Differences in Perception of Technostress and Factors Influencing Technostress by University Faculty in China

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This study aimed to explore the differences in the perception of technostress (techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty) and the factors influencing technostress (TPACK, technology self-efficacy, and school support) by university faculty in China. Demographic factors including gender, age, career, professional title, and teaching subject were used to explore the differences. A questionnaire survey was used to collect 1,133 data from six universities. The results indicated differences in the faculty's perception of technostress by all demographic factors. Differences were also shown in their perception of TK and TCK by gender and subject; in TPK, TCK, and TPCK by age, career, and professional title; in technology self-efficacy by subject; and in school support by age and career. In addition, TPACK and school support were proved to have positive or negative impacts on technostress, while technology self-efficacy showed no impact. These findings provided support for the faculty and policymakers of higher education.

Keywords: School Support, Technostress, TPACK, Technology Self-Efficacy

Introduction

Universities in China have been promoting the use of Information and Communication Technology (ICT) in teaching, such as mobile teaching and learning, blended learning, and so on (Qi, 2019; Wang & Li, 2019). However, many faculty in China lack the knowledge or skills to use ICT well (Huang, Xiang, & Zhang, 2021). Consequently, they are exposed to an increased risk of stress caused by technology, which is called technostress.

Technostress may have negative impacts on the faculty, such as technical anxiety, emotional instability, lack of self-confidence, and low work performance (Boyer-Davis, 2020; Mullen & Wedwick, 2008). Therefore, in the past decades, scholars in America, Korea, Japan, Turkey, Spain, and other countries (Eom, Lee, & Lee, 2020; Jena & Mahanti, 2014; Salanova, Llorens, & Cifre, 2013) have carried out some research on their faculty's technostress.

It has been proved that the faculty's perception of technostress would vary by certain demographic factors, such as age, gender, career (teaching experience), professional position, and teaching subject (Boyer-Davis, 2020; Li & Wang, 2021; Özgür, 2020). In addition, technological pedagogical and content knowledge (TPACK), technology self-efficacy, and school support have been explored as the major factors that might influence the faculty's perception of technostress (Eom et al., 2020; Huang et al., 2021; Özgür, 2020).

In China, technostress is a relatively understudied topic with few studies on higher education (Li & Wang, 2021). Previous studies on technostress in China were mainly in the non-educational fields, such as government and enterprises (Tu, Wang, & Shu, 2005; Zhao, Xia, & Huang, 2020). Among the limited studies in the field of education, the technostress by primary and secondary school teachers held more weight (Yang, Yang, Yuan, & Li, 2017), while university faculty's technostress gained little attention (Li & Wang, 2021; Wang & Li, 2009).

Therefore, further research was needed to explore the level of technostress perceived by university faculty in China and find out the factors that influence their technostress. Three research questions were addressed in this study. First, what are the differences in the perception of technostress by university faculty in China? Second, what are the differences in the perception of the factors influencing technostress by university faculty in China? Third, what are the impacts of TPACK, technology self-efficacy, and school support on the technostress perceived by university faculty in China?

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Theoretical Background

Faculty's Technostress

Technostress was proposed by Craig Brod, who defined technostress as "a modern disease of adaptation caused by an inability to cope with the new computer technology in a healthy manner" (Brod, 1984, p. 16). Some scholars agreed with him to treat technostress as a disease (Ayyagari, Grover, & Purvis, 2011; Arnetz & Wiholm, 1997), while some other scholars (Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2007; Weil & Rosen, 1997) offered another definition with a broader meaning that technostress referred to any negative impact of technology directly or indirectly on one's attitude, thought, behavior or body.

There are five ***components of technostress*** (Boyer-Davis, 2020; Tarafdar et al., 2007): techno-overload (refers to the condition that faculty are forced to work more and faster), techno-invasion (ICT infringes upon and compels professors to stay connected during non-teaching hours, breaking the work-life balance), techno-complexity (a product of the increased time and effort spent by faculty to update their skills and learn how to operate new technology), techno-insecurity (faculty concerns that they will be replaced by technology or those with more advanced ICT skills), and techno-uncertainty (the high-speed turnover of technology and the indeterminate future outcomes may lead to results such as university closure and budget cuts).

