Check for updates

# A multigroup analysis of factors underlying teachers' technostress and their continuance intention toward online teaching

Hui-Lien Chou, Chien Chou [*]

*Institute of Education, National Yang Ming Chiao Tung University, Taiwan*

ABSTRACT

Online teaching has been implemented in response to the COVID-19 pandemic. Nonetheless, teaching online consumes considerable time and adds pressure to teachers' daily lives. Teachers have to not only acquire technical skills but also provide engaging instruction online. Meanwhile, privacy breaches occasionally occur in online teaching. The objective of the current study is to analyze the factors underlying the continuance intention toward online teaching beyond the COVID-19 pandemic. We use the person-environment fit theory to develop the survey for investigation. An open-ended question appended to the survey helps to gather teachers' further thoughts on sustainable online teaching. The structural equation modeling reveals that teachers' technostress is associated with their privacy concerns and self-efficacy in delivering effective instruction amid online teaching. The multigroup analysis further demonstrates that technostress, self-efficacy and school support are related to the continuance intention to teach online for teachers at distinct teaching levels to different extents. The responses to the open-ended question reveal that teachers' preference for online instruction lies in wealthy teaching resources and flexibility. Students' learning performance and the effectiveness of assessments constitute a concern in conducting online teaching. The implications for policymakers and teachers are remarked upon at the end of this paper.

## 1. Introduction

Although online teaching has been practiced for decades, using it to replace face-to-face classroom instruction has been less emphasized in K-12 formal (compulsory) education than in higher education. However, prevention measures against coronavirus disease 2019 (COVID-19) have been turning points in teachers' online teaching journeys. Indeed, online teaching has recently been conducted in formal education in many countries (Scherer et al., 2021).

Whether government-certified teachers, from primary to secondary education, are ready or not, the rapid transition to online teaching is real. Mandated online teaching during the pandemic is different from a spontaneous act, and teachers' stress has arisen as a result. According to an international sample of language teachers, workload, family members' health conditions and even the blurred line between family and work resulting from online teaching have all contributed to teachers' stress during the crisis (MacIntyre et al., 2020). Truzoli et al. (2021) survey 107 Italian high-school teachers with experience in online teaching during the pandemic, and the results show that almost one in six participants have a high level of stress. Likewise, a certain level of stress is revealed among the national sample of 1626 Canadian K-12 teachers with remote teaching experience in the study by Sokal et al. (2020).

As person-environment fit theory (P-E fit theory) states, stress is derived from the misfit between work demands and an individual's competence (Edwards & Cooper, 1990; Qi, 2019). In weighing the misfit, technological characteristics should be taken into consideration in a technological environment (Ayyagari et al., 2011; Califf & Brooks, 2020). Accordingly, the current study addresses the misfit derived from personal, environmental and technological characteristics in mandated online teaching. How the misfit relates to the continuance intention toward online teaching is the overarching research question in the present study.

As technology advances, educational capacities expand. Online teaching can serve as differentiated/remedial instruction, as well as educational exploration. Analyzing teachers' technostress and the factors underlying their continuance intention toward online teaching beyond the COVID-19 pandemic is pivotal. It lends itself for policymakers to understand the perceptions of in-service teachers when online teaching practices are mandated and to make adjustments for teacher education accordingly (Carrillo & Flores, 2020; Dyment & Downing, 2020). To collect quantitative and qualitative data from in-service teachers, we developed a questionnaire survey with an open-ended question. Responses to the open-ended question revealed probable factors concerning sustainable online teaching in addition to P-E fit theory. The multigroup analysis will provide further insight into these contributions when differentiating samples at different teaching levels. The views of university professors constitute an interesting contrast to those of K-12 teachers, as teachers in higher education generally appear to be more experienced with and less coerced into online teaching before the pandemic.

## 2. Literature review and hypotheses

### 2.1. Technostress and the continuance intention of online teaching

Technostress includes any unhealthy state resulting from attempts to cope with new technology, including addiction and stress (Brod, 1984; Verkijika, 2019). Insufficient self-efficacy, job insecurity, work-home conflict, information overload and privacy concerns are plausible stressors (Ayyagari et al., 2011; Chen et al., 2019; Qi, 2019). Technostress in turn influences users' performance and continuance intention to use various technologies. Information security compliance, mobile shopping and social networking site fatigue are some examples of this influence (Chen et al., 2019; Hwang & Cha, 2018; Lee, Son, & Kim, 2016). In the educational context, an early study performed by Jena (2015) concludes that technostress is negatively related to job satisfaction and organizational commitment among teachers in Indian higher education. A similar result is found for U.S. K-12 teachers (Califf & Brooks, 2020). With regard to technology integration, technostress is negatively associated with secondary education teachers' intention to use technology for teaching (Joo & Shin, 2020). Technostress is also negatively associated with the continuance intention to use digital textbooks among adolescents in South Africa (Verkijika, 2019). Comparably, techno complexity (a dimension of technostress) is shown to relate negatively to university teachers' work performance, while techno overload (another dimension of technostress) is not (Li & Wang, 2021).

Since teachers experience intensified workloads or stress when using information technology (Al-Fudail & Mellar, 2008; Chou, 2003), we define technostress as the stress associated with teachers' inability to cope with mandated online teaching in the present study. P-E fit theory is relevant for investigating whether teachers' technostress resulting from mandated online teaching in the pandemic is associated with the continuance intention to use online teaching beyond the pandemic (as shown in Fig. 1). P-E fit theory postulates that stress is associated with the misfit between the characteristics of a person and the environment (Edwards & Cooper, 1990; van Vianen, 2018). Ayyagari et al. (2011) incorporate technological characteristics into P-E fit theory when exploring the mechanism. Such a framework is generally adopted in exploring the stress of technology use in educational contexts (Califf & Brooks, 2020; Penado Abilleira et al., 2021; Qi, 2019; Steelman & Soror, 2017; Wang et al., 2020).

Based on the findings in past studies, our first research hypothesis is that teachers' technostress resulting from mandated online teaching in the pandemic is negatively associated with their continuance intention to use online teaching beyond the pandemic (H1).

### 2.2. Personal factor – self-efficacy

Self-efficacy is domain-specific and reflects an individual's confidence in executing an action according to social cognitive theory (Bandura, 1977, 2006). There is little doubt that a higher level of self-efficacy in using technology relates to a lower level of
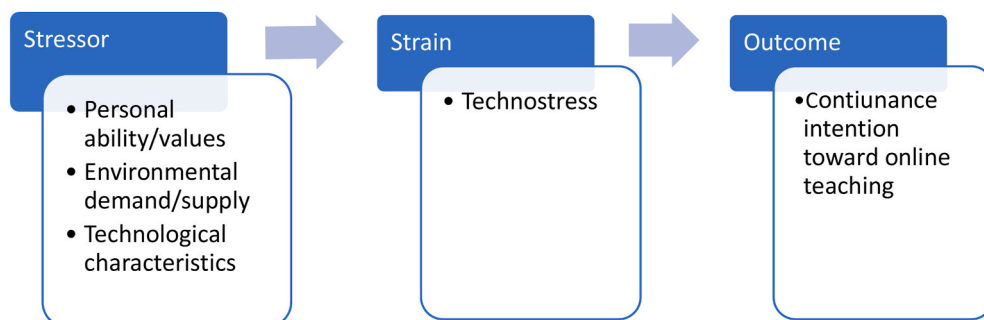


**Fig. 1.** Person-environment fit theory.

technostress. For example, greater computer self-efficacy is associated with a lower level of computer-related technostress among employees and salespersons that need to use technology (Shu et al., 2011; Tarafdar et al., 2015). Students' self-efficacy with respect to mobile technology is negatively related to their associated technostress, and technostress in turn is inversely related to their academic performance in management information systems courses (Qi, 2019). Physicians' self-efficacy is negatively related to their technostress resulting from using mobile electronic medical records (Liu et al., 2019).

Task-specific self-efficacy also affects task accomplishment in educational contexts (Bakar et al., 2018). An early study with a sample of university instructors reveals that teachers' self-efficacy is positively related to their intentions to adopt e-learning as a teaching aid (Liaw et al., 2007). A recent study with teachers in higher education also demonstrates that those who are ready for online teaching possess higher self-efficacy (Scherer et al., 2021). Preservice teachers' technology self-efficacy is associated with technology integration in classrooms (Tondeur et al., 2019). Secondary education teachers' self-efficacy in utilizing gamified applications is positively and indirectly related to their acceptance of gamification learning (Adukaite et al., 2017). The same is true for technology integration among teachers in primary, secondary and higher education (Kwon et al., 2019; Petko et al., 2018; Zheng et al., 2018). Relatedly, teachers' digital competence and opportunities to gain knowledge in teacher education are associated with teachers' intentions to maintain social contact with students and parents when providing online courses in a German sample (König et al., 2020).

Self-efficacy refers to teachers' perceived competence in guiding and responding to students in online teaching in the current study. During the pandemic, we suspect that teachers' self-efficacy in delivering effective online instruction would reduce their technostress (H2). In view of the mediating role of technostress in P-E fit theory and past research (Califf & Brooks, 2020; Lam et al., 2010; Panisoara et al., 2020), self-efficacy relates to teachers' continuance intention to advance online teaching when controlling the mediating role of technostress is the third research hypothesis (H3).

### 2.3. Environmental factor – school support

Using technology in teaching entails adequate technology, skills and resilience when confronting unexpected incidents. Because mandated online teaching has been implemented in response to potential school shutdowns, it definitely necessities school support (Bao, 2020). Contexts such as infrastructure, coordination and training can alleviate teachers' technostress. Quantitative analyses show that technical and social support are related to a lower level of technostress among K-12 teachers (Dong et al., 2020; Joo et al., 2016) and among high-school teachers (Özgür, 2020). This link is also evident among teachers in higher education (Li & Wang, 2021).

Past studies reveal that teachers, especially those in K-12 education, base their technology integration decisions on the availability of miscellaneous support. An earlier study states that through the mediator of teachers' motivation, secondary education teachers will persist in education innovation when they perceive that school support teachers' competence and autonomy (Lam et al., 2010). Using qualitative analysis, research reveals that social support and pressure from others, such as administrators and colleagues, consolidates preservice teachers' intention to use Web 2.0 in class (Sadaf et al., 2012). Interestingly, while social support plays a vital role, logistic support, such as technical materials and ready-made course resources, is not vital for secondary education teachers' decisions in teaching integrated STEM (Knipprath et al., 2018). In a recent study, social support is again shown to be related to K-12 teachers' intention to integrate digital literacy into classroom practice (Sadaf & Johnson, