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Relations of Technological Pedagogical Content Knowledge (TPACK) and Educational Settings Support with Iranian EFL Teachers' Technostress

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Abstract

Despite the incontrovertible benefits of modern technologies for the learning process, interest in understanding the dark side of technology use has increased among researchers. The present study aimed to investigate whether Technological Pedagogical Content Knowledge (TPACK) and educational settings support could predict Iranian EFL Teachers' Technostress. In so doing, from among high-school teachers and university lecturers of Islamic Azad University of Isfahan, required to integrate Information Communication Technology (ICT) in their teaching curriculum, 63 were chosen to participate in the study through convenience sampling. To gather the data, a Likert-type questionnaire was adopted from Dong et al. (2020). Regression analyses revealed that Iranian EFL Teachers' Technostress could be predicted from Technological Pedagogical Content Knowledge (TPACK), university support, and School Support. The implications for the findings are that school principals, as well as university administrators, need to support university lecturers and teachers and create university professional learning communities to improve their TPACK as well as computer efficacy to get along with teachers and university lecturers' technostress.

Key Words: School support, Technostress, Technological Pedagogical Content Knowledge (TPACK), University support

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Introduction

Despite the undeniable advantages of technology use in education, there has been growing concern about its negative impacts on the teaching process. Modern technologies have blurred the lines between individuals' personal and professional lives, leading to disruptions in their social and work-life balance (Salazar-Concha et al., 2021). Scholars who have delved into human's interaction with new technology have used the term 'technostress' to refer to the psychological strain, consisting of a range of negative feelings, thoughts, behaviors, and attitudes, experienced by individuals dealing with new technologies (Kupersmith, 1992; Weil & Rosen, 1997; Shu, et al., 2011; Jena, 2015). In the context of education, it arises from lacking the skills and expertise required to effectively incorporate technology into teaching, potentially leading to stress (Çoklar et al., 2016, Tarafdar et al.,2019).

Teaching has been known for being inherently stressful. Today's public-school teachers are facing increasing pressure due to the numerous responsibilities and rising expectations from students, parents, and school principals. The situation is even worse by the introduction of new technology and gadgets in educational settings. In response, and as emphasized by Shulman (1986), teachers are advised to acquire pedagogical content knowledge (PCK), which integrates content knowledge (CK) and pedagogical knowledge (PK) to develop suitable curricula that meet the various needs of students. In 2005, Koehler and Mishra proposed a combination of PK, CK, and technological knowledge (TK), resulting in technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPCK/TPACK). The TPACK includes the total knowledge and skills that teachers need so that they can effectively adopt educational technology in curriculum organization and design (Schmidt et al., 2009). TPACK serves as the preferred framework for guiding teachers in integrating new technology into their teaching practices (Dong et al., 2020; Soler-Costa et al., 2021).

Besides, the educational environment's support is seen as a key factor in encouraging teachers and university professors to efficiently use technology (Drossel et al., 2017; Eickelmann et al., 2017; Inan & Lowther, 2010). As Porter and Graham (2016) suggested, providing strong infrastructure, technological support, and pedagogical support can enhance teaching processes. Gaining a deeper insight into how teachers react to the adoption and use of technology can assist educators, parents, and particularly school administrators in supporting teachers who are incorporating technology into their teaching.

Literature Review

Various accounts of technostress have been provided in the literature. Panisoara and co-authors (2020) defined technostress as the outcome of inadequate adjustment stemming from individuals' inability to adapt to technology and the evolving demands associated with its use, leading to psychological and physical stress. Dong and colleagues (2020) described teachers' technostress as a contemporary ailment that hampers educators' capacity to effectively manage the increasing use of new technologies in teaching. According to the findings

by Estrada-Muñoz and team (2021), technostress can indicate an individual's or an organization's incapacity to utilize technology in a beneficial manner.

Regarding the link between social factors and the willingness to use technology among teachers, previous studies (e.g., Brown et al., 2010; Weber & Kauffman, 2011) indicated that mutual assistance can support technology integration by teachers. Some research has studied the integration of technology in higher education (Nepo, 2017; Wood et al., 2018). A number of studies, such as those by Joo et al. (2016) and Meristo and Eisenschmidt (2014), have explored how school support influences teachers' development of ICT skills in utilizing technology. However, there have been few, if any, studies which have investigated the obligatory adoption of technology and technostress in public and higher education institutional environments.

The main objective of the present study was to explore the relationship between Iranian EFL teachers' technostress, Technological Pedagogical Content Knowledge (TPACK), and school/university support. The study has endeavored to contribute to the literature by examining the factors influencing teachers' technostress and understanding their reluctance to use emerging technology in their teaching practices in the Iranian EFL context.

Research Questions

The following research questions were formulated in line with the objectives of the study.

RQ1: Is Technological Pedagogical Content Knowledge (TPACK) a predictor of Iranian EFL teachers' and lecturers' Technostress?

RQ2: Does schools' and universities' support predict Iranian EFL teachers' and lecturers' Technostress?

Methodology

In this section, the methodological issues of the research are elaborated.

Research Design and Context of the Study

This research was carried out in four high schools (Adl, Shahid Ehsani, Imam Sadeq [Pbuh], and Shahid Kharrazi) and the Islamic Azad University of Isfahan (Khorasgan) branch, Isfahan, Iran. The study took a correlational design in which the relationship between three variables, including Technological Pedagogical Content Knowledge (TPACK), educational setting support, and Technostress was examined among Iranian EFL teachers and lecturers.

Participants

Sixty-three English language teachers and lecturers, chosen respectively from four high schools and the Islamic Azad University of Isfahan (Khorasgan) branch, Isfahan, Iran, through convenience sampling, took part in the study. They included 28 males and 35 females. The teachers' experience of teaching ranged from 5 to 15 years, and they ranged in age from 28 to 38. The university lecturers were 29 and the high school teachers were 34 in number. They had

already been required by the school/university to integrate ICT in their teaching to their students, intermediate in level of English proficiency.

Data Collection Instrument

In order to gather the necessary data to provide answers to the research questions of the study, a Likert-type questionnaire was adopted from Dong, et al. (2020). The questionnaire comprised 20 items, to be rated on a 5-point Likert scale, with 1 indicating strongly disagree to 5 indicating strongly agree. The questionnaire was composed of three sub-scales, including administration and university support to evaluated how well teachers received technical training and adequate resources from their schools and university (6 items), technological pedagogical content knowledge (TPACK) (4 items), and technostress consisting of computer confidence, computer liking, and computer anxiety (10 items).

Data Collection Procedures

As the first step of conducting the study, the necessary permits were taken from authorities. Then, the researchers attended a number of high schools and the Islamic Azad University, Isfahan (Khorasgan) branch. The criterion for choosing the schools was employment of ICT tools in their pedagogy. The research was carried out during the winter term of the academic year of 2024-2025. Having received the participants' email addresses and contact numbers, the researchers sent the questionnaire (adopted from Dong, et al, 2020) to them through email to be filled out and sent back. The return rate was 96% and a total number of 58 questionnaires were filled out and sent back to the researchers. The returned questionnaires, subsequently, underwent statistical analysis.

Data Analysis

In order to analyze the gathered data, regression analyses were carried out to investigate whether teachers' and lecturers' technological pedagogical content knowledge and the educational setting support were predictors of teacher technostress.

Research Findings

The first question of the present study aimed to investigate whether Technological Pedagogical Content Knowledge (TPACK) is a predictor of Iranian EFL teachers' and lecturers' Technostress. To answer this research question, the scores obtained from part 4 of the questionnaire (technostress) and Technological Pedagogical Content Knowledge (TPACK) were analyzed using regression analysis. The results of the prediction analysis are presented below.

Table 1. *Coefficient Correlation of TPACK and Teacher's and Lecturers' Technostress*

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	3.213	2.830		1.136	.261
TPACK	2.134	.240	.765	8.889	.000

a. Dependent Variable: Technostress

As shown in Table 1, the coefficient correlation was found to be .765 for TPACK, which was considered to be statistically significant (P = .000).

Table 2. *Model Summary of the Correlation between TPACK and Technostress*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.765[a]	.585	.578	2.78287

a. Predictors: (Constant), TPACK

b. Dependent Variable: Technostress

Table 2 illustrates that the level of R is .765. The R Square value signifies how much of the technostress is explained by the predictor variable, which is TPACK. In the case of the present research, the value is 58.5%.

Table 3. *Regression Analysis of TPACK and Technostress*

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	611.918	1	611.918	79.015	.000[a]
	Residual	433.685	56	7.744		
	Total	1045.603	57			

a. Predictors: (Constant), TPACK

b. Dependent Variable: Technostress

A multiple regression was run to specify whether Technological Pedagogical Content Knowledge (TPACK) was a predictor of teacher technostress. It was observed that TPACK statistically significantly predicted OSRL, F (1, 95) = 79.01, $p < .000$, $R^2 = .58$, which was a moderate positive value of prediction. Figure 1 depicts the predictive power of TPACK on teacher technostress.

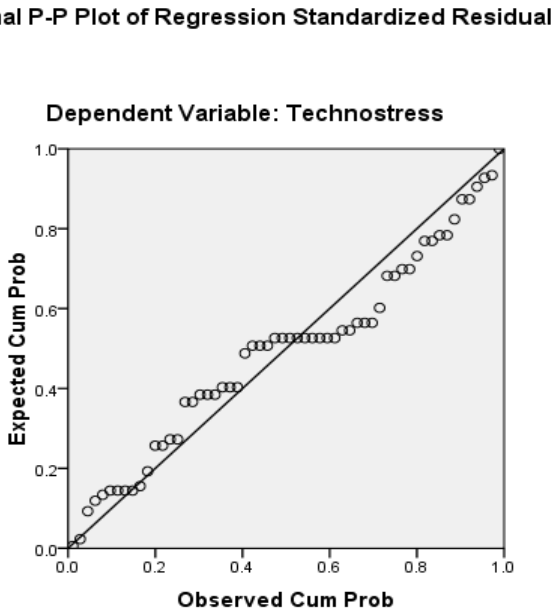

Figure 1. *A Regression Line to Predict Teacher Technostress from TPACK*

According to the statistical analyses presented above, it can be concluded that TPACK can be a predictor of technostress.

The second research question was to investigate whether educational settings could predict Iranian EFL teachers' and lecturers' Technostress. The data gathered by the questionnaire were analyzed, and the results are reported in Table 4 below.

Table 4. *Coefficient Correlation between Administration School Support and Teacher Technostress*

		Unstandardized Coefficients		Standardized Coefficients		
Model		**B**	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	12.955	2.624		4.937	.000
	AS	1.712	.291	.618	5.879	.000

a. Dependent Variable: Technostress

According to Table 4, the coefficient correlation was .618 for administration school support, which was considered to be statistically significant (p = .000).

Table 5. *Model Summary of the Correlation between School Support and Teachers' and Lecturers' Technostress*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.465[a]	.216	.202	3.82565

a. Predictors: (Constant), AS

b. Dependent Variable: Technostress

Table 5 reports the level of R to be .465. According to the Table, the R square value was found to be 21.6, which shows that administration school support could meaningfully predict teacher technostress.

Table 6. *Regression Analysis of Administration School Support and Teacher Technostress*

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	226.012	1	226.012	15.443	.000[a]
	Residual	819.591	56	14.636		
	Total	1045.603	57			

a. Predictors: (Constant), AS

b. Dependent Variable: Technostress

The results of multiple regression showed that administration school support was a predictor of technostress F (1, 95) = 15.44, $p < .000$, $R^2 = .21$. Figure 2 depicts the predictive power of administration school support for teacher technostress.

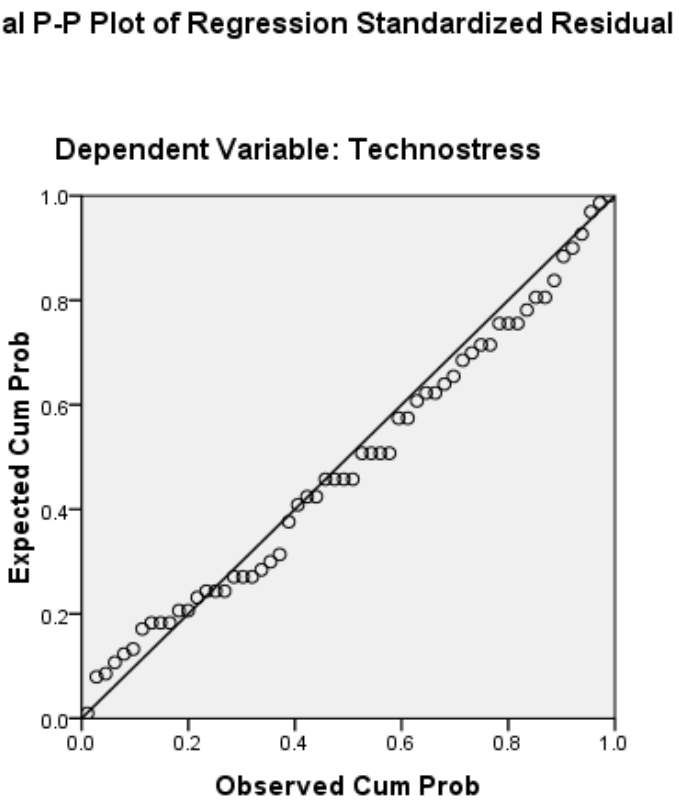

Figure 2. *A Regression Line to Predict Technostress from Administration School Support*

In addition to school support, the second research question also aimed to investigate whether university support could predict Iranian EFL lecturers' Technostress. For doing so, a regression analysis was administered. Table 7 presents the results of correlational analysis of the two variables.

Table 7. *Coefficient Correlation between University Support and Iranian EFL Teachers' Technostress*

	Unstandardized Coefficients		**Standardized Coefficients**		
Model	B	Std. Error	Beta	**T**	**Sig.**
1 (Constant)	15.852	3.171		4.999	.000
AS	1.433	.365	.465	3.930	.000

a. Dependent Variable: Technostress

Table 7 reveals a significant correlation between university support and Iranian EFL lecturers' Technostress. The model summary obtained from the analysis is presented in Table 8 below.

Table 8. *Model Summary of the Correlation between University Support and Iranian EFL Teachers' Technostress*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.618[a]	.382	.371	3.39795

a. Predictors: (Constant), AS

b. Dependent Variable: Technostress

Table 8 shows that the level of R is .61. The R square between university support and Iranian EFL lecturers' technostress was found to be 38.2, meaning that university support could meaningfully predict Iranian EFL lecturers' technostress.

Table 9. *Regression Analysis of University School Support and Iranian EFL Lecturers' Technostress*

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	295.287	1	295.287	22.039	.000[a]
	Residual	750.317	56	13.399		
	Total	1045.603	57			

a. Predictors: (Constant), CS

b. Dependent Variable: Technostress

The results obtained from multiple regression revealed that university support could predict Iranian EFL lecturers' Technostress significantly F (1, 95) = 22.03, p > .000, R^2 = .38. Figure 3 depicts the correlation between university support and Iranian EFL lecturers' Technostress.

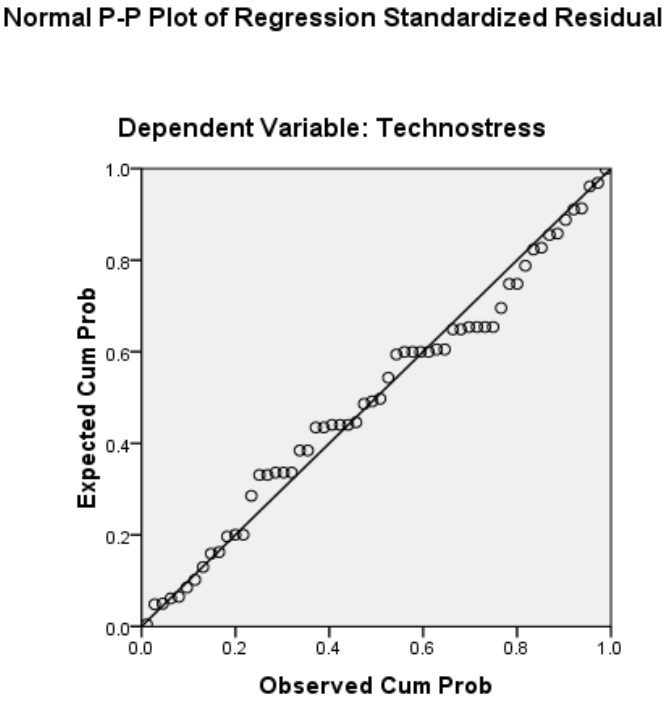

Figure 3. *A Regression Line to Predict Iranian EFL Lecturers' Technostress from University Support*

Discussion

The present research aimed to analyze the interplay among the latent variables of administration support, university support, and TPACK on the one hand and EFL teachers' and lecturers' technostress on the other. The findings indicated that TPACK had a significant predictive influence on teachers' and lecturers' technostress, serving as a potential means for alleviating educators' stress while utilizing technology in their pedagogy. This implies that teachers' TPACK has a determining role in helping them cope with the psychological stress resulting from technology unfamiliarity. The results are in line with previous research on the effects of TPACK on technostress (e.g., Dong, et al., 2020; Al-Fudail & Mellar, 2008; Joo et al., 2016). The findings also confirm the significant role of TPACK in reducing teachers' stress when using ICT in language classes. Furthermore, the results regarding the effectiveness of TPACK in controlling teachers' technostress resemble those of previous studies (Dong et al., 2020; Soler-Costa et al., 2021). The observations in the present research could stem from the fact that stress may occur when the required level of proficiency in using technology surpasses an individual's current technical competencies (Fuglseth & Sorebo, 2014). Educators could hence benefit from integrating various types of knowledge into a mosaic faculty informing their professional practice, as stipulated by the TPACK framework. Moreover, instructors should take into account diverse situational factors and accordingly devise appropriate methods to assess the practicality of the lesson plan.

As asserted by Koh et al. (2017), the required level of knowledge and design capabilities take long-term support to develop. The results of the current research revealed that the forms and strength of teacher professional development can enhance teachers' technostress, which lends support to their study. In line with Xie et al. (2017), educational programs should provide more opportunities for teachers to gain experiences, carry out more evaluation, and provide feedback to enhance their knowledge and ability, reducing their stress while employing ICT in classroom. The results of the present research also revealed that school support leads to reduction in teachers' technostress which is compatible with those of some previous studies, such as Joo et al. (2016), which showed that school support significantly affects teachers' stress related to technology use. The impact of school and university support on TPACK demonstrates that schools and universities may play a crucial role in improving teachers' technological competence, thereby helping to alleviate the stress experienced by them as integrating technology into their teaching. This suggests that school support may be influenced by TPACK, providing guidance to school principals on where to direct their support. These findings also align with Ertmer's (1999) theory, which suggests that second-order barriers to integrating ICT can either amplify or lessen the impact of the first-order barriers.

One of the previous studies whose findings resonate well with the results of the present research was the study by Dong, et al. (2019), which investigated the relationship among Chinese teachers' technostress, TPACK, computer self-efficacy, administration support, and collegial support. They found that administration support predicts teachers' computer self-efficacy, and collegial support predicts both teachers' TPACK and computer self-efficacy, which negatively predict their technostress. Finally, the current findings lend support to the study by Al-Fudail and Mellar (2008), which proposed a teacher-technology interaction model and found that teachers experienced technostress when there was a discrepancy between their characteristics and the school technology support.

Conclusions

The present study aimed to investigate whether TPACK, school, and university support could predict EFL teachers' and lecturers' technostress. The results revealed that these variables have a predictive effect on educators' experienced technostress. Teachers' technostress was confirmed to be influenced by TPACK, suggesting that teachers' confidence in using computers and their abilities to integrate technology significantly affect their stress levels while employing ICT in educational contexts. Additionally, settings support was proved to play a vital role in reducing teachers' technostress by empowering them in tackling unfamiliar technologies. The support, not only technical but also affective in nature, may assist in combating stressing factors in play as one is engaged with new technological facilities. The support could go even further by accompanying novice educators in dealing with less- or un-known, paving the way for experiencing the enjoyment inherent in applying novel technology in educational settings.

The findings of this study can offer recommendations and spark further research into teachers' technostress. Putting the existing literature into perspective, future studies can explore and devise innovative and constructive strategies for the educational staff to deal successfully with technostress. It seems beneficiary, if not obligatory, for school principals and college deans to provide their teaching staff with long-term professional development support. Such investment may most probably pay off the time, energy, and budget spent by training more efficient educators and recruiting them on board.

