



## **Technostress Dynamics in EFL Teachers: First- and Second-Order SEM on Computer Self-Efficacy, TPACK, Burnout, Academic Resilience, Support, and Demographics**

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### **Abstract**

Despite the promising role of technology in education, teachers' techno-stress anchors integrating technology into the instructional process. The present research aimed to test a structural model of teachers' techno-stress, technological pedagogical content knowledge (TPACK), computer self-efficacy, environmental support, academic resilience, and burnout. To achieve this goal, 232 EFL teachers completed the Computer Self-Efficacy Scale, Teachers' Technostress Level Defining, TPACK survey, Overall Support questionnaire, Connor–Davidson Resilience Scale, and Maslach Burnout Inventory (2016). Exploratory and confirmatory factor analyses were conducted on all questionnaires, confirming satisfactory validity and reliability indices that supported the subfactors within the constructs. Structural equation modeling (SEM) indicated that: (a) EFL teachers' TPACK, and resilience negatively predicted their technostress while burnout predicted technostress positively; (b) administrative support and computer self-efficacy negatively predicted EFL teachers' technostress through the mediating role of TPACK and resilience; (c) Teachers' burnout serves as a mediator between administrative support and technostress, as well as computer self-efficacy, exhibiting a negative association with latent exogenous variables and demonstrating significant predictive impact on the latent endogenous. (d) Additionally, TPACK and resilience indirectly affected teachers' burnout, demonstrating that elevated levels of TPACK and resilience are associated with reduced burnout and technostress; (e) Technostress was positively associated with age, whereas its relationship with gender was nonsignificant. The analysis yielded instructional recommendations for EFL instructors, educators, and policymakers.

*Keywords:* technostress, technological pedagogical content knowledge, environmental support, computer self-efficacy, demographic variables

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## **Introduction**

Despite the positive aspects of the advancement of hyper-connected technology, the anxiety of dealing with and coping with new information technologies leads to a psychological embarrassment known as technostress. Technostress, therefore, refers to the adverse emotions, thoughts, and attitudes that individuals experience when confronted with new technologies (Munˆoz et al., 2017). In the academic context, this modern adaptation disorder becomes one of the problems that stands in the way of teachers. Rapid and constant technological developments affect the educational and teaching dynamics in all professional disciplines (Coklar et al., 2017), making it essential for teachers to incessantly expand both their technological and pedagogical knowledge. Therefore, finding out the factors that affect teachers' technostress and overcoming their self-inadequacy to adapt to computer technologies becomes prominent. To stay current with emerging technologies, technological and pedagogical knowledge play a role in decreasing teachers' stress (Zhao et al., 2022). Schmidt et al (2009) defined TPACK as the ability to utilize technology to cover the methods that are used in academic settings with technology, to support students in solving issues they face while learning, to consolidate current knowledge, and to work on technology in terms of keeping and obtaining more up-to-date data and knowledge. Other factors, such as computer self-efficacy, also contribute to practical solutions that can help teachers navigate this anxiety-inducing context (Daniilidou et al., 2020). The belief in one's skills and knowledge of computers, known as computer self-efficacy, empowers teachers to endure setbacks and face complications with minimum tension (Dong, 2020). Accompanied by unceasing support, teachers feel more confident in dealing with evolving technology and with the accompanying novelties in pedagogy. Keeping teachers abreast of the recent technological developments and the pertinent methodologies, supporting them in getting along with technology, and providing backup in times of any breakdown helps them cope with the rapid changes of the information age.

Research on the implications of technostress has demonstrated that technology can evoke unpleasant feelings, such as inadequacy, mental exhaustion, and anxiety, which may lead to burnout (Daniilidou et al., 2020). Burnout denotes the state of mental, emotional, and physical exhaustion that can emerge because of prolonged exposure to emotionally demanding situations, technology hassles, academic adversities, and academic setbacks (Maslach et al., 2016). In a century of stress and tension, burnout might occur due to the misfit between teachers' inadequacy of technological resources and their job demands.

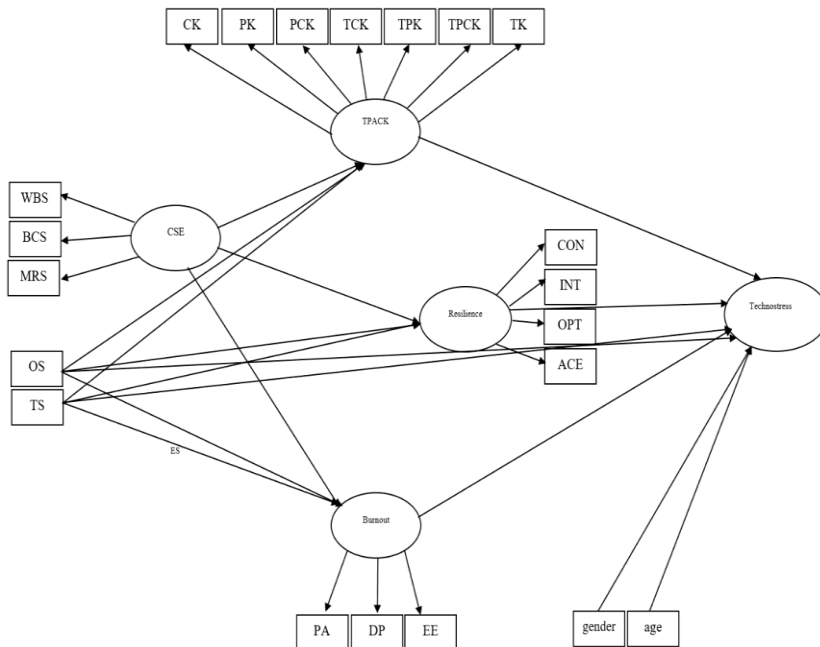
Whatever the reasons for the technostress are, teachers' inner status assists them in managing technostress, diminishes the amount of stress, and accordingly lessens the level of emotional exhaustion. Resilient teachers are less prone to distress in challenging situations, effectively navigating academic challenges and setbacks. They focus on their emotions, strengths, and capabilities rather than on negative aspects and stressors (Joo et al., 2016). What led to the exploration of the relationship among these variables was their contributory effects, since they help teachers tackle their techno-related stresses and setbacks. Little has been done to unveil the causal modeling of the relationship among these variables. It is noteworthy to acknowledge that, except for a few studies, there has been a scarcity of research examining the function of TPACK, resilience, and burnout as mediators, along with environmental support and computer self-efficacy, concerning teachers' techno-stress within a structural model. Thus, this research was executed using the SEM framework to identify the causal relationships among potential contributing

factors, namely, teachers' techno-stress, TPACK, computer self-efficacy, administrative support, technical support, and burnout. Using path analysis, the study conjointly examined the predictive TPACK, resilience, and burnout as mediators, along with environmental support and computer self-efficacy, concerning teachers' techno-stress within a structural model. Given the particularly important emphasis on technostress for EFL teachers, the possible reciprocal relations among TPACK, resilience, and burnout were explored. The full model is shown in Fig. 1. The study tried to test the following hypotheses:

- H1: Computer self-efficacy significantly influences EFL teachers' technostress.
- H2: Environmental support significantly impacts EFL teachers' technostress.
- H3: TPACK significantly influences teachers' technostress.
- H4: Resilience significantly positively affects teachers' technostress.
- H5: Burnout significantly affects teachers' technostress.
- H6: The impact of computer self-efficacy on technostress is mediated by TPACK.
- H7: The relationship between computer self-efficacy and technostress is mediated by resilience.
- H8: Burnout intervenes between computer self-efficacy and technostress.
- H9: The mediation of TPACK regulates the relationship between environmental factors and technostress.
- H10: Resilience mediates between environmental factors and technostress.
- H11: Burnout serves as a mediator in the relationship between the environment and technostress.

**Figure 1**

*PLS-SEM Path Model*



## **Review of Literature**

### **Teachers' Technostress**

As technology rapidly progresses, technostress has become an essential aspect of individuals' lives, particularly in education, where teachers must not only acquire new technologies but also incorporate them into their teaching to meet various expectations (Özgür, 2020). This tension arises from the gap between contextual constraints and an individual's problem-solving competencies. To keep pace with technological progressions and pedagogical inventions, teachers must continuously boost their knowledge and skills for competent incorporation (Coklar et al., 2017). Research in educational and EFL/TEFL contexts indicates that technostress and technostress creators (e.g., techno-overload, techno-complexity, techno-invasion) unfavorably affect institutional costs (through reduced performance and potential turnover), as well as teachers' job satisfaction and motivation (Aktan & Toraman, 2022; Dong et al., 2020; Zhao et al., 2022).

### **Technological Pedagogical Content Knowledge (TPACK)**

The concept of TPACK merges Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK), empowering teachers to adeptly integrate educational technology into the curriculum enterprise (Schmidt et al., 2009). They highlight that TPACK is vital for efficacious technology integration, yet insufficiencies in this knowledge can deter educational outcomes. While previous studies highlight TPACK's role in reducing technostress (Schmidt et al., 2009; Sulla et al., 2022), recent research indicates that knowledge alone does not guarantee successful implementation (Dong et al., 2020; Zhao et al., 2022). The studies conducted in this realm varied from examining the factors that bring about technostress in teachers to the effect of technological knowledge (Joo et al., 2016), to insufficient support (Dong et al., 2020; Özgür, 2020), to social and psychological factors (Yeşilyurt et al., 2016). Joo et al (2016) discovered that higher levels of teachers' TPACK are associated with lowered stress related to computer usage, yet their model failed to consider the additional influencing factors. Accordingly, while TPACK reduces stress, its efficacy demands holistic interventions beyond knowledge acquisition.

### **Computer Self-efficacy**

Integrating technology into teachers' pedagogical practices is decisive for promoting educational modernization and growth (Koh et al., 2017). Teachers' confidence in their capacity to exploit technology, known as computer self-efficacy, meaningfully stimulates their efficiency in teaching (Yeşilyurt et al., 2016). Nevertheless, recent scholarship complicates the notion that elevated self-efficacy unilaterally ensures effective technology integration. Studies by Sulla et al. (2022) and Yeşilyurt et al. (2016) reveal that this relationship is dynamically mediated by organizational climate, workload intensity, and teachers' emotional regulation capacities. Furthermore, although higher self-efficacy is positively associated with TPACK and professional resilience, these links are profoundly context-dependent, varying across institutional cultures and support structures (Li, 2023; Skaalvik & Skaalvik, 2010). Accordingly, computer self-efficacy should be reconceptualized not as a static individual disposition but as a socially constructed competence contingent upon systemic support, reflective professional development, and sustainable institutional scaffolding that collectively mitigate technostress and professional burnout.

## **Environmental Support**

The school environment is one of the key conditions for motivating teachers to adopt technology in their instruction (Özgür,2020). Access to technological and administrative support, as well as cooperation among colleagues, strongly improves teachers' intentions to learn technology (Krishnan, 2017). Administrative support, in the form of technical help as well as aid from colleagues, enhances teachers' technology proficiency and self-confidence (Joo et al., 2016). Moreover, technical help offers assurance that contributes to teachers' propensity to use technology (Dong et al., 2020). Earlier studies have indicated a positive correlation between such assistance and decreased technostress (Zhao et al., 2022). The relationships among administration support, TPACK, technostress, resilience, and burnout, nevertheless, still need much scrutiny; thus, the present study aspires to fill the gap in the literature by conducting a thorough investigation into the dynamic interplay.

## **Burnout**

Burnout is a continued reaction to ongoing stressors, marked by emotional collapse, depersonalization, and a reduced sense of personal achievement (Maslach et al., 2016). While traditionally linked to high job demands and limited resources, recent studies highlight the evolving nature of burnout in educational settings, emphasizing how rapid technological integration and shifting pedagogical expectations exacerbate these stressors (Skaalvik & Skaalvik, 2010; Zhao et al., 2022). Critically, this suggests that burnout is not merely a consequence of workload but also a failure of institutional support systems to adapt to changing teaching landscapes. The repercussions extend beyond individual teachers, manifesting as heightened anxiety, strained interpersonal relationships, and waning professional commitment, which collectively undermine both teacher well-being and student achievement (Li, 2023). Emerging evidence underscores the pivotal role of teacher resilience and self-efficacy as mediating factors that can buffer against burnout. However, their development requires deliberate integration into teacher training programs, suggesting that systemic interventions, rather than isolated individual efforts, are essential to reduce burnout and promote sustainable teaching careers effectively (Sulla et al., 2022).

