensive model of well-being, and this conceptualizing framework was widely adopted in research on different populations, including students and teachers across different cultural backgrounds (Zeng et al., 2019). Recent research has revealed how promoting ECE teachers' well-being may lower their burnout and turnover rate and, at the same time, support better classroom organization and instructional effectiveness (Grant et al., 2019). Emerging evidence has also supported the connectedness between teachers' well-being and self-efficacy (Burić et al., 2020; Zee & Koomen, 2016).

Teachers' Self-efficacy

Teachers' self-efficacy reflects teachers' beliefs in their abilities to carry out teaching duties, manage students' misbehaviours effectively, and motivate and engage students to learn (Tschannen-Moran & Hoy, 2001; Zee & Koomen, 2016). Tschannen-Moran and Hoy (2001) proposed that teachers' self-efficacy comprises three sub-domains: student engagement, instructional strategies, and classroom engagement. Specifically, self-efficacious teachers would strongly believe in their ability to motivate students, use effective teaching and assessment strategies, and enforce classroom rules (Tschannen-Moran & Hoy, 2001). Teachers' self-efficacy is crucial to quality education (Burić et al., 2020; Zee & Koomen, 2016). Studies have discovered that ECE teachers' self-efficacy is associated with students' academic achievement, engagement, motivation, teachers' well-being, and job satisfaction (Zee & Koomen, 2016). According to the social cognitive theory (Bandura, 1993), there are four determinants of self-efficacy: mastery experience (i.e., personal experience of success), vicarious experience (i.e., seeing someone succeed), verbal persuasion (i.e., encouragement), and physiological arousal (i.e., positive affective and emotional states). Recent research proposed that teachers' well-being is positively associated with self-efficacy determinants, such as mastery experience and physiological arousal (Burić et al., 2020; Granziera & Perera, 2019). The present study examined the relationships between teachers' well-being and self-efficacy, two fundamental elements of quality education (Zee & Koomen, 2016).

Relationships Between Teachers' Well-Being and Self-efficacy

The positive reciprocal relationship between teachers' well-being and self-efficacy has been grounded on the heuristic model of teacher self-efficacy (Zee & Koomen, 2016) and the triadic reciprocal causation model (Bandura, 1986). The triadic causation model proposes individual behaviour as a result of the interaction between the environment, behaviours (itself), and personal factors (Bandura, 1986). Zee and Koomen (2016) have further proposed that, within the classroom context, teachers' self-efficacy (personal factor), quality of classroom processes (behaviours and environment), students' academic adjustment (environment), and teachers' well-being (personal factor) may mutually influence each other.

Indeed, well-being components may be associated with the antecedents of self-efficacy (Burić et al., 2020; Granziera & Perera, 2019). For example, positive emotion has

been suggested to link with physiological arousal (Burić et al., 2020), while personal accomplishment is associated with mastery experience (Bandura, 1993). Mood can impact teachers' self-efficacy by predisposing them to personal information or experiences congruent with their affective state (i.e., mood-congruent effect on self-efficacy; Schutte, 2014; Thelwell et al., 2007). Moreover, studies have reported the predictive links between engagement and teachers' self-efficacy (Granziera & Perera, 2019; Simbula et al., 2011). Teachers with higher teaching engagement would allocate more cognitive, physical, and affective resources to work-related tasks, generating opportunities for domain-specific mastery, thereby leading to stronger self-efficacy beliefs. Zee and Koomen (2016) reviewed the teachers' self-efficacy literature. They suggested that teachers with higher self-efficacy tend to have better well-being, as reflected by higher personal accomplishment, commitment, and job satisfaction.

Drawing on the theoretical frameworks and empirical evidence suggesting the reciprocal development of teachers' self-efficacy and well-being, accumulating research has examined the bidirectionality between these factors (Burić et al., 2020; Granziera & Perera, 2019; Simbula et al., 2011). For example, Granziera and Perera (2019)'s study discovered teachers' self-efficacy, engagement, and satisfaction were reciprocally associated over time. Burić et al. (2020) adopted a three-wave cross-lagged design to investigate the bidirectionality of teachers' emotions (i.e., joy, pride, love, anger, exhaustion, and hopelessness) and self-efficacy. However, the results revealed that the association was unidirectional (Burić et al., 2020). Only teachers' self-efficacy significantly predicted prospective joy and pride, while the paths from early positive emotions to later self-efficacy were non-significant (Burić et al., 2020). In general, these studies have provided evidence of the potential effects of teachers' self-efficacy on well-being (Zee & Koomen, 2016). But the existing evidence in relation to the predictive role of teachers' well-being components in self-efficacy is relatively inconsistent (Burić et al., 2020; Granziera & Perera, 2019; Zee & Koomen, 2016). Furthermore, this line of research has examined the emotional aspects of well-being without considering the other components (e.g., accomplishment and positive relationships) (Burić et al., 2020). Therefore, a comprehensive investigation with additional well-being components considered is necessary to better inform the reciprocal relationship between teachers' well-being and self-efficacy. Given the inconclusive evidence of the reciprocal relationships between teachers' well-being and self-efficacy, we generated two research questions: (1) Does teachers' self-efficacy predict their prospective well-being? and (2) Does teachers' well-being predict their subsequent self-efficacy? We expected that teachers' self-efficacy might have stronger cross-lagged effects on various PERMA well-being components than those in the reverse direction.