Differences in Faculty's Technostress

Differences were found in the faculty's perception of technostress by various demographic variables (Boyer-Davis, 2020; Li & Wang, 2021; Özgür, 2020). Specifically, most previous studies explored that the faculty who were old or with long careers perceived higher levels of technostress (Boyer-Davis, 2020; Burton-Jones & Hubona, 2005). Male and female faculty perceived different levels of technostress in some studies (Jena & Mahanti, 2014; Penado, Rodicio-García, RíoSDe-Deus, & Mosquera-González, 2021), while other studies found no statistically significant differences (Hsiao, 2017; Özgür, 2020). In addition, professors were proven to perceive a higher level of technostress than lecturers (Boyer-Davis, 2020). Previous studies on faculty's technostress by teaching subject were few. However, it was found that the faculty of humanities and social science showed more willingness and confidence in using technology than those of natural science and engineering (Hennessy, Ruthven, & Brindley, 2005; Li & Zhang, 2018). Since confidence would help to reduce stress (Compeau & Higgins, 1995), the differences in faculty's perception of technostress might be predicted by teaching subject.

Factors Influencing Faculty's Technostress

TPACK is a form of teachers' professional knowledge, which comes from multiple knowledge based on technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK). Teachers' technical integration ability comes from the integration of TK, PK, and CK (Mishra & Koehler, 2006). In addition, pedagogical and content knowledge (PCK), technological and pedagogical knowledge (TPK), technological and content knowledge (TCK) are further integrated to make the TPACK structure (Koh & Divaharan, 2013). Most previous studies (Al-Fudail & Mellar, 2008; Eom et al., 2020; Özgür, 2020) proved a negative impact of TPACK on faculty's perception of technostress.

Technology self-efficacy is a personal assessment of one's ability of using technology to accomplish a certain task (Compeau & Higgins, 1995; Tian, 2017). The faculty with a high level of self-efficacy can teach well in any situation and show more willingness to use ICT (Eom & Yoon, 2005). Most previous studies (Dong, Xu, Chai, & Zhai, 2020; Qi, 2019) found that technology self-efficacy would negatively predict the faculty's perception of technostress.

School support came from 'organization support,' which was viewed as a coping strategy and one of the most effective ways for employees to reduce their work pressure (Halbesleben & Ronald, 2006). Previous studies (Al-Fudail & Mellar, 2008; Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008) pointed out that school support was necessary for the faculty to integrate ICT in their teaching. It has been proved that the lack of school support would lead to technostress (Salanova et al, 2013).

Method

Participants

The participants in this study were 1,200 faculty members from six universities in China, with 200 faculty members from each university. Based on the purpose of this study, two universities were in the central areas of China, the other

four were in the northern, southern, western, and eastern areas separately. The six universities were all four-year public universities, providing their faculty with various educational technology in their teaching process. They also offered training programs to help their faculty improve their knowledge and skills in using ICT.

After removing the invalid data, such as the 'straight line' answers, missing data, or unreasonably fast done ones, 1,133 valid data were collected finally. 446 (39%) of the faculty participating in the study are male and 687 (61%) are female. 235 (21%) of the faculty aged under 30, 705 (62%) aged from 31 to 45, and 193 (17%) aged over 45. There are 540 faculty (48%) with less than 10 years of higher education teaching experience, 420 (37%) with 10 to 20 years, and 173 (15%) with more than 20 years of teaching experience. Those who have the professional positions of teaching assistant, lecturer, associate professor, and professor are 269 (24%), 537 (47%), 269 (24%), and 58 (5%) respectively. 598 (53%) of the participants teach the lessons of humanities and social science, 283 (25%) of natural science and engineering, and 252 (22%) of arts and physical education.