## **Resilience**

Vital in mitigating burnout, resilience is defined as the ability to adapt and cope with challenges such as heavy workloads and high-pressure situations (Li, 2023). Resilient teachers maintain a positive attitude, experience lower stress levels, and achieve greater job satisfaction, resulting in improved student outcomes, including enhanced academic performance and reduced behavioral issues (Daniilidou et al., 2020). Key factors that nurture resilience include social support, positive teacher-student relationships, and effective handling strategies (Polat & İskender, 2018). Notably, resilience can be amended through targeted training, making it essential to understand its expansion, especially among teachers in demanding contexts (Fathi & Saeedian, 2020). Framed within positive psychology, resilience empowers teachers to succeed despite hardship, enhancing their sense of agency and professional fulfilment. Resilience mitigates burnout and elevates efficacy (Daniilidou et al., 2020; Li, 2023), yet studies overlook its mechanisms in EFL teaching under technostress despite its trainability (Fathi & Saeedian, 2020; Polat & İskender, 2018). This study fills that gap via first-/second-order SEM modeling resilience's interplay with self-efficacy, TPACK, support, and demographics.

## Method

### Participants

This study employed purposive sampling of 232 senior high school EFL teachers, with 51% female ( $n = 118$ ) and 49% male ( $n = 114$ ), averaging 37.4 years in age ( $SD = 8.15$ ). Participants' teaching experience ranged from 4 to 29 years, sourced from Tehran and Karaj. Their professional experience varied: less than five years (2.5%), five to ten years (15.9%), ten to fifteen years (34.1%), fifteen to twenty years (30.5%), and over twenty years (17%). Academic credentials revealed that 46% held a BA, 51% an MA, and 4% PhD, with field specializations in TEFL/applied linguistics (52%), English translation (25%), and English literature (23%). The cohort exceeds the minimum  $N = 200$  threshold for stable first- and second-order SEM with multiple latent constructs (Lakens, 2022; Wolf et al., 2013), yielding robust fit indices ( $\chi^2/df < 5$ , CFI  $> .90$ ).

### Instruments

The following instruments were utilized in this study:

#### *Computer Self-Efficacy Scale*

Developed by Teo and Koh (2010), this twelve-item instrument comprises three sub-components: Basic Computer Skills (BCS), Web-Based Skills (WBS), and Media-Related Skills (MRS). The assessment uses a 5-point Likert scale for each statement, with options from (1) *strongly disagree* to (5) *strongly agree*. In this study, the tool demonstrates a reliability score, measured by Cronbach's Alpha, of .77, which meets the minimum thresholds for research instruments in education and social sciences ( $\alpha \geq .70$ ) (Soriano-Alcantara et al., 2025). CFA confirmed the adequacy of the questionnaire and the structural model, yielding the following fit indices: ( $\chi^2/df = 1.28$ ; RMR = .03; RMSEA = .03; AGFI = .95; NFI = .98; GFI = .98; CFI = .99; TLI = .98; IFI = .99).

#### *Teachers' Technostress Level Defining Scale (TTLDS)*

It is a twenty-eight-item questionnaire developed by Coklar et al (2017) that employs a 5-point Likert scale. It is organized into five distinct sub-components: Learning-Teaching Process Oriented, Profession Oriented, Technical Issue Oriented, Personal Oriented, and Social Oriented. In this investigation, it demonstrated robust reliability, evidenced by a Cronbach's Alpha coefficient of .85, which exceeds the accepted threshold of .70 for research instruments (Nunnally & Bernstein, 1994). Additionally, CFA provided further validation of the questionnaire's adequacy and the structural model it represents ( $\chi^2/df = 1.28$ ; RMSEA = .03; RMR = .03; AGFI = .95; NFI = .98; GFI = .98; CFI = .99; TLI = .98; IFI = .99).

#### *TPACK questionnaire*

Created by Schmidt et al (2009), this instrument consists of 46 items rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), comprehensively addressing all seven components of the TPACK framework. In the present study, the instrument demonstrates a high reliability coefficient of .88, which is above the commonly recommended minimum of .70 for research instruments (Nunnally & Bernstein, 1994). CFA further validated the adequacy of the

questionnaire and the structural model, yielding the following fit indices: ( $\chi^2/df=$  1.28; RMSEA = .03; RMR = .03; AGFI = .95; NFI = .98; CFI = .99; GFI = .98; TLI = .98; IFI = .99).

### ***The Teacher Technology Questionnaire (TTQ)***

Developed by Lowther and Ross (2000), TTQ includes two subscales: Overall Support (OS) and Technical Assistance (TA). Each subscale contains four items rated on a five-point Likert scale, with 1 representing *strong disagreement* and 5 representing *strong agreement*. The OS subscale measures teachers' views regarding the support received from administrators, colleagues, and parents. The latter evaluates perceptions of technical support, resource availability, and problem-solving assistance. In this study, CFA confirmed the adequacy of both subscales, yielding fit indices of  $\chi^2/df=$  1.28; RMSEA = .03; RMR = .03; AGFI = .95; NFI = .98; CFI = .99; GFI = .98; TLI = .98; IFI = .99. The Cronbach's alpha coefficients for the OS and TA dimensions were .84 and .85, respectively, which are higher than the .70 cutoff considered acceptable for scale reliability (Nunnally & Bernstein, 1994).

### ***Connor–Davidson Resilience Scale (CD-RISC)-EFL Teacher Survey***

Designed by Connor and Davidson (2003), this 10-item questionnaire employs a 5-point Likert scale, ranging from 1 (*not true at all*) to 5 (*true all the time*), and encompasses three dimensions: tenacity, optimism, and coping style. Tenacity represents teachers' persistence and dedication in language teaching, while optimism reflects their confidence and positive mindset when encountering difficulties, while optimism signifies their confidence and positive mindset when encountering difficulties. The coping style captures EFL teachers' propensity to resist pressures and proactively navigate risks. In this study, the instrument demonstrated strong reliability, with a Cronbach's alpha coefficient of .83, which surpasses the reliability benchmark of .70 suggested for research measures (Nunnally & Bernstein, 1994). CFA further validated fit indices of ( $\chi^2/df=$  1.28; RMSEA = .03; RMR = .03; AGFI = .95; NFI = .98; CFI = .99; GFI = .98; TLI = .98; IFI = .99).

### ***Burnout Inventory- Educator Survey (MBI-ES)***

This 22-item questionnaire (Maslach et al., 2016) utilizes a 7-point Likert scale from 0 (never) to 6 (every day). It is structured into three subscales: Personal Achievement, which comprises 8 items; Depersonalization, entail five items; and Emotional Exhaustion, encompasses nine items. In this study, the Cronbach's alpha of .85 indicates high consistency, surpassing the established threshold of .70 for research instruments (Nunnally & Bernstein, 1994). CFA further confirmed the questionnaire's validity and structural model ( $\chi^2/df=$  1.28; RMSEA = .03; RMR = .03; AGFI = .95; NFI = .98; CFI = .99; GFI = .98; TLI = .98; IFI = .99).

### **Procedure**

Data preservation measures were enacted to certify privacy and anonymity, complying with ethical standards that underlined confidentiality, voluntary participation, and informed consent. To enhance item clarity and scale reliability, all

six questionnaires were completed and commented on by 30 Iranian EFL teachers, who reported no comprehension issues. Using purposive sampling, teachers' phone numbers were obtained from the Administrative Office of the Department of Education for communication via Telegram, WhatsApp, or Eitaa. The sample size grew as links were shared among colleagues, with clarifications provided at intervals to prevent confusion. An informative post detailing the scale's measurements and guidelines was pinned for easy access, and inquiries were promptly addressed. Electronic scales were created in Google Docs, and data were collected through direct outreach at various institutes and language schools in Tehran. To expedite collection, phone calls were made to nonrespondents. Familiarity with platforms like Shad, Zoom, and Google Meet facilitated access to e-learning resources. Their consistent engagement with these platforms ensured appropriate exposure to technology-related demands relevant to the construct of technostress. Completed scale forms were reviewed meticulously, resulting in the exclusion of 33 respondents for potential misconduct, such as incomplete submissions or inconsistent markings.

### **Data Analysis**

The research model was evaluated through Structural Equation Modeling (SEM) utilizing SmartPLS version 3.2.4, employing a bootstrapping procedure with 1,000 resamples (Ringle et al., 2020) to estimate the causal relationships suggested by both the outer and inner models. This approach is particularly suitable for models incorporating formative indicators within the framework of second-order modeling (Javidkar et al., 2022)

## **Results**

### **The Results of the Measurement Model**

This study adopted a two-phase analytical strategy, initially evaluating the measurement model before examining the hypothesized relationships and the structural nature of both first- and second-order constructs (Schumacker & Lomax, 2004). The Partial Least Squares (PLS) analysis encompasses two key stages: the first requires weighing the measurement model, focusing on reliability and discriminant validity; the second comprises gauging the structural model. Reliability was tested by examining indicator factor loadings, Cronbach's alpha, composite reliability (CR), and the Variance Inflation Factor (VIF) (see Table 6). Item loadings and internal consistency values exceeding .70 are deemed acceptable (Fornell & Larcker, 1981). Model validity was established through convergent validity measures—outer loadings and the average variance extracted (AVE)—and discriminant validity, validated via cross-loadings and the Fornell–Larcker criterion (Schumacker & Lomax, 2004). As shown in Table 1, all first-order construct item loadings surpassed the .70 benchmark (Hair et al., 2022), with composite reliability values ranging from .889 to .955, exceeding the .70 threshold and indicating strong construct reliability. Furthermore, AVE values above .70 confirm robust convergent validity. For second-order constructs, outer loadings ranged from .711 to .875, AVE values from .72 to .89, and CR reached .930, collectively affirming satisfactory convergent validity across both construct levels.

**Table 1**

*The Results of Cronbach's Alpha, Average Variance Extracted (AVE), and the Composite Reliability of the Constructs*

	$\alpha$	CR	AVE	Number of Items	loadings
CSE	.801	.826	.724	12	.723-.825
WBS	.840	.844	.820	3	.719-.835
BCS	.860	.870	.861	5	.714-.822
MRS	.891	.919	.820	4	.723-.833
ES	.891	.897	.818	8	.739-.829
OS	.890	.890	.815	4	.793-.842
TS	.889	.891	.811	4	.722-.835
TPACK	.890	.851	.876	46	.779-.855
CK	.891	.841	.870	12	.769-.830
PK	.890	.878	.871	7	.729-.825
PCK	.878	.871	.870	4	.720-.820
TCK	.866	.869	.872	4	.728-.824
TPK	.872	.865	.873	5	.721-.835
TPCK	.890	.884	.875	8	.730-.835
TK	.875	.860	.870	7	.749-.815
RE	.851	.855	.844	10	.740-.850
TEN	.850	.850	.844	3	.750-.815
OPT	.849	.850	.844	4	.711-.815
CoS	.843	.848	.846	3	.733-.835
BO	.872	.889	.898	22	.719-.821
PA	.869	.882	.888	8	.769-.865
DEP	.870	.876	.887	5	.726-.826
EX	.871	.879	.881	9	.779-.825
TechnoS	.890	.899	.899	28	.789-.825
LTPO	.885	.889	.882	7	.749-.805
PO1	.880	.889	.886	6	.779-.875
TIO	.881	.886	.887	6	.759-.865
PO 2	.880	.882	.880	5	.739-.826
SO	.882	.882	.884	4	.751-.813

After thoroughly analyzing the factor loadings, reliability of the latent constructs, and convergent validity, the study advanced to evaluating discriminant validity for both first- and second-order constructs. This was accomplished using the Fornell-Larcker criterion alongside the heterotrait-monotrait ratio (HTMT), methods designed to demonstrate distinctiveness between constructs. To Fornell and Larcker (1981), discriminant validity is settled when a construct's variance surpasses the shared variance with other constructs. As shown in Table 2 and Table 3, the square roots of the average variance extracted (AVE) placed on the diagonal surpass all inter-construct correlations, thereby confirming satisfactory discriminant validity among the first-order latent constructs (Hair et al., 2022).

**Table 2***Fornell-Larcker Criterion for First-Order Constructs*

	WBS	BCS	MRS	OS	TS	CK	PK	PCK	TCK	TPK	TPCK	TK	TEN	OPT	CoS	PA	DP	EE	LTP	PO	TIO	PO	SO	
WBS	0.74																							
BCS	0.35	0.75																						
MRS	0.07	0.15	0.76																					
OS	0.51	0.15	0.10	0.84																				
TS	0.29	0.64	0.43	0.60	0.83																			
CK	0.28	0.54	0.24	0.55	0.62	0.78																		
PK	0.40	0.52	0.25	0.56	0.42	0.34	0.75																	
PCK	0.51	0.55	0.44	0.52	0.45	0.43	0.39	0.86																
TCK	0.46	0.54	0.48	0.43	0.40	0.41	0.42	0.39	0.85															
TPK	0.30	0.44	0.35	0.46	0.49	0.40	0.50	0.30	0.39	0.79														
TPC	0.52	0.51	0.41	0.40	0.39	0.38	0.36	0.33	0.28	0.34	0.81													
TK	0.22	0.45	0.46	0.40	0.35	0.41	0.48	0.31	0.45	0.38	0.34	0.76												
TEN	0.22	0.19	0.16	0.17	0.18	0.20	0.15	0.18	0.28	0.41	0.48	0.15	0.76											
OPT	0.32	0.31	0.40	0.30	0.29	0.37	0.43	0.40	0.26	0.19	0.41	0.64	0.12	0.77										
CoS	0.43	0.33	0.31	0.30	0.32	0.36	0.27	0.30	0.22	0.38	0.19	0.14	0.15	0.17	0.80									
PA	0.40	0.30	0.28	0.26	0.27	0.39	0.35	0.41	0.19	0.41	0.38	0.41	0.10	0.45	0.13	0.79								
DP	0.47	0.30	0.28	0.31	0.29	0.46	0.39	0.44	0.19	0.50	0.42	0.43	0.09	0.19	0.13	0.13	0.82							
EE	0.37	0.34	0.30	0.30	0.32	0.43	0.48	0.51	0.20	0.37	0.50	0.19	0.14	0.32	0.14	0.12	0.46	0.84						
LTP	0.41	0.41	0.44	0.44	0.39	0.40	0.50	0.48	0.30	0.27	0.37	0.31	0.19	0.33	0.16	0.17	0.51	0.51	0.77					
PO	0.32	0.33	0.23	0.23	0.30	0.29	0.22	0.20	0.21	0.46	0.33	0.33	0.22	0.23	0.15	0.22	0.33	0.31	0.50	0.88				
TIO	0.50	0.46	0.41	0.36	0.40	0.39	0.50	0.46	0.19	0.31	0.25	0.19	0.20	0.27	0.19	0.26	0.29	0.20	0.31	0.75	0.80			
PO	0.40	0.49	0.42	0.35	0.49	0.48	0.44	0.46	0.25	0.48	0.46	0.30	0.10	0.25	0.33	0.15	0.20	0.17	0.20	0.28	0.77	0.81		
SO	0.43	0.47	0.40	0.27	0.41	0.30	0.32	0.36	0.19	0.20	0.31	0.29	0.14	0.29	0.37	0.18	0.28	0.14	0.16	0.23	0.59	0.59	0.86	



Table 3 offers a distinct perspective on the Fornell-Larcker criterion applied to the second-order constructs, including computer self-efficacy, environmental support, TPACK, resilience, burnout, and technostress. It is evident that the square roots of the average variance extracted (AVE), displayed along the diagonal of the matrix, exceed the correlations with other constructs found in the off-diagonal values (Fornell & Larcker, 1981). This demonstrates that both first- and second-order constructs satisfactorily meet the criteria for discriminant validity (Hair et al., 2022). Collectively, the results affirm that all reflective constructs examined possess the necessary properties to ensure robust reliability as well as convergent and discriminant validity.

**Table 3**

*Fornell-Larcker Criterion for Second-Order Construct*

	CSE	ES	TPACK	RE	BO	TechnoS
CSE	0.84					
ES	0.35	0.83				
TPACK	0.43	0.28	0.78			
RE	0.40	0.21	0.43	0.75		
BO	0.60	0.41	0.25	0.35	0.77	
TechnoS	0.31	0.19	0.23	0.37	0.32	0.74

Discriminant validity was examined using the heterotrait-monotrait ratio of correlations (HTMT), with a brink of .85 or below considered indicative of adequate distinctiveness between constructs (Henseler et al., 2015). As shown in Table 2, all HTMT values fell well within this acceptable range, confirming that the constructs demonstrate strong discriminant validity. In this study, technostress creators, computer self-efficacy, TPACK, academic resilience, and environmental support were conceptualized as formative second-order constructs. Specifically, technostress creators encompass multiple facets such as learning-teaching processes, professional concerns, technical issues, personal factors, and social dimensions. Similarly, computer self-efficacy captures rudimentary computer skills, technology-related capabilities, and web-based competencies. The TPACK construct integrates diverse knowledge areas, including technology, content, pedagogy, and their intersections. Burnout and environmental support were each represented as a singular indicator reflecting elements like personal achievement, depersonalization, professional performance, overall support, and technical assistance. Following the two-step procedure, the initial phase involved checking multicollinearity among first-order constructs using the variance inflation factor (VIF). According to Hair et al (2022), VIF standards should remain below 5, and as shown in Table 2, nearly all observed values met this criterion. Further confirmation is illustrated in Table 4, where none of the underlying constructs exceeded the VIF threshold, indicating that multicollinearity is not an issue for the second-order constructs.