Like any other study, the present research suffers from a number of limitations and inadequacies. First, in this study, teachers' and lecturers' technostress was measured using Dong, et al.'s (2020) questionnaire. Future studies can investigate more detailed dimensions of technostress and other corresponding influential parameters. Another insufficiency was that the current study gathered data using a convenience sampling method, failing to encompass schools with varying levels of technology-integrated instruction. Conducting large-scale research on more representative samples is necessary to acquire more reliable and valid findings, especially considering the discrepancy in ICT support for teachers across different economic development levels in countries. Ultimately, further studies can examine additional factors, such as teachers' attitudes toward incorporating ICT in teaching, which could potentially affect their experienced levels of technostress.

References

Al-Fudail, M., & Mellar, H. (2008). Investigating teacher stress when using technology. *Computers & Education, 51*(3), 1103–1110.

Brown, S. A., Dennis, A. R., & Venkatesh, V. (2010). Predicting collaboration technology use: Integrating technology adoption and collaboration research. *Journal of Management Information Systems, 27*(2), 9–54.

Çoklar, A. N., Efilti, E., Şahin, Y. L., & Akçay, A. (2016). Investigation of Techno-Stress Levels of Teachers Who Were Included in Technology Integration Processes. *TOJET: The Turkish Online Journal of Educational Technology, Special Issue for INTE,* 1331–1339.

Dong, Y., Xu, C., Chai, C. S., & Zhai, X. (2020). Exploring the structural relationship among teachers' technostress, technological pedagogical content knowledge (TPACK), computer self-efficacy and school support. *The Asia-Pacific Education Researcher, 29*(2), 147–157.

Drossel, K., Eickelmann, B., & Gerick, J. (2017). Predictors of teachers' use of ICT in school: The relevance of school characteristics, teachers' attitudes and teacher collaboration. *Education & Information Technologies, 22*(2), 551–573.

Eickelmann, B., Gerick, J., & Koop, C. (2017). ICT use in mathematics lessons and the mathematics achievement of secondary school students by international comparison: Which role do school level factors play? *Education & Information Technologies, 22*, 1–25.

Ertmer, P. A. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(4), 47–61.

Estrada-Muñoz, C., Vega-Muñoz, A., Castillo, D., Müller-Pérez, S., & Boada-Grau, J. (2021). Technostress of Chilean Teachers in the Context of the COVID-19

Pandemic and Teleworking. *International Journal of Environmental Research and Public Health, 18*(10), 5458. https://doi.org/10.3390/ijerph18105458

Fuglseth, A. M., & Sorebo, O. (2014). The effects of technostress within the context of employee use of ICT. *Computers in Human Behavior, 40*(40), 161–170.

Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research and Development, 58*(2), 137–154.

Jena, R. K. (2015). Technostress in ICT enabled collaborative learning environment: An empirical study among Indian academician. *Computers in Human Behavior, 51*(Part B), 1116–1123. https://doi.org/10.1016/j.chb.2015.03.020

Joo, Y. J., Lim, K. Y., & Kim, N. H. (2016). The effects of secondary teachers' technostress on the intention to use technology in South Korea. *Computers & Education, 95*, 114–122.

Koehler, M. J., & Mishra, P. (2005). What happens when teachers design educational technology? The development of technological pedagogical content knowledge. *Journal of Educational Computing Research, 32*(2), 131–152.

Koh, J. H. L., Chai, C. S., & Lim, W. Y. (2017). Teacher professional development for TPACK-21CL: Effects on teacher ICT integration and student outcomes. *Journal of Educational Computing Research, 55*(2), 172–196.

Kupersmith, J. (1992). Technostress and the reference librarian. *Reference Services Review, 20:* 7–14.

La Torre, G., Esposito, A., Sciarra, I., & Chiappetta, M. (2019). Definition, symptoms and risk of technostress: A systematic review. *International Archives of Occupational and Environmental Health, 92*(1), 13–35.

Lee, J. C., & Xiong, L. N. (2021). *Investigation of the relationships among educational application (APP) quality, computer anxiety and student engagement.* Online Information Review.