Pre-service and In-Service Teachers' Self-efficacy and Well-Being

Increasing attention has been paid to investigating pre-service and in-service teachers' psychological well-being and self-efficacy (Azar, 2010; Gradišek, 2012; Nislin & Pesonen, 2019). This topic is important as a better transition from pre-service to in-service teaching practice may lower the teacher attrition rate (Nislin & Pesonen, 2019). Research has examined the differences between pre-service and in-service teachers' well-being and self-efficacy (Nislin & Pesonen, 2019). Nislin and Pesonen (2019) revealed that pre-service teachers tend to have better well-being since in-service teachers have entered the profession, experienced a stressful working environment, and are more likely to experience emotional exhaustion and even burnout (Nislin & Pesonen, 2019). In contrast, other studies showed no difference between well-being in pre-service and in-service teachers (Gradišek, 2012). In terms of self-efficacy, in-service teachers tend to be more self-efficacious than their pre-service counterparts due to their substantive teaching experience (Seo & Moon, 2013). However, separate studies reported similar levels of self-efficacy in pre-service and in-service teachers (Azar, 2010; Nislin & Pesonen, 2019). Although there were inconsistent results in relation to the pre-service and in-service teachers' well-being and self-efficacy, studies discovered no difference in the association between self-efficacy and well-being among the two groups (Spilt et al., 2011; Zee & Koomen, 2016). The present study further examined the associations between teachers' self-efficacy and well-being in the ECE context. Hence, we proposed the third research question: (3) Do ECE pre-service and in-service teachers show similar patterns of reciprocal relationships between their self-efficacy and well-being?

The Present Study

This study investigated the reciprocal relationships between teachers' self-efficacy and PERMA well-being among pre-service and in-service Hong Kong ECE teachers. We used a cross-lagged panel design with two-time points, baseline (T1) and follow-up testing (T2) to examine their reciprocity. This study aims to address the following research questions and hypotheses:

1. Does teachers' self-efficacy at T1 positively predict their prospective well-being at T2?

2. Does teachers' well-being at T1 positively predict their self-efficacy at T2?
3. Do ECE pre-service and in-service teachers show similar patterns of reciprocal relationships between their self-efficacy and well-being across T1 and T2?

Hypothesis 1 Based on the previous studies (Burić et al., 2020; Zee & Koomen, 2016), we expected that teachers' self-efficacy at T1 would positively predict various PERMA well-being factors: positive emotions, engagement, relationship, meaning, and accomplishment at T2 among pre-service and in-service teachers.

Hypothesis 2 Guided by the social cognition theory (Bandura, 1986) and studies (Granziera & Perera, 2019; Schutte, 2014), we anticipated that the teachers' PERMA well-being factors at T1 would positively predict their self-efficacy at T2 among pre-service and in-service teachers.

Hypothesis 3 Grounded on the meta-analytic study (Zee & Koomen, 2016), it is anticipated that the cross-lagged pathways of the reciprocal model would be invariant between the two groups of teachers.

Hypothesis 4 Based on previous studies (Burić et al., 2020; Granziera & Perera, 2019), it is expected that the cross-lagged effects of the teachers' PERMA well-being on self-efficacy would be smaller than those effects of teachers' self-efficacy on the PERMA well-being.

Method

Participants and Procedure

The study was approved by the Human Research Ethics Committee of the affiliated institute [approval number = Blinded]. An email invitation was sent to 400 pre- and in-service teachers in a public university in Hong Kong. The in-service teachers were affiliated with the public university because they were taking up postgraduate courses or teacher development programmes there. One hundred fifty-five pre-service teachers ($n = 77$) and in-service teachers ($n = 78$) ($M_{age} = 23.97$, $SD = 4.46$, female = 92.9%) signed the informed consent and agreed to participate in the current study. On average, the in-service teacher had 3.00 years ($SD = 2.88$) of teaching experience. All participants were recruited via a convenience sampling approach. Participants

were asked to complete the main study survey at baseline and the follow-up survey one month later.

Measures

Teachers' PERMA well-being was measured by five subscales. For positive emotion, the 10-item positive affect subscale from the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) was adopted to measure participants' positive affect. Participants were asked to indicate the extent to which they had a certain positive feeling (e.g., "inspired" or "interested") over the past week, and they responded on a five-point scale (1 = *Not at all*; 5 = *Extremely*). The Chinese version of the PANAS demonstrated good reliability ($\alpha = 0.87$) among Hong Kong teachers (Lee et al., 2022a, 2022b). In this study, the Cronbach's alphas of positive affect at baseline and follow-up testing were 0.87 and 0.90, respectively.

Engagement was assessed by the 5-item dedication subscale from the Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2006). Participants rated the items (e.g., "I find the work that I do full of meaning and purpose") on a seven-point scale (1 = *Never*; 7 = *Always*). The Chinese version of UWES showed acceptable reliability (i.e., $\alpha = 0.93$) in the previous study (Datu et al., 2022). The internal consistencies at baseline ($\alpha = 0.93$) and follow-up testing ($\alpha = 0.86$) were satisfactory.

For relationship, we adopted the 7-item demonstrating mutual support and trust subscale of the Teacher Collegiality Scale to measure teachers' relationships with their peers (Shah, 2011). Participants rated each item (e.g., "Teachers provide strong social support for colleagues") on a seven-point scale (1 = *Strongly disagree*; 7 = *Strongly agree*). The Chinese version of the scale showed decent reliability (i.e., $\alpha = 0.90$ to 0.93) in local research (Datu et al., 2023). In this study, the Cronbach's alphas of relationship at baseline and follow-up testing were 0.86 and 0.95, respectively.

Meaning was assessed by the 5-item presence subscale from the Meaning in Life Questionnaire (MLQ; Steger et al., 2006). Participants rated each item (e.g., "My life has a clear sense of purpose") on a seven-point scale (1 = *Strongly disagree*; 7 = *Strongly agree*). The Chinese version of MLQ was adopted in the Hong Kong population (Datu et al., 2023) and displayed good internal consistency (i.e., $\alpha = 0.82$ to 0.88). The internal consistencies at baseline ($\alpha = 0.90$) and follow-up testing ($\alpha = 0.89$) were excellent.

For accomplishment, the 8-item personal accomplishment subscale from Maslach Burnout Inventory

(Poghosyan et al., 2009) was used to measure participants' sense of accomplishments. Participants rated the item (e.g., "Can easily understand students' feelings") on a seven-point scale (1 = *Never*; 7 = *Always*). The Chinese version of the scale has been suggested to be reliable (i.e., $\alpha = 0.86$; Lee et al., 2022a, 2022b). In this study, the Cronbach's alphas of accomplishment at baseline and follow-up testing were 0.87 and 0.92, respectively.

Teachers' self-efficacy was measured using the Chinese version of the Teachers' Sense of Efficacy Scale tapping into efficacy in learning and teaching and classroom management (C-TSE; Tschannen-Moran & Hoy, 2001). The scale contained 12 items and sample questions were "How much can you do to motivate students who show low interest in schoolwork", "How much can you use a variety of assessment strategies", and "How much can you do to control disruptive behaviours in the classroom?". Participants rated the items on a five-point scale (1 = *Never*; 5 = *Always*). The Cronbach's alphas of C-TSE at baseline and follow-up were 0.94 and 0.95, respectively.

Data Analysis

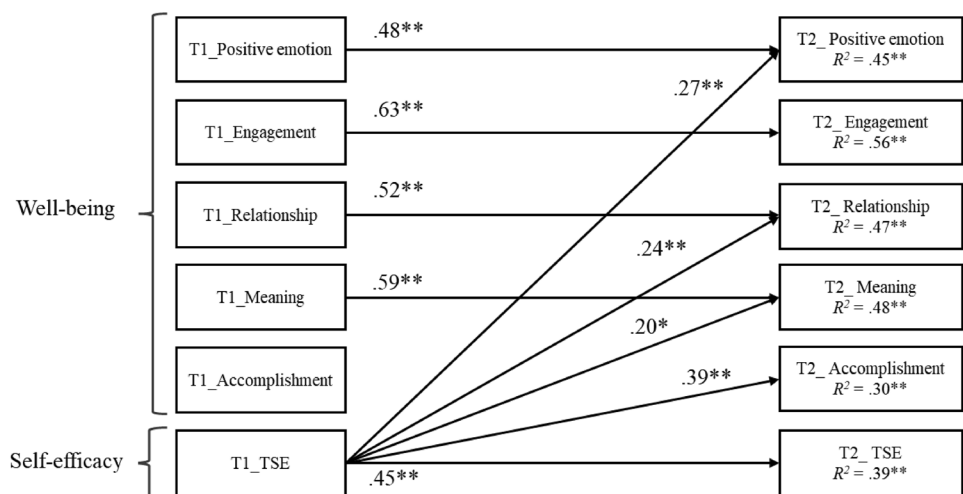
Reliabilities, means, standard deviations, skewness, kurtosis, and correlation of our study variables were examined. Reciprocal relations between teachers' well-being and self-efficacy controlling for constructs stability over time were tested using path modelling in Mplus version 8.4 (Muthén & Muthén, 2017). First, for Hypothesis 1 and 2, single group analyses were performed on pre-service and in-service teachers' data individually to determine if the two groups could fit the reciprocal model. Second, to examine the

invariance of the pathways in the reciprocal model (Hypothesis 3), the model was tested with pre-service and in-service teachers' data simultaneously using multiple-group analysis. All paths were constrained one at a time to be equal across the samples to explore similarities and differences of the integrated model pathways. Chi-square difference tests were conducted to compare the baseline model and the constrained models. Finally, for Hypothesis 4, if the data fitted into the multiple-group analysis and supported invariance, we combined the two samples and compared the effect sizes of the cross-lagged paths of teachers' self-efficacy at T1 on the PERMA well-being at T2, with the effect sizes of the reciprocal paths using the confidence intervals about the parameter estimates with a formal test provided by Schenker and Gentleman (2001). Regarding the effect sizes, we used the f^2 to assess the individual relative impact of the T1 variables on the T2 variables. The f^2 value of 0.02, 0.15, and 0.35 are considered small, medium, and large effects, respectively (Cohen, 2013).

Conventional fit indices, including the Comparative fit index (CFI), the Tucker-Lewis Index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR), were used in the current study. Models were considered to show acceptable goodness-of-fit with the data if CFI and TLI values approached or exceeded 0.90 and the RMSEA and SRMR values below 0.08 (Hu & Bentler, 1999).

Regarding the missing data, 10 participants were lost in the follow-up testing. The retention rate was 93.46%, consistent with longitudinal studies' retention range (Gustavson et al., 2012; Lee et al., 2022a, 2022b). The Little's missing completely at random test (Chi-square = 32.42, $df = 22$,

Fig. 1 Proposed path model for pre-service teachers. Non-significant paths were omitted for readability. T1 = baseline; T2 = follow-up; TSE = teachers' self-efficacy. * $p < .05$ ** $p < .01$



$p=0.07$) suggested that data were missing completely at random (Little & Rubin, 2019). The full information maximum likelihood method (FIML) was used to handle missing data in Mplus. This approach computes a case-wise likelihood function using only those variables that are observed (Muthén & Muthén, 2017). Compared to other missing data methods, FIML has been considered reliable, unbiased, and more efficient in handling datasets with missing responses (Enders & Bandalos, 2001; Shin et al., 2017).

Results

Preliminary Results

Descriptive statistics, including reliabilities, means, standard deviations, skewness, kurtosis, and correlations of our study variables across two-time points, are presented in Appendix A. All the study variables were positively correlated ($r_s=0.24$ to 0.91 , $p_s<0.01$).

Single Group Path Analysis

The single group path model of pre-service teachers (Fig. 1) met goodness-of-fit criteria, $\chi^2=27.18$, $df=18$, CFI=0.98, TLI=0.93, RMSEA=0.08 [90% CI=0.00 to 0.14], SRMR=0.07. All auto-regressive pathways were positive and significant ($\beta_s=0.45$ to 0.63 , $p_s<0.01$), except accomplishment ($\beta=0.19$, $p=0.24$). The effect sizes of the significant auto-regressive pathways were medium to large ($f^2=0.25$ to 0.47). For the cross-lagged pathways, the results revealed that baseline self-efficacy positively predicted later positive emotion ($\beta=0.27$, $p<0.01$), relationship ($\beta=0.24$, $p<0.01$), meaning ($\beta=0.20$, $p=0.04$), and accomplishment ($\beta=0.39$, $p<0.01$). Meanwhile, none of

the baseline well-being components significantly predicted prospective self-efficacy, ($\beta_s=-0.05$ to 0.18 , $p_s=0.11$ to 0.94). The effect sizes of the significant cross-lagged pathways were small ($f^2=0.07$ to 0.18). In the proposed model, the amount of variance of the variables in T2 explained by the T1 variables ranged between 30 and 56% ($R^2=0.30$ to 0.56 , $p_s<0.01$). For the in-service teachers, the path model (Fig. 2) also displayed adequate fit to the data, $\chi^2=25.18$, $df=18$, CFI=0.98, TLI=0.93, RMSEA=0.07 [90% CI=0.00 to 0.13], SRMR=0.08. All variables at baseline testing predicted their corresponding value at follow-up testing positively and significantly ($\beta_s=0.26$ to 0.50 , $p_s<0.01$). The effect sizes of the auto-regressive pathways were small to medium ($f^2=0.09$ to 0.26). Regarding the cross-lagged effects, teachers' self-efficacy positively predicted later accomplishment ($\beta=0.30$, $p=0.02$) and meaning ($\beta=0.25$, $p=0.02$). Accomplishment was the only well-being component that significantly predicted future self-efficacy ($\beta=0.31$, $p<0.01$). The effect sizes of the significant cross-lagged pathways were small ($f^2=0.09$ to 0.12). The amount of variance of the variables in T2 explained by the T1 variables ranged between 20 and 34% ($R^2=0.20$ to 0.34 , $p_s<0.05$). The results partially supported Hypothesis 1 and barely supported Hypothesis 2.

Multiple Group Path Analysis

The multiple-group path analysis displayed adequate fit to the data, $\chi^2=50.31$, $df=34$, CFI=0.98, TLI=0.93, RMSEA=0.08 [90% CI=0.02 to 0.12], SRMR=0.07. The Chi-square difference tests revealed that the pathways in the reciprocal model were invariant between pre-service teachers and in-service teachers, ($\Delta\chi^2=-0.04$ to 2.64 , $p_s=0.25$ to 0.95). See Table 1. The results were consistent with our Hypothesis 3. A post hoc power analysis was conducted to

Fig. 2 Proposed path model for in-service teachers. Non-significant paths were omitted for readability. T1 = baseline; T2 = follow-up; TSE = teachers' self-efficacy. * $p<.05$ ** $p<.01$

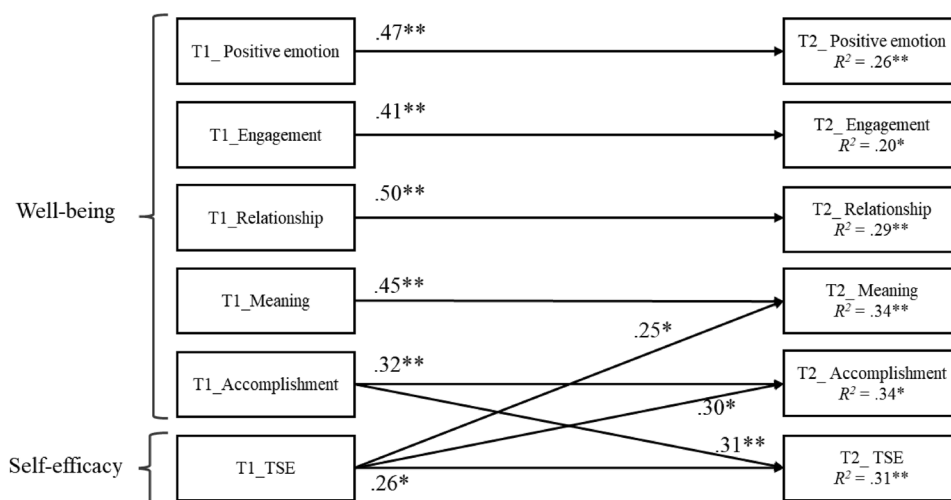


Table 1 Results of multiple group analysis

	χ^2	<i>df</i>	$\Delta\chi^2$	Δdf	<i>p</i>
Total model (baseline Model)	50.31	34			
Nested model (fully constrained)	64.12	50	13.81	16	.01
Nested model (cross-lagged paths)	55.00	44	4.69	10	.05
Constrained pathways (cross-lagged paths)					
T1 Positive emotion → T2 TSE	50.45	35	1.32	1	.25
T1 Engagement → T2 TSE	51.13	35	- 0.04	1	.67
T1 Relationship → T2 TSE	50.31	35	0.90	1	.37
T1 Meaning → T2 TSE	50.78	35	0.04	1	.70
T1 Accomplishment → T2 TSE	50.54	35	0.64	1	.47
T1 TSE → T2 Positive emotion	51.63	35	0.14	1	.74
T1 TSE → T2 Engagement	50.27	35	0.82	1	.46
T1 TSE → T2 Relationship	51.22	35	0.01	1	.64
T1 TSE → T2 Meaning	50.35	35	0.47	1	.95
T1 TSE → T2 Accomplishment	50.95	35	0.23	1	.94

T1 = baseline; T2 = follow-up; TSE = teachers' self-efficacy

examine if we had sufficient power to test the fit of the multiple-group path model. MacCallum et al. (1996) proposed that the power of a path model can be tested using the root mean square error of approximation (RMSEA) approach, in which sample size (i.e., *n* = 155), RMSEA fit indices (i.e., RMSEA = 0.08), and degrees of freedom (*df* = 34) of the model are taken into account to estimate the power. The results of the power analysis (α = 0.05) for the fit of our proposed multiple-group path model indicate a power level of 0.92.

Cross-Lagged Effects Comparison

Pre-service teachers' and in-service teachers' data were combined. The proposed path model met the goodness-of-fit criteria, χ^2 = 32.16, *df* = 17, CFI = 0.98, TLI = 0.92, RMSEA = 0.08 [90% CI = 0.03 to 0.12], SRMR = 0.06. Teachers' self-efficacy at baseline was predictive of well-being components at follow-up testing (β s = 0.18 to 0.38, *ps* < 0.01), except engagement (β = 0.15, *p* = 0.09).

Conversely, only accomplishment at baseline significantly predicted self-efficacy at follow-up testing (β = 0.23, *p* < 0.01). In terms of the effect size, the significant cross-lagged pathways from T1 self-efficacy to T2 well-being yielded small to medium effects (f^2 = 0.05 to 0.18). The effect size from T1 accomplishment to T2 self-efficacy were also small (f^2 = 0.08). Generally, the results suggested that teachers' self-efficacy had larger predictive power on PERMA components than those of PERMA components on teachers' self-efficacy. Significantly stronger effects were found in the reciprocal pathways between teacher's self-efficacy and (1) positive emotion, *t* = 2.91, *p* < 0.01; (2) relationship, *t* = 3.00, *p* < 0.01; and (3) meaning, *t* = 3.69, *p* < 0.01. The cross-lagged pathways between self-efficacy and engagement (*t* = 0.85, *p* < 0.40) or accomplishment (*t* = 1.51, *p* = 0.13) had no significant difference. See Table 2. The results partially supported Hypothesis 4.

Table 2 Cross-lagged paths comparisons

	Directions						Comparisons				
	T1 TSE → T2 WB			T1 WB → T2 TSE			β^{diff}	95% CI		<i>t</i>	<i>p</i>
	β	f^2	95% CI	β	f^2	95% CI		LB	UB		
			LB UB			LB UB		LB	UB		
TSE and Positive emotion	.26	.09	.12 .40	.01	.01	-.09 .10	.25	.05 .45	2.91	.01	
TSE and Engagement	.15	.03	.00 .30	.07	.01	-.02 .17	.08	-.14 .29	0.85	.40	
TSE and Relationship	.18	.05	.07 .29	-.04	.01	-.13 .06	.22	.05 .40	3.00	.01	
TSE and Meaning	.24	.08	.11 .37	-.05	.01	-.13 .03	.29	.11 .47	3.69	.01	
TSE and Accomplishment	.38	.18	.24 .52	.23	.08	.09 .36	.15	-.08 .38	1.51	.13	

T1 = baseline; T2 = follow-up; TSE = teachers' self-efficacy; WB = well-being components

Discussion

This study investigated the reciprocal relationships between pre-service and in-service teachers' well-being and self-efficacy. The results revealed teachers' baseline self-efficacy predicted teachers' well-being of positive emotion, relationships, meaning, and accomplishment at follow-up. However, only the accomplishment aspect of in-service teachers' well-being significantly predicted their prospective self-efficacy. Regarding the cross-lagged pathways, there was no significant difference between pre-service and in-service teachers. The cross-lagged paths from teachers' self-efficacy to subsequent well-being were stronger than those in the reverse direction. Further discussion of findings is as follows.

Reciprocal Relationships Between Teachers' Well-Being and Self-efficacy

Teachers' self-efficacy was predictive of teachers' well-being of positive emotion, relationships, meaning, and accomplishment, aligning with the findings from previous studies (Burić et al., 2020; Granziera & Perera, 2019; Simbula et al., 2011). Self-efficacious teachers were more likely to believe that they could handle their teaching duties effectively and hence, perceived less stress from work (positive emotion), had better relationships with colleagues (relationships), had a clearer purpose in life (meaning), and achieved more personal goals (accomplishment). Moreover, the cross-lagged effects of teachers' self-efficacy on positive emotion, relationship, and meaning were stronger than the effects of teachers' well-being on self-efficacy. The current study extended previous work (Burić et al., 2020; Granziera & Perera, 2019) by including additional indicators to examine teachers' well-being. Contradicting the social-cognitive theory (Bandura, 1993) and the model of teachers' efficacy beliefs (Tschannen-Moran & Hoy, 2001), the current findings revealed positive emotions did not predict prospective self-efficacy. Yet, a previous study (Burić et al., 2020) also discovered similar patterns in which teachers' positive emotions (i.e., joy and pride) had nonsignificant effects on future teachers' self-efficacy. The results implied that positive emotions (e.g., physiological and affective states) might not influence cognitive processing and regulatory mechanisms in shaping teachers' self-efficacy. Nevertheless, the present results suggested that accomplishment and self-efficacy may have a reciprocal relationship, concurring with previous findings (Bandura, 1993). A possible explanation is that accomplishment is closely associated with mastery experience. According to the social cognitive theory (Bandura, 1986, 1993), mastery experience is the most influential source of self-efficacy compared to vicarious experience, verbal persuasion, and physiological arousal. The mastery experience was the concrete evidence of teachers' abilities

and skills in completing a challenging task or overcoming a difficulty in teaching, which aligns with the conceptualization of personal accomplishments (Bandura, 1986, 1993). Teachers with high personal accomplishments are more likely to master their daily teaching duties (e.g., managing the classroom and motivating students effectively) because they have experienced some success in teaching and understood how to achieve their teaching goals (Tschannen-Moran & Hoy, 2001). Alternatively, the pride that teachers experience when they accomplish something strengthens their self-esteem and confidence, which may also positively predict their self-efficacy (Bandura, 1986, 1993). This speculation may also explain the non-significant predictions of other well-being components to self-efficacy, as these factors might be less connected with mastery experience (Bandura, 1986, 1993). Given the small sample size in the present study, further investigation with a larger sample is warranted to examine the relationships between teachers' well-being and self-efficacy, especially the effects on self-efficacy (Burić et al., 2020).

Comparison Between Pre-service and In-Service Teachers

Based on the multiple-group analysis, no significant differences between pre-service and in-service teachers in the cross-lagged paths were found. The invariant path coefficients were aligned with prior evidence (Azar, 2010; Gradišek, 2012; Spilt et al., 2011; Zee & Koomen, 2016). This finding provides preliminary evidence of the similarities in psychological processes among pre-service and in-service teachers. It is worth noting that the in-service teachers in the current study were mainly novice teachers, and the average years of teaching were 3.00 ($SD = 2.88$). The in-service teachers' psychological processes of self-efficacy and well-being might be similar to their pre-service counterparts. Secondly, our data collection was conducted from February to May 2021 amidst the COVID-19 pandemic. According to the Hong Kong Education Bureau policy, ECE teachers were expected to provide face-to-face and online teaching during COVID-19, which had not been practiced before. The unprecedented situation (i.e., inexperience in online teaching) may have changed in-service teachers' self-efficacy and well-being in preschool settings (Pressley & Ha, 2021) and led to the similarity. Nonetheless, the findings underscored the importance of teachers' self-efficacy in early career teachers (Zee & Koomen, 2016).

Implications

The current study supported that teachers' self-efficacy was not only associated with students' academic outcomes,

engagement, and motivation (Granziera & Perera, 2019) but also predicted teachers' well-being. Our findings echo recent research suggesting the relationship between teachers' self-efficacy and work engagement and how these factors collectively impact their teaching practises (Wang et al., 2021). It is, therefore, necessary to provide theory-based self-efficacy training/intervention to pre-service and in-service teachers to improve the ECE quality. According to the social cognitive theory (Bandura, 1986), self-efficacy can be enhanced by facilitating mastery experience, vicarious experience, verbal persuasion, and physiological arousal. For example, research suggested that the provision of professional development (i.e., mastery experience; Rutherford et al., 2017), video reflection (i.e., vicarious experience; Gröschner et al., 2018), specific and sincere evaluative feedback (i.e., verbal persuasion; Morris et al., 2017), and emotional regulation technique (i.e., physiological arousal; Sutton et al., 2009) are effective approaches in fostering teachers' self-efficacy (Morris et al., 2017). The current findings also suggested that teachers' accomplishment predicted their self-efficacy. Based on previous intervention studies, teachers' personal accomplishment can be facilitated by using cognitive behavioral therapy (e.g., goal setting), gratitude intervention (e.g., blessing counting), social support (e.g., strengthening collegiality), and mindfulness training (e.g., self-compassion and self-awareness) (Chan, 2011; Datu et al., 2022; Iancu et al., 2018; Lee et al., 2023; Wang et al., 2021). Our findings inform teacher education institutions to promote ECE teachers' self-efficacy and well-being, especially their accomplishments.

Limitations and Future Directions

This study has at least four limitations. First, the current sample size was small, and it may not have adequate power to detect the significance of the pathways. In our proposed model, we could not adjust the results for control variables, including age, gender, and years of teaching experience for in-service teachers. This is because the small sample size would cause convergence error in Mplus. Besides, the selected sample was recruited from a single university, and the majority of them were female (i.e., 92.9%). These may also limit the generalizability of the study findings. Future studies are encouraged to recruit a larger sample from more male teachers and diverse backgrounds such as primary and secondary teachers to increase the representativeness and the statistical power to validate the current findings. Secondly, a single 1-month follow-up session after the baseline testing may limit the impacts of the current study. We recommend future research to examine the long-term reciprocal relationships between teachers' well-being and self-efficacy (e.g., two follow-up occasions). Thirdly, the current study relied on self-report measures; hence, the validity of the results may

suffer from social desirability biases and common method variance. Future investigations need to explore alternative approaches (e.g., peer-report measure, children's engagement/motivation, bio-physiological measures of emotions) in assessing teachers' well-being and self-efficacy. Finally, future studies could adopt an even more comprehensive approach to explore teachers' well-being. Recent studies have included negative emotion, life satisfaction, character strength, thriving at work, teaching stress, and physical health to illustrate the relationships between individuals' well-being and self-efficacy (Burić et al., 2020; Fan & Wang, 2022). Recent research has conceptualized and examined teachers' well-being by referring to the PROSPER model (Noble & McGrath, 2015), which includes positivity, relationship, outcome, strength, purpose, engagement, and resilience dimensions (e.g., Datu et al., 2022; Lee et al., 2023).

Conclusion

The present study showed that teachers' self-efficacy was predictive of teachers' PERMA-based well-being. This study examined the reciprocal relationships between teachers' self-efficacy and well-being among pre-service and in-service ECE teachers in Chinese society. Notably, it showed that teachers' self-efficacy predicted teachers' PERMA-based well-being. This study extended previous work and provided empirical evidence supporting the importance of teachers' self-efficacy in facilitating teachers' well-being. Considering that the less-experienced teachers in this study reported lower levels of self-efficacy and well-being, interventions targeting to promote teachers' self-efficacy and well-being at the early stage of their careers are worth considering in teacher training and school professional development.

Acknowledgements The work is supported by the Faculty of Education and Human Development, The Education University of Hong Kong under the Strategic Area 7: Positive Education in Early Childhood Grant [1-F241-S9-02337] awarded to Kevin Kien Hoa Chung, Department of Early Childhood Education, The Education University of Hong Kong. Correspondence concerning this article should be addressed to Wing Kai Fung, Early Childhood, School of Education, Liverpool Hope University, UK. Email: fungw@hope.ac.uk. The submitting author of this article is Alfred S. Y. Lee, Centre for Child and Family Science, The Education University of Hong Kong. Email: alfredlee@eduhk.hk.

Data availability The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Competing interests The authors report there are no competing interests to declare.

Appendix

See Table 3.

Table 3 Zero-order correlations, means, and standard deviation of the study variables

Components	1	2	3	4	5	6	7	8	9	10	11	12
T1												
1. Positive emotion	1											
2. Engagement	.50**	1										
3. Relationships	.32**	.50**	1									
4. Meaning	.52**	.44**	.25**	1								
5. Accomplishment	.50**	.53**	.40**	.48**	1							
6. TSE	.45**	.54**	.46**	.35**	.74**	1						
T2												
7. Positive emotion	.60**	.47**	.28**	.45**	.39**	.44**	1					
8. Engagement	.40**	.65**	.39**	.49**	.44**	.43**	.58**	1				
9. Relationships	.32**	.45**	.62**	.32**	.32**	.43**	.49**	.58**	1			
10. Meaning	.48**	.49**	.24**	.66**	.35**	.38**	.62**	.67**	.43**	1		
11. Accomplishment	.37**	.50**	.36**	.37**	.52**	.55**	.52**	.60**	.55**	.55**	1	
12. TSE	.38**	.51**	.35**	.36**	.55**	.60**	.57**	.62**	.59**	.56**	.81**	1
Mean	3.05	4.81	4.70	4.49	2.95	3.66	3.09	4.85	4.73	4.53	2.93	3.66
SD	0.61	1.02	0.92	1.25	0.44	0.58	0.67	1.17	0.92	1.23	0.48	2.93
Cronbach's alpha	.87	.93	.86	.90	.87	.94	.90	.86	.95	.89	.92	.95
Skewness	-0.15	-0.46	-0.25	-0.50	0.23	-0.29	-0.31	-0.61	-0.23	-0.21	-0.73	-1.01
Kurtosis	-0.26	0.09	-0.53	0.24	0.34	0.30	0.60	0.31	0.01	-0.50	2.68	1.94