Instruments

Two instruments were used in this study: A Questionnaire of Technostress (QT) and a Questionnaire of Factors Influencing Technostress (QFIT). All the items in QT and QFIT were measured by a five-point Likert method ranging from 1 to 5. 1 stood for 'strongly disagree,' and 5 for 'strongly agree.' QT was made based on ***The Technostress Creator Scale*** developed by Tarafdar et al. (2007), which consisted of 23 items with five sub-scales indicating the components of technostress. Cronbach's α as the internal consistency coefficient of all sub-scales in QT and the total was from .81 to .93, which showed an internal consistency. Since the original scale was written in English and was designed for the employees in companies, translation and rewording were used to produce the Chinese version, and confirmatory factor analysis (CFA) was conducted to test the validity of the scale. The results showed a good fit of QT (χ^2/df = 2.89, RMSEA = .076, GIF = .928, AGFI = .935, and CFI = .931).

QFIT consisted of three scales. ***The TPACK Scale*** had 14 items with four dimensions TK, TCK, TPK, and TPCK (Archambault & Barnett, 2010; Huang, Gao, & Wang, 2013). ***The Technology Self-Efficacy Scale*** had ten items with only one dimension (Compeau & Higgins, 1995; Tian, 2017). ***The School Support Scale*** had two dimensions (administration support and colleague support) with three items for each dimension (Dong et al., 2020; Eom et al., 2020; Lam, Cheng, & Choy, 2010). Cronbach's α as the internal consistency coefficients of all sub-scales in QFIT and the total were over .80, and the results in CFA showed a good fit ($3 < \chi^2/df < 5$, RMSEA, GIF, AGFI, & CFI > .90).

Data Analysis

The editing, delivery, and data collection of the questionnaire were made by an online survey tool called 'Questionnaire Star' (https://www.wjx.cn/). The collected data from the questionnaire survey were analyzed by SPSS 26.0 and AMOS 24.0. Specifically, to answer the first and second questions, independent-sample *t*-tests were conducted to explore the differences in the perception of technostress and the factors influencing technostress between male and female university faculty in China. One-way ANOVAs were conducted to explore the differences in their perception of technostress and factors influencing technostress by age, career, professional position, and teaching subject respectively. Scheffé was used in the Post Hoc multiple comparisons. In addition, to answer the third question, a multiple regression analysis was conducted to find out the impacts of TPACK, technology self-efficacy, and school support on the technostress perceived by university faculty in China.

Results

Differences in Perception of Technostress

Table 1 shows that the means of all dimensions of technostress were over 3 (maximum = 5), indicating that university faculty in China perceived a high level of technostress, among which, techno-invasion was the highest (M = 3.76, SD = .79), while techno-insecurity was the lowest (M = 3.08, SD = .81). Differences were found in the faculty's perception of technostress by gender, age, career, professional position, and teaching subject. Male faculty perceived a higher level of techno-insecurity than females. The faculty who were under 30 years old, those who had less than 10 years of teaching experience, or teaching assistants perceived a lower level of technostress. However, it was not the older, the longer teaching experience the faculty had, or the higher the professional position of the faculty, the greater technostress he or she would perceive. In addition, the faculty of humanities and social science perceived the highest level of techno-overload, while those of arts and physical education perceived the highest level of techno-insecurity.