Li, L., & Wang, X. (2021). Technostress inhibitors and creators and their impacts on university teachers' work performance in higher education. *Cognition, Technology & Work, 23*(2), 315–330.

Maier, C., Laumer, S., Weinert, C., & Weitzel, T. (2015). The effects of technostress and switching stress on discontinued use of social networking services: A study of Facebook use. *Information Systems Journal, 25*(3), 275–308.

Marchiori, D. M., Felix, A. C. S., Popadiuk, S., Mainardes, E. W., & Rodrigues, R. G. (2020). A relationship between technostress, satisfaction at work, organizational commitment and demography: Evidence from the Brazilian public sector. *Revista Gestão & Tecnologia, 20*(4), 176–201.

Meristo, M., & Eisenschmidt, E. (2014). Novice teachers' perceptions of school climate and self- efficacy. *International Journal of Educational Research, 67*, 1–10.

Nepo, K. (2017). The use of technology to improve education. In Child & youth care forum. *Springer US, 46*(2), 207–221.

Özgür, H. (2020). Relationships between teachers' technostress, technological pedagogical content knowledge (TPACK), school support and demographic variables: A structural equation modeling. *Computers in Human Behavior, 112*, 106–468.

Panisoara, I. O., Lazar, I., Panisoara, G., Chirca, R., & Ursu, A. S. (2020). Motivation and continuance intention towards online instruction among teachers during the COVID-19 pandemic: The mediating effect of burnout and technostress. *International Journal of Environmental Research and Public Health, 17*(21), 8002.

Pfügner, K., Baumann, A., & Maier, C. (2021). *Managerial Technostress: A Qualitative Study on Causes and Consequences.* In Proceedings of the 2021 on Computers and People Research Conference (pp. 63–70).

Porter, W. W., & Graham, C. R. (2016). Institutional drivers and barriers to faculty adoption of blended learning in higher education. *British Journal of Educational Technology, 47*(4), 748–762.

Qi, C. (2019). A double-edged sword? Exploring the impact of students' academic usage of mobile devices on technostress and academic performance. *Behavior & Information Technology, 38*(12), 1337–1354.

Ragu-Nathan, T. S., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. *Information Systems Research, 19*(4), 417–433.

Salazar-Concha, C., Ficapal-Cusí, P., Boada-Grau, J., & Camacho, L. J. (2021). Analyzing the evolution of technostress: A science mapping approach. *Heliyon, 7*(4), 706–726.

Salo, M., Salo, M., Pirkkalainen, H., Chua, C. E. H., & Koskelainen, T. (2022). Formation and mitigation of technostress in the personal use of IT. *Mis Quarterly, 46*.

Sarabadani, J., Carter, M., & Compeau, D. (2018). *10 years of research on technostress creators and inhibitors: Synthesis and critique.* Americas Conference on Information Systems.

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK) the development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education, 42*(2), 123–149.

Shu, Q., Tu, Q. & Wang, K. (2011). The impact of computer self-efficacy and technology dependence on computer- related technostress: A Social cognitive theory perspective. *International Journal of Human-Computer Interaction, 27*(10), 923–939.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.

Soler-Costa, R., Moreno-Guerrero, A. J., López-Belmonte, J., & Marín-Marín, J. A. (2021). Co-word analysis and academic performance of the term TPACK in web of science. *Sustainability, 13*(3), 1481.

Tarafdar, M., Cooper, C. L., & Stich, J. F. (2019). The technostress trifecta-techno eustress, techno distress and design: Theoretical directions and an agenda for research. *Information Systems Journal, 29*(1), 6–42.

Xie, K., Min, K. K., Cheng, S. L., & Luthy, N. C. (2017). Teacher professional development through digital content evaluation. *Educational Technology Research and Development, 65*(4), 1–37.

Weber, D. M., & Kauffman, R. J. (2011). What drives global ICT adoption? Analysis and research directions. *Electronic Commerce Research and Applications, 10*(6), 683–701.

Weil, M. & Rosen, L. (1997). *Techno-Stress: Coping with Technology @work @home @play.* New York, NY: J. Wiley.

Wood, A. J., Graham, M., Lehdonvirta, V., & Hjorth, I. (2018). Good gig, bad gig: Autonomy and algorithmic control in the global gig economy. *Work, Employment and Society,* 1–20.