Note. T1 = baseline; T2 = follow-up; TSE = teachers' self-efficacy. * $p < .05$, ** $p < .01$

References

- Azar, A. (2010). In-service and pre-service secondary science teachers self-efficacy beliefs about science teaching. *Educational Research and Reviews*, 5(4), 172–185.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice Hall.
- Bandura, A. (1993). Perceived self-efficacy in cognitive-development and functioning. *Educational Psychologist*, 28(2), 117–148. https://doi.org/10.1207/s15326985ep2802_3
- Burić, I., Slišković, A., & Sorić, I. (2020). Teachers' emotions and self-efficacy: A test of reciprocal relations. *Frontiers in Psychology*, 11, 1650. <https://doi.org/10.3389/fpsyg.2020.01650>
- Chan, D. W. (2011). Burnout and life satisfaction: Does gratitude intervention make a difference among Chinese school teachers in Hong Kong? *Educational Psychology*, 31(7), 809–823. <https://doi.org/10.1080/01443410.2011.608525>
- Cohen, J. (2013). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge.
- Datu, J. A. D., Lee, A. S. Y., Fung, W. K., Cheung, R. Y. M., & Chung, K. K. H. (2022). Prospering in the midst of the COVID-19 pandemic: The effects of PROSPER-based intervention on psychological outcomes among preschool teachers. *Journal of School Psychology*, 94, 66–82. <https://doi.org/10.1016/j.jsp.2022.08.003>
- Datu, J. A. D., Lee, A. S. Y., & Chung, K. K. H. (2023). Leveraging technology for pre-service teachers' well-being: The effectiveness of a multicomponent positive psychology intervention in pre-service preschool teachers in Hong Kong. *Applied Psychology: Health and Well-Being*. <https://doi.org/10.1111/aphw.12446>
- Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). Subjective well-being: Three decades of progress. *Psychological Bulletin*, 125(2), 276–302. <https://doi.org/10.1037//0033-2909.125.2.276>
- Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling*, 8(3), 430–457. https://doi.org/10.1207/S15328007sem0803_5
- Fan, J., & Wang, Y. (2022). English as a foreign language teachers' professional success in the Chinese context: The effects of well-being and emotion regulation. *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2022.952503>
- Gradišek, P. (2012). Character strengths and life satisfaction of slovenian in-service and pre-service teachers. *Center for Educational Policy Studies Journal*, 2(3), 167–180.
- Grant, A. A., Jeon, L., & Buettner, C. K. (2019). Relating early childhood teachers' working conditions and well-being to their turnover intentions. *Educational Psychology*, 39(3), 294–312. <https://doi.org/10.1080/01443410.2018.1543856>
- Granziera, H., & Perera, H. N. (2019). Relations among teachers' self-efficacy beliefs, engagement, and work satisfaction: A social cognitive view. *Contemporary Educational Psychology*, 58, 75–84. <https://doi.org/10.1016/j.cedpsych.2019.02.003>
- Gröschner, A., Schindler, A.-K., Holzberger, D., Alles, M., & Seidel, T. (2018). How systematic video reflection in teacher professional development regarding classroom discourse contributes to teacher

- and student self-efficacy. *International Journal of Educational Research*, 90, 223–233. <https://doi.org/10.1016/j.ijer.2018.02.003>
- Gustavson, K., von Soest, T., Karevold, E., & Røysamb, E. (2012). Attrition and generalizability in longitudinal studies: Findings from a 15-year population-based study and a Monte Carlo simulation study. *BMC Public Health*. <https://doi.org/10.1186/1471-2458-12-918>
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- Iancu, A. E., Rusu, A., Măroiu, C., Păcurar, R., & Maricuțoiu, L. P. (2018). The effectiveness of interventions aimed at reducing teacher burnout: A meta-analysis. *Educational Psychology Review*, 30(2), 373–396. <https://doi.org/10.1007/s10648-017-9420-8>
- Lee, A. S. Y., Datu, J. A. D., Chan, D. K. C., Lau, E. Y. H., Fung, W. K., Cheng, R. W.-Y., Cheung, R. Y. M., & Chung, K. K. H. (2023). The effects of a PROSPER-based intervention on well-being among pre-service preschool teachers during the COVID-19 pandemic: A randomized control trial. *Educational Psychology*. <https://doi.org/10.1080/01443410.2023.2189649>
- Lee, A. S. Y., Fung, W. K., Datu, J. A. D., & Chung, K. K. H. (2022a). Well-being profiles of pre-service teachers in Hong Kong: Associations with teachers' self-efficacy during the COVID-19 pandemic. *Psychological Reports*. <https://doi.org/10.1177/00332941221127631>
- Lee, A. S. Y., Sun, Y., & Chung, K. K. H. (2022b). Linking university students' mindfulness to positive adjustment amidst COVID-19 pandemic: A 6-month cross-lagged panel design. *Mindfulness*, 13(12), 3080–3090. <https://doi.org/10.1007/s12671-022-02014-2>
- Little, R. J., & Rubin, D. B. (2019). *Statistical analysis with missing data* (3rd ed.). Wiley.
- MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1(2), 130–149. <https://doi.org/10.1037/1082-989X.1.2.130>
- Mayer, J. D., Gaschke, Y. N., Braverman, D. L., & Evans, T. W. (1992). Mood-congruent judgment is a general effect. *Journal of Personality and Social Psychology*, 63(1), 119. <https://doi.org/10.1037/0022-3514.63.1.119>
- Morris, D. B., Usher, E. L., & Chen, J. A. (2017). Reconceptualizing the sources of teaching self-efficacy: A critical review of emerging literature. *Educational Psychology Review*, 29, 795–833. <https://doi.org/10.1007/s10648-016-9378-y>
- Muthén, L. K., & Muthén, B. (2017). *Mplus user's guide: Statistical analysis with latent variables, user's guide*. Muthén & Muthén.
- Nislin, M., & Pesonen, H. (2019). Associations of self-perceived competence, well-being and sense of belonging among pre-and in-service teachers encountering children with diverse needs. *European Journal of Special Needs Education*, 34(4), 424–440. <https://doi.org/10.1080/08856257.2018.1533093>
- Noble, T., & McGrath, H. (2015). PROSPER: A new framework for positive education. *Psychology of Well-being*. <https://doi.org/10.1186/s13612-015-0030-2>
- Poghosyan, L., Aiken, L. H., & Sloane, D. M. (2009). Factor structure of the Maslach burnout inventory: An analysis of data from large scale cross-sectional surveys of nurses from eight countries. *International Journal of Nursing Studies*, 46(7), 894–902. <https://doi.org/10.1016/j.ijnurstu.2009.03.004>
- Pressley, T., & Ha, C. (2021). Teaching during a pandemic: United States teachers' self-efficacy during COVID-19. *Teaching and Teacher Education*, 106, 103465. <https://doi.org/10.1016/j.tate.2021.103465>
- Rutherford, T., Long, J. J., & Farkas, G. (2017). Teacher value for professional development, self-efficacy, and student outcomes within a digital mathematics intervention. *Contemporary Educational Psychology*, 51, 22–36. <https://doi.org/10.1016/j.cedpsych.2017.05.005>
- Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57(6), 1069–1081. <https://doi.org/10.1037/0022-3514.57.6.1069>
- Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire: A cross-national study. *Educational and Psychological Measurement*, 66(4), 701–716. <https://doi.org/10.1177/0013164405282471>
- Schenker, N., & Gentleman, J. F. (2001). On judging the significance of differences by examining the overlap between confidence intervals. *The American Statistician*, 55(3), 182–186. <https://doi.org/10.1198/000313001317097960>
- Schutte, N. S. (2014). The broaden and build process: Positive affect, ratio of positive to negative affect and general self-efficacy. *The Journal of Positive Psychology*, 9(1), 66–74. <https://doi.org/10.1080/17439760.2013.841280>
- Seligman, M. (2011). *Flourish: A new understanding of happiness, well-being-and how to achieve them*. Nicholas Brealey Pub.
- Seligman, M. (2018). PERMA and the building blocks of well-being. *The Journal of Positive Psychology*, 13(4), 333–335. <https://doi.org/10.1080/17439760.2018.1437466>
- Seo, S., & Moon, H. (2013). A comparative study of teaching efficacy in pre-service and in-service teachers in Korean early childhood education and care (ECEC). *Asia-Pacific Journal of Teacher Education*, 41(4), 363–376. <https://doi.org/10.1080/1359866x.2013.787394>
- Shah, M. (2011). The dimensionality of teacher collegiality and the development of teacher collegiality scale. *International Journal of Education*, 3(2), Article E10. <https://doi.org/10.5296/ije.v3i2.958>
- Shin, T., Davison, M. L., & Long, J. D. (2017). Maximum likelihood versus multiple imputation for missing data in small longitudinal samples with nonnormality. *Psychological Methods*, 22(3), 426–449. <https://doi.org/10.1037/met0000094>
- Simbula, S., Guglielmi, D., & Schaufeli, W. B. (2011). A three-wave study of job resources, self-efficacy, and work engagement among Italian schoolteachers. *European Journal of Work and Organizational Psychology*, 20(3), 285–304. <https://doi.org/10.1080/13594320903513916>
- Spilt, J. L., Koomen, H. M., & Thijs, J. T. (2011). Teacher wellbeing: The importance of teacher–student relationships. *Educational Psychology Review*, 23(4), 457–477. <https://doi.org/10.1007/s10648-011-9170-y>
- Steger, M. F., Frazier, P., Oishi, S., & Kaler, M. (2006). The meaning in life questionnaire: Assessing the presence of and search for meaning in life. *Journal of Counseling Psychology*, 53(1), 80–93. <https://doi.org/10.1037/0022-0167.53.1.80>
- Sutton, R. E., Mudrey-Camino, R., & Knight, C. C. (2009). Teachers' emotion regulation and classroom management. *Theory into Practice*, 48(2), 130–137. <https://doi.org/10.1080/00405840902776418>
- Thelwell, R. C., Lane, A. M., & Weston, N. J. (2007). Mood states, self-set goals, self-efficacy and performance in academic examinations. *Personality and Individual Differences*, 42(3), 573–583. <https://doi.org/10.1016/j.paid.2006.07.024>
- Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education*, 17(7), 783–805. [https://doi.org/10.1016/S0742-051x\(01\)00036-1](https://doi.org/10.1016/S0742-051x(01)00036-1)

- Wang, Y., Derakhshan, A., & Zhang, L. J. (2021). Researching and practicing positive psychology in second/foreign language learning and teaching: The past, current status and future directions. *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2021.731721>
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070. <https://doi.org/10.1037//0022-3514.54.6.1063>
- Zee, M., & Koomen, H. M. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research*, *86*(4), 981–1015. <https://doi.org/10.3102/0034654315626801>
- Zeng, G., Chen, X., Cheung, H. Y., & Peng, K. (2019). Teachers' growth mindset and work engagement in the Chinese educational context: Well-being and perseverance of effort as mediators. *Frontiers in Psychology*, *10*, 839. <https://doi.org/10.3389/fpsyg.2019.00839>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.