Table 1 *Differences in Perception of Technostress by Demographic Factors*

Index	*n*	Techno-overload				Techno-invasion				Techno-complexity				Techno-insecurity				Techno-uncertainty			
		M (SD)	*t / F*	*df*	*Scheffé*	*M (SD)*	*t / F*	*df*	*Scheffé*	*M (SD)*	*t / F*	*df*	*Scheffé*	*M (SD)*	*t /F*	*df*	*Scheffé*	*M (SD)*	*t /F*	*df*	*Scheffé*
a	446	3.64 (.90)	-1.72	1131		3.74 (.84)	-.49	1131		3.29 (.86)	1.84	1131		3.16 (.88)	2.85 **	1131		3.76 (.81)	1.10	1131	
b	687	3.73 (.79)				3.77 (.75)				3.19 (.83)				3.02 (.75)				3.71 (.78)			
c	235	3.42 (.88)	16.52 **	2	c < d, e d > e	3.54 (.81)	11.99 **	2	c < d, e	3.10 (.84)	7.91 **	2	c, d < e	3.02 (.86)	1.87	2		3.61 (.86)	7.29 **	2	c, d < e
d	705	3.76 (.81)				3.82 (.78)				3.22 (.85)				3.11 (.79)				3.72 (.78)			
e	193	3.80 (.83)				3.81 (.76)				3.42 (.82)				3.10 (.80)				3.90 (.74)			
f	540	3.56 (.83)	14.76 **	2	f < g	3.66 (.79)	9.76 **	2	f < g	3.13 (.82)	7.18 **	2	f < g, h	3.05 (.83)	4.72 **	2	g > h	3.66 (.78)	4.71 **	2	f < h
g	420	3.85 (.81)				3.88 (.77)				3.32 (.85)				3.16 (.78)				3.77 (.80)			
h	173	3.72 (.87)				3.77 (.80)				3.32 (.88)				2.95 (.80)				3.86 (.77)			
i	269	3.46 (.84)	9.73 **	3	i < j, k	3.59 (.81)	5.81 *	3	i < j, k	3.16 (.84)	1.79	3		3.07 (.82)	.082	3		3.67 (.83)	1.72	3	
j	537	3.78 (.76)				3.82 (.74)				3.21 (.81)				3.07 (.75)				3.72 (.75)			
k	269	3.77 (.86)				3.81 (.83)				3.31 (.85)				3.09 (.84)				3.78 (.78)			
l	58	3.63 (1.11)				3.86 (.89)				3.23 (.84)				3.07 (1.13)				3.88 (.95)			
m	598	3.75 (.80)	3.33 *	2	m > n	3.76 (.76)	.048	2		3.25 (.83)	1.65	2		3.05 (.76)	5.42 *	2	m, n < o	3.69 (.75)	1.36	2	
n	283	3.59 (.89)				3.75 (.80)				3.15 (.94)				3.01 (.87)				3.77 (.87)			
o	252	3.69 (.86)				3.77 (.83)				3.27 (.78)				3.22 (.82)				3.77 (.79)			
total	1,133	3.69 (.84)				3.76 (.79)				3.23 (.85)				3.08 (.81)				3.73 (.79)			

Note. a = male; b = female; c = under 30 yrs old; d = 30 to 45 yrs old; e = over 45 yrs old; f = less than 10 yrs; g = 10 to 20 yrs; h = over 20 yrs; i = teaching assistant; j = lecturer; k = associate professor; l = professor; m = humanities & social science; n = natural science & engineering; o = arts & physical education.
*p < .05. **p < .01.

Differences in Perception of Factors Influencing Technostress

Differences were found in the perception of TPACK, technology self-efficacy, and school support by all the demographic factors. Specifically, the faculty perceived a generally high level of TPACK, among which, the level of TPK was the highest (M = 3.80, SD = .75), while TK was the lowest (M = 3.53, SD = .82). The levels of TPK, TCK, and TPCK were relatively high among the faculty who were over 45 years old, those who had more than 20 years of teaching experience, or professors. In the dimensions of TK and TCK, male faculty perceived higher levels than that of female, and faculty of natural science and engineering perceived a higher level than that of humanities and social science.

University faculty in China perceived a generally high level of technology self-efficacy, but no significant differences were found by gender, age, career, and professional position. The faculty of humanities and social science perceived a lower level of technology self-efficacy than those of natural sciences and engineering. In addition, no statistical differences were found in their perception of school support by gender and teaching subject. However, the faculty aged from 30 to 45, and those who had 10 to 20 years of teaching experience perceived lower levels of colleague support and administration support.

Table 2 *Differences in Perception of Factors Influencing Technostress by Demographic Factors*

Index	*n*	TPACK															
		TK				TCK				TPK				TPCK			
		M (SD)	*t / F*	*df*	*Scheffé*	*M (SD)*	*t / F*	*df*	*Scheffé*	*M (SD)*	*t / F*	*df*	*Scheffé*	*M (SD)*	*t / F*	*df*	*Scheffé*
a	446	3.68 (.81)	4.70 ***	1131		3.66 (.81)	3.05 **	1131		3.81 (.78)	.68	1131		3.79 (.77)	1.28	1131	
b	687	3.45 (.81)				3.51 (.77)				3.78 (.73)				3.73 (.75)			
c	235	3.56 (.85)	.43	2		3.58 (.83)	.12	2		3.71 (.84)	5.20 **	2	c, d < e	3.66 (.86)	3.11 *	2	c < e
d	705	3.55 (.79)				3.56 (.77)				3.79 (.73)				3.76 (.74)			
e	193	3.49 (.87)				3.59 (.80)				3.94 (.70)				3.84 (.67)			
f	540	3.56 (.79)	.56	2		3.59 (.78)	.68	2		3.76 (.76)	3.07 *	2	f < h	3.74 (.78)	.71	2	
g	420	3.53 (.83)				3.53 (.80)				3.78 (.74)				3.75 (.72)			
h	173	3.49 (.87)				3.58 (.78)				3.92 (.73)				3.82 (.77)			
i	269	3.56 (.83)	2.50	3		3.57 (.81)	3.36	3	i, j < l	3.72 (.82)	3.13	3	i < l	3.69 (.84)	2.83	3	i < l

j	537	3.51 (.77)				3.53 (.74)	*			3.79 (.71)	*			3.74 (.71)	*		
k	269	3.53 (.83)				3.57 (.81)				3.82 (.73)				3.80 (.75)			
l	58	3.81 (1.0)				3.87 (.96)				4.05 (.87)				3.99 (.83)			
m	598	3.46 (.78)				3.49 (.76)				3.77 (.69)				3.75 (.71)			
n	283	3.68 (.85)	7.50 **	2	m < n	3.70 (.81)	7.36 **	2	m < n	3.86 (.79)	1.28	2		3.81 (.79)	1.21	2	
o	252	3.57 (.83)				3.61 (.82)				3.77 (.82)				3.71 (.82)			
total	1,133	3.53 (.82)				3.57 (.79)				3.80 (.75)				3.76 (.76)			

(to be continued)

Table 2 *Differences in Perception of Factors Influencing Technostress by Demographic Factors*

(continued)

Index	*n*	Technology Self-Efficacy				School Support: Administration Support				School Support: Colleague Support			
		M (SD)	*t* / *F*	*df*	*Scheffé*	*M (SD)*	*t* / *F*	*df*	*Scheffé*	*M (SD)*	*t* / *F*	*df*	*Scheffé*
a	446	3.70 (.68)	2.0*	1131		3.42 (.92)	.68	1131		3.58 (.88)	.98	1131	
b	687	3.68 (.65)				3.38 (.85)				3.53 (.87)			
c	235	3.60 (.77)				3.45 (.85)				3.64 (.82)			
d	705	3.68 (.64)	1.25	2		3.37 (.90)	1.33	2		3.48 (.89)	5.71**	2	c, e > d
e	193	3.65 (.63)				3.45 (.83)				3.68 (.86)			
f	540	3.66 (.68)				3.46 (.85)				3.62 (.83)			
g	420	3.66 (.65)	.056	2		3.31 (.92)	3.34*	2	f > g	3.42 (.91)	7.25**	2	f, h > g
h	173	3.64 (.67)				3.43 (.84)				3.64 (.89)			
i	269	3.63 (.71)				3.47 (.87)				3.63 (.85)			
j	537	3.64 (.62)	1.36	3		3.38 (.86)	2.63	3		3.51 (.84)	4.07**	3	k < l
k	269	3.67 (.66)				3.32 (.89)				3.47 (.93)			
l	58	3.82 (.85)				3.63 (.96)				3.83 (.91)			
m	598	3.62 (.63)				3.40 (.86)				3.54 (.85)			
n	283	3.75 (.71)	3.57**	2	m < n	3.46 (.90)	1.30	2		3.63 (.87)	2.65	2	
o	252	3.63 (.69)				3.34 (.90)				3.46 (.94)			
total	1,133	3.66 (.66)				3.40 (.88)				3.55 (.88)			

Note. a = male; b = female; c = under 30 yrs old; d = 30 to 45 yrs old; e = over 45 yrs old; f = less than 10 yrs; g = 10 to 20 yrs; h = over 20 yrs; i = teaching assistant; j = lecturer; k = associate professor; l = professor; m = humanities & social science; n = natural science & engineering; o = arts & physical education.
*p < .05. **p < .01. ***p < .001.

Impacts of TPACK, Technology Self-efficacy, and School Support on Technostress

Results in Table 3 showed that TK had a positive impact on techno-insecurity, and TPK had positive impacts on techno-overload, techno-invasion, techno-complexity, and techno-uncertainty. Technology self-efficacy showed positive impacts on techno-overload, techno-invasion, and techno-uncertainty. Administration support had a negative impact on techno-invasion, but positive impacts on techno-complexity, techno-insecurity, and techno-uncertainty. Colleague support had a negative impact on techno-insecurity.

Table 3 *Impacts of TPACK, Technology Self-Efficacy, and School Support on Technostress*

Index		*R*	R^2	*df*	*F*	*B*	*β*	*t*
Techno -overload	①	.26	.07	7	12.00**	.04	.04	.84
	②					-.06	-.06	-1.00
	③					.20	.18	2.73**
	④					.03	.03	.46
	⑤					.16	.13	2.90**
	⑥					.00	.00	.001
	⑦					-.05	-.05	-1.15
Techno -invasion	①	.36	.13	7	23.32**	.04	.04	.91
	②					-.04	-.04	-.71
	③					.33	.31	4.95**
	④					.00	.00	-.06
	⑤					.17	.14	3.39**
	⑥					-.07	-.08	-2.1*
	⑦					-.07	-.07	-1.8
Techno -complexity	①	.13	.02	7	2.91**	.03	.03	.65
	②					-.11	-.11	-1.75
	③					.20	.18	2.65**
	④					-.09	-.08	-1.29
	⑤					-.05	-.04	-.93
	⑥					.12	.12	2.96**
	⑦					-.01	-.02	-.35
Techno -insecurity	①	.20	.04	7	6.74**	.11	.11	2.28*
	②					.05	.05	.86
	③					-.08	-.07	-1.13
	④					-.03	-.03	-.40
	⑤					.13	.10	2.37*
	⑥					.13	.14	3.35**

	⑦					-.17	-.19	-4.43**
Techno -uncertainty	①	.44	.20	7	38.92**	.05	.05	1.23
	②					.04	.04	.75
	③					.22	.21	3.44**
	④					.08	.08	1.29
	⑤					.08	.07	1.65
	⑥					.07	.08	1.97*
	⑦					.01	.01	.15

Note. ① TK ② TCK ③ TPK ④ TPCK ⑤ technology self-efficacy ⑥ administration support ⑦ colleague support
*p < .05. **p < .01.

Discussion

First, this study found that male faculty perceived a higher level of techno-insecurity than females. This is consistent with some previous studies (Hsiao, 2017; Xu, 2007) while differentiating from other studies (Li & Wang, 2021; Özgür, 2020). Men are more worried about losing their jobs because the expectations for their working performance were much higher than for women in traditional Chinese culture (Xu, 2007). Lecturers and associate professors were found to perceive relatively high levels of techno-overload and techno-invasion. It coincides with previous studies on the relationship between professional positions and teachers' stress (Lai, Zou, & Chen, 2010; Wang et al., 2015). In the professional position system of higher education in China, teaching assistants belong to the lowest rank, and are incapable of teaching certain lessons (Tian, 2006), while professors always focus on scientific research with few teaching tasks (Xu, 2007). Therefore, lecturers and associate professors had to do the most teaching tasks (Lai et al., 2010). The faculty of humanities and social science perceived a relatively higher level of techno-overload, while those of arts and physical education perceived the highest level of techno-insecurity. This finding coincides with the results of some studies examining the relationship between the teaching subjects and technology, or between the teaching subjects and teachers' perception of stress (Kang, Liu, & Zhang, 2005; Tang, 2006; Xie, 2010). Faculty in humanities and social science preferred to use the ICT-enhanced teaching methods to better perform teaching activities, such as communication, discussion, and practice (Kang et al., 2005). In addition, since ICT was well developed in majors of arts and physical education, which brought the faculty a threat of being replaced by technology (Xie, 2010). Take music lessons, for instance, a music software could be used to analyze and correct the students' intonation in a music class. In this case, the music teacher might be replaced by the software (Tang, 2006).

Second, this study found that the faculty perceived the lowest TK of the TPACK framework. This is consistent with the study by Xu, Fu, and Hou (2018) that university faculty in China had limited technical knowledge to deal with the problems of using ICT. As the basic knowledge required to use technical tools such as computers and software, TK plays a vital role in using ICT in teaching (Koehler & Mishra, 2005). It has been suggested that taking training programs is the most effective way for teachers to increase their TK in using ICT (Wang & Jiao, 2013). In addition, the faculty who were old or with long careers perceived relatively higher levels of TPK, TCK, and TPCK. This finding is consistent with Eom et al. (2020)'s study. Due to the rich teaching experience, teachers with long teaching experience could choose appropriate technology, and effectively integrate their technical skills and pedagogic knowledge to improve the teaching effect. Male faculty perceived a higher level of technology self-efficacy than female, and faculty of humanities and social science perceived a lower level than that of faculty in natural science and engineering. According to Yue (2008), female faculty in China were always afraid of using ICT because they thought they were not able to deal with technical problems in the teaching progress. In addition, this study found that the professors perceived a higher level of colleague support. Because professors were always old, they would show less willingness of using ICT in their teaching process since they lacked TK, and they preferred using traditional teaching methods (Qiu, 2008; Xu, Dong, & Lu, 2015). Therefore, they often sought support from associate professors, lecturers, and teaching assistants who were generally younger and better educated by ICT (Xu et al., 2018).

Third, this study found positive impacts of TPK on technostress, which is opposite to most previous studies (Al-Fudial & Mellar, 2008; Dong et al., 2020; Özgür, 2020; Penado et al., 2021). According to Tarafdar et al. (2007), the more ICT people used the higher level of technostress they might feel. Since technostress was caused by the inability to use technology well, there would be no technostress if a person did not use ICT at all. From this perspective, TPK may positively predict technostress, because faculty who perceive a higher level of TPK may use ICT more frequently and thoroughly. Therefore, there will be more difficulties for them to integrate educational technology with pedagogical knowledge, and they may feel greater technostress accordingly. As for the impact of technology self-efficacy on technostress, most previous studies found a negative impact (Dong et al., 2020; Eom et al., 2020; Özgür, 2020). However, the findings in this study showed no statistically significant impacts on the technostress perceived by university faculty in China. Zhao (2017) pointed out that the faculty's willingness of using ICT might not come from their computer self-efficacy but from the school's policies or regulations. In addition, administration support was found to positively predict techno-complexity, techno-insecurity, and techno-uncertainty. This finding is opposite of previous studies (Joo, Lim, & Kim, 2016; Oncu, Delialioglu, & Brown, 2008). Tong (2007) proposed that the administration support offered by universities in China was always invalid, such as some technical training programs were made without any classification of the training contents, which was called 'one size fits all.' In addition, the

training programs should be produced according to the teachers' real needs and provided in the way they wanted. Only in this way could the faculty's real needs be met, and the negative effects caused by technostress be reduced (Eom et al., 2020).

Conclusion

The differences explored in this study suggest universities in China should make policies based on the diversity of their faculty. Specifically, more training programs about the basic knowledge and skills of using ICT should be offered for the female faculty. The workload should be reduced for lecturers, associate professors, and those of humanities and social science. ICT should not be over-used in some lessons of arts and physical education, avoiding the faculty from being replaced by ICT. In addition, more colleague support should be offered for the faculty aged from 30 to 45, and those with 10 to 20 years of teaching experience.

Some limitations are needed to be considered and further studied in the future. First, the participants in this study could not fully represent university faculty in China. Therefore, more in-depth and extensive research with a larger number of participants will be needed. In addition, due to the vast territory of China, research about regional differences will be a worthwhile topic. Second, only quantitative research methods were used in the present study, which may lead to incomplete research results. Qualitative research methods such as interviews and observation will be required to offer supplements and new findings for this study.

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