**Table 4**

*Discriminant validity (HTMT0.85)*

	WBS	BCS	MRS	OS	TS	CK	PK	PCK	TCK	TPK	TPCK	TK	TEN	OPT	CoS	PA	DP	EE	LT	PO	TIO	PO	SO	
WBS	0.83																							
BCS	0.49	0.82																						
MRS	0.65	0.64	0.80																					
OS	0.37	0.47	0.45	0.84																				
TS	0.43	0.34	0.43	0.44	0.83																			
CK	0.24	0.23	0.32	0.37	0.44	0.79																		
PK	0.44	0.51	0.50	0.39	0.37	0.39	0.76																	
PCK	0.45	0.32	0.44	0.20	0.39	0.60	0.34	0.87																
TCK	0.46	0.43	0.36	0.40	0.28	0.53	0.22	0.39	0.87															
TPK	0.30	0.33	0.35	0.41	0.22	0.42	0.38	0.30	0.39	0.87														
TPCK	0.26	0.29	0.42	0.39	0.32	0.36	0.33	0.33	0.28	0.34	0.88													
TK	0.22	0.19	0.46	0.29	0.33	0.41	0.30	0.31	0.45	0.38	0.34	0.88												
TEN	0.22	0.29	0.40	0.17	0.26	0.40	0.22	0.18	0.28	0.41	0.48	0.15	0.84											
OPT	0.32	0.30	0.40	0.30	0.29	0.37	0.40	0.40	0.26	0.39	0.41	0.34	0.42	0.84										
CoS	0.43	0.31	0.45	0.2	0.32	0.35	0.27	0.30	0.22	0.38	0.19	0.14	0.45	0.47	0.85									
PA	0.39	0.34	0.48	0.46	0.27	0.39	0.35	0.41	0.19	0.41	0.38	0.31	0.50	0.46	0.28	0.89								
DP	0.47	0.30	0.38	0.31	0.39	0.46	0.35	0.44	0.19	0.50	0.42	0.33	0.09	0.39	0.13	0.63	0.88							
EE	0.33	0.32	0.44	0.35	0.37	0.43	0.36	0.51	0.40	0.47	0.50	0.19	0.48	0.32	0.14	0.42	0.46	0.88						
LTPO	0.41	0.42	0.46	0.27	0.36	0.40	0.35	0.48	0.30	0.27	0.37	0.31	0.39	0.33	0.16	0.47	0.51	0.51	0.89					
PO1	0.32	0.34	0.33	0.23	0.44	0.29	0.22	0.20	0.21	0.46	0.33	0.33	0.49	0.40	0.15	0.40	0.33	0.31	0.49	0.89				
TIO	0.43	0.40	0.41	0.26	0.37	0.39	0.30	0.46	0.19	0.41	0.25	0.19	0.33	0.38	0.19	0.36	0.49	0.62	0.36	0.60	0.89			
PO2	0.42	0.43	0.45	0.35	0.25	0.48	0.24	0.46	0.25	0.48	0.46	0.30	0.58	0.35	0.33	0.41	0.39	0.57	0.49	0.58	0.65	0.88		
SO	0.44	0.21	0.40	0.29	0.29	0.30	0.32	0.36	0.19	0.20	0.31	0.29	0.46	0.40	0.37	0.43	0.61	0.54	0.53	0.61	0.59	0.54	0.86	

To evaluate the second-order constructs within the formative model, two additional criteria were carefully examined: indicator weights and collinearity. Indicator weights reflect the degree of contribution each first-order construct makes toward shaping its corresponding second-order construct, with weights above .10 regarded as meaningful. Unlike reflective models, where items are often interchangeable, formative models require special attention to correlations among indicators, as high correlations can distort weight estimations and their significance (Hair et al., 2022). Collinearity among indicator variables was measured using the variance inflation factor (VIF), where values of five or above signal potential multicollinearity issues. As shown in Table 6, all indicator weights reached significance, ranging comfortably between .240 and .393, indicating robust support from first-order constructs in forming the second-order counterparts. Moreover, the VIF standards ranged from 2.30 to 2.97—well below the expiry of 5—demonstrating that multicollinearity was not a concern. Strong correlations were

also observed between each second-order construct and its related first-order dimensions, as confirmed in Table 5, which highlights the significant contributions of all first-order elements. Further, construct validity was assessed by examining both nomological and discriminant validity. Nomological validity tests whether the formative constructs behave as theoretically expected within the model, requiring significant relationships with related constructs. Discriminant validity, on the other hand, ensures constructs are sufficiently distinct, with correlations less than .70 signaling adequate separation. Table 8 reveals significant path coefficients linking the second-order constructs—computer self-efficacy (CSE), environmental support (ES), TPACK, burnout (BU), and resilience (RE)—to technostress, confirming nomological validity. The correlation values ranged between .315 and .685, further substantiating discriminant validity. Collectively, these findings affirm that the formative constructs hold sound validity at both the indicator and construct levels.

**Table 5**  
*Valuation of the Second-order Constructs*

Construct level					
second-order constructs	first-order constructs	Measure	Weights	<i>t</i>	VIF
CSE	WBS	Formative	0.380	29.13***	1.71
	BCS		0.370	21.97***	
	MRS		0.351	22.34***	
ES	TS	Formative	0.338	22.97***	1.81
	OS		0.364	23.89***	
TPACK	CK	Formative	0.301	36.34***	1.64
	PK		0.268	29.44***	
	PCK		0.258	29.45***	
	TCK		0.367	30.10***	
	TPK		0.393	31.41***	
	TPCK		0.382	32.18***	
	TK		0.341	33.20***	
BO	PA	Formative	0.240	30.46***	1.82
	DP		0.313	29.25***	
	EE		0.354	28.74***	
RE	TEN	Formative	0.310	22.81***	1.76
	OPT		0.312	30.57***	
	CoS		0.355	28.74***	

TechnoS	LTPO	Formative	0.371	32.19***	1.97
	PO1		0.367	27.07***	
	TIO		0.359	31.71***	
	PO2		0.342	32.73***	
	SO		0.344	23.98***	
Gender			-0.34	6.19***	2.28
Age			-0.31	1.61***	2.38
Teaching experiences			-0.22	4.50***	1.20

### Results of the Structural Model and Hypothesis Testing

The structural model was evaluated using a bootstrapping procedure with 1,000 randomly drawn subsamples and a significance threshold set at .05 (Hair et al., 2022). This approach enabled the estimation of standardized path coefficients and the assessment of hypothesis significance. The evaluation included several metrics: the coefficient of determination ( $R^2$ ), which reflects predictive accuracy; effect size ( $f^2$ ); predictive relevance ( $Q^2$ ); and the significance of path coefficients. Assessing multicollinearity was also essential to ensure the accuracy and reliability of the parameter estimates, as high collinearity can undermine the model's predictive power.

The  $R^2$  value represents how well the model explains variance in the endogenous constructs, with benchmarks of .75, .50, and .25 considered substantial, moderate, and weak, respectively (Hair et al., 2022). In this study, computer self-efficacy (CSE) and environmental support (ES) together accounted for 68% of the variance in technostress, while the combined influence of CSE, ES, TPACK, resilience (RE), and burnout (BO) explained 72%, indicating a strong predictive model (Ringle et al., 2020). The mediating variables explained approximately 70% of the variance in the exogenous variables. Effect sizes ( $f^2$ ) were also calculated, with values of .02, .15, and .35 marking small, medium, and large effects, respectively (Ringle et al., 2020). Here, the effect of predicting TPACK from CSE was moderate, while environmental support, burnout, resilience, and TPACK all exhibited large effects on technostress, except for CSE, which had a moderate effect (see Table 5). The  $Q^2$  values confirmed that the model has adequate predictive relevance, with strong predictive power demonstrated for CSE and ES, moderate for TPACK, and a large negative predictive relevance associated with resilience and burnout.

Predictive relevance, assessed via  $Q^2$  values greater than zero, further confirmed the model's robustness (Ringle et al., 2020). The final assessment focused on path coefficients—direct, indirect, and total effects—reported in Table 6 and

illustrated in Figure 1. Direct effects revealed that computer self-efficacy exerted the strongest influence on teachers' technostress ( $\beta = .51, p < .001$ ), followed by environmental support ( $\beta = .24, p < .001$ ). TPACK also significantly influenced technostress ( $\beta = .11, p < .01$ ), while resilience and burnout showed significant negative impacts ( $\beta = .11, p < .01$ ;  $\beta = -.43, p < .01$ ;  $\beta = -.24, p < .01$ , respectively). Accordingly, hypotheses 1 through 5 received empirical support. The indirect effects on technostress, mediated through TPACK, highlighted the importance of computer self-efficacy ( $\beta = .05, p < .05$ ) and environmental support ( $\beta = .03, p < .05$ ), thus supporting hypotheses 4 and 7. Similar patterns of indirect influence via resilience and burnout further emphasized the key roles of these constructs in shaping teachers' experiences of technostress.

**Table 6**

*Hypothesized Path Coefficients of the Structural Model with Interaction Effect*

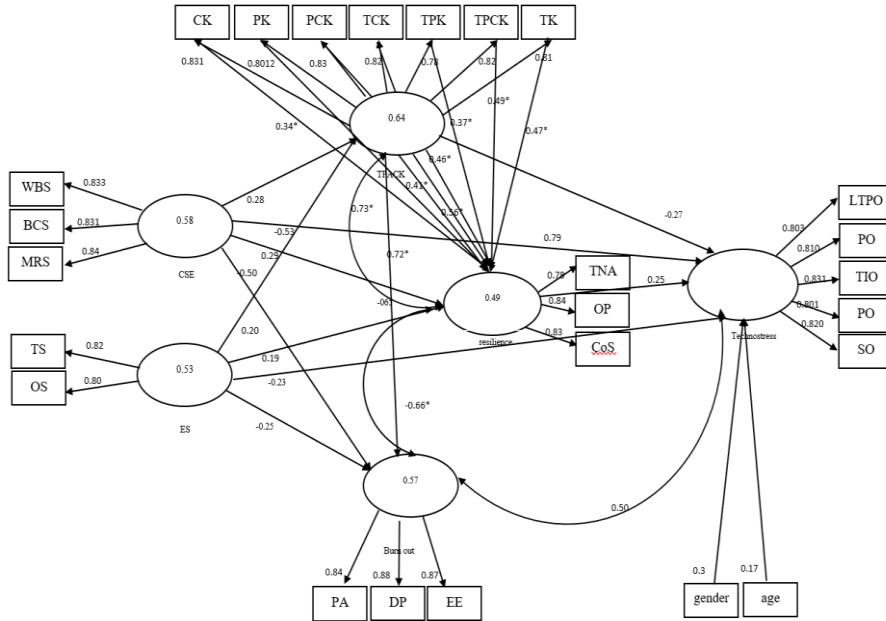
Hypotheses	Proposed Relationship	$(\beta)$	$t$	Status	$f^2$	$Q^2$	P	Bootstrapped 95% CI	
								LL	UL
Second-order latent variables									
H1	Computer self-efficacy teachers' $\rightarrow$ technostress	-0.19	3.45*	supported	0.03	0.01	0.00	-0.44	-0.07
H2	Environmental support $\rightarrow$ teachers' technostress	-0.14	4.56*	supported	0.01	0.00	0.00	-0.67	-0.18
H3	TPACK $\rightarrow$ teachers' technostress	-0.18	4.28*	supported	0.31	0.03	0.00	-0.35	0.05
H4	Resilience $\rightarrow$ teachers' technostress	-0.10	3.75*	supported	0.02	0.00	0.00	-0.26	0.04
H5	Burnout $\rightarrow$ teachers' technostress	0.13	3.35*	supported	0.05	0.01	0.00	0.07	0.16

H6	Computer-self efficacy → TPACK → teachers' technostress	-0.30	3.43*	supported	-	-	0.00	-0.26	-0.02
H7	Computer-self efficacy → Resilience → teachers' technostress	-0.43	4.02*	supported	-	-	0.00	-0.53	-0.19
H8	Computer-self efficacy → Burn out → teachers' technostress	-0.34	3.29*	supported	-	-	0.00	-0.41	-0.17
H9	Environmental support → TPACK → teachers' technostress	-0.29	3.45*	supported	-	-	0.00	-0.33	-0.03
H10	Environmental support → Resilience → teachers' technostress	-0.43	4.05*	supported	-	-	0.00	-0.32	-0.17
H11	Environmental support → Burn out → teachers' technostress	-0.38	3.22*	supported	-	-	0.00	-0.27	-0.10
	gender → technostress	0.05	1.12	unsupported	-	-	0.26	-0.04	0.13
	age → technostress	0.22	3.84*	supported	-	-	0.01	-0.31	-0.10

The size of these correlations indicates that the higher the teachers' computer self-efficacy, the less likely they are to experience burnout and technostress. According to Sulla et al (2022), a robust sense of self-efficacy enhances human achievement and personal well-being in various ways, including the capacity to manage stress effectively. In addition, instructors who are provided with support in their careers are more adept at handling diverse stress-related challenges.

**Figure 1**

*Outer Model for PLS-SEM Path Analysis*



### Discussion

This study investigated how Iranian EFL teachers' TPACK, burnout, and resilience mediate the relationship between computer self-efficacy, environmental support, demographics, and technostress. Results revealed that environmental support significantly and negatively reduces technostress, highlighting the protective role of a supportive, resource-rich atmosphere. Prior research confirms that inadequate support exacerbates technostress (Dong et al., 2019; Joo et al., 2016). Consistent with these results, Joo et al. (2016) underscored the critical role of institutional infrastructure, technical assistance, and collegial collaboration in alleviating technology-induced stress in educational settings. Stakeholders should thus prioritize creating inclusive environments that empower educators and foster sustainable digital engagement. The results indicated that overall and technical supports significantly strengthen teachers' TPACK, with collaborative peer relationships evidencing more impactful than infrastructure or training alone. Prior studies affirm that collegial support and technical assistance ease the burdens of technology integration, boosting computer self-efficacy and TPACK development (Koh et al., 2017; Krishnan, 2017; Yeşilyurt et al., 2016). Strong environmental backing cultivates technological literacy and confidence, encouraging meaningful engagement with educational technology while mitigating technostress. Such support creates a vital ecosystem where educators collaboratively navigate challenges and integrate technology with assurance.

The findings also indicated that both overall and technical support significantly enhance teachers' TPACK, with collaborative peer relationships proving more effective than infrastructure or training alone. Prior studies confirm that collegial support and technical assistance alleviate the challenges of technology integration, thereby boosting computer self-efficacy and TPACK development (Dong et al., 2020; Koh et al., 2017; Yeşilyurt et al., 2016). Strong environmental support fosters technological literacy and confidence, facilitating meaningful engagement with educational technology while reducing technostress. Such support cultivates a vital ecosystem where educators collaboratively address challenges and integrate technology with confidence.

The study found that computer self-efficacy predicts technostress through the mediation of TPACK, indicating that teachers with higher self-efficacy in using computers are more adept at integrating technology into their pedagogical practices. This integration enhances their understanding and application of TPACK, leading to reduced technostress. Consequently, teachers with greater computer self-efficacy are likely to experience lower levels of technostress (Daniilidou et al., 2020; Dong et al., 2020; Fathi & Saeedian, 2020). The results show that the path coefficient from computer self-efficacy to TPACK and technostress is significantly higher than that from environmental support to TPACK, underscoring the greater influence of self-efficacy over school support (Koh et al., 2017; Teo & Koh, 2010; Yeşilyurt et al., 2016). This emphasizes the need for educational leaders to implement training programs that focus on developing teachers' ICT problem-solving skills rather than merely providing procedural guidance for specific technological issues (Mun˘oz et al., 2017). Such strategies can enhance teachers' ICT literacy and confidence in technology use, thereby reducing technostress (Shu et al., 2011).

The relationship between technostress and burnout indicates that teachers experiencing higher levels of technology-related stress are more susceptible to burnout. Educational institutions must acknowledge the impact of technostress on teachers' well-being and implement strategies such as stress management programs and professional development to mitigate burnout. These findings align with those of Zhao et al. (2022) and Califf and Brooks (2020), suggesting that excessive workloads, inadequate training, low computer self-efficacy, and insufficient technical support contribute to teacher burnout. Additionally, the results indicate that technostress intensifies with advancing age, potentially due to prolonged digital exposure and performance demands, mirroring Huffman et al. (2013), who link this to adaptability deficits and cognitive overload in older cohorts. This finding highlights the need for implementing targeted interventions and support frameworks to help older teachers manage technostress more effectively. Conversely, the absence of a statistically significant association between gender and technostress suggests that men and women experience comparable levels of this phenomenon. Aligning with Özgür (2020), who reported that gender did not have a significant influence on technostress, the findings suggest that gender appears to exert a limited influence on technostress, highlighting the need to prioritize age-related determinants in both its theoretical conceptualization and practical management. Furthermore, these results call for future research to examine additional

demographic and psychological variables that may shape individuals' susceptibility to technostress. Creating a supportive environment that addresses teachers' technological concerns and provides adequate resources is essential for reducing burnout among EFL teachers (Mun˜oz et al., 2017; Shu et al., 2011).

### **Conclusion**

The study found that age negatively predicts technostress, while gender showed no significant direct relationship. This suggests that younger teachers, regardless of gender, benefit from early exposure to technology, resulting in greater experience and confidence in its use in teaching. Previous research supports the negative correlation between age and technostress (Özgür, 2020; Zhao, 2022). These findings are consistent with various gender-technology studies (Coklar et al., 2017; Krishnan, 2017) but contradict studies suggesting a gender advantage for males (Huffman et al., 2013; Venkatesh & Morris, 2000) or females (Krishnan, 2017). These discrepancies highlight the need to explore underlying gender-specific mechanisms.

This analysis offers several key contributions. First, it demonstrates that higher computer self-efficacy negatively predicts technostress, indicating that greater confidence in technology use can alleviate stress and anxiety. Additionally, superior TPACK negatively predicts burnout, suggesting that teachers proficient in integrating technology, pedagogy, and content knowledge experience reduced emotional exhaustion and depersonalization. These findings underscore the importance of addressing technostress creators, fostering supportive environments, and enhancing teachers' self-efficacy to promote effective technology integration in language education. The findings contribute to the literature on technostress in EFL teaching, offering critical insights for researchers, educators, and policymakers in formulating strategies to support teachers in navigating technological challenges and enhancing their well-being. By mitigating technostress creators, improving computer self-efficacy and TPACK, ensuring adequate environmental support, and addressing burnout, instructors can more efficiently incorporate technology into their instructional practices. Educational institutions and policymakers need to acknowledge these factors and implement appropriate interventions. Future research should investigate collegial support mechanisms to bolster teachers' computer efficacy and TPACK development, as well as explore alternative relationships related to technostress for further insights in the field.

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### Author' Biographies

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**Hoda Divsar** is currently an associate professor of ELT at University of Guilan, Rasht, Iran. She has dedicated over 17 years to the field of Teaching English as a Foreign Language (TEFL). Throughout her academic career, she has had the privilege of supervising numerous master's theses and PhD dissertations, guiding emerging scholars in their research endeavors. Her primary areas of interest include Structural Equation Modeling (SEM), critical thinking skills, and curriculum development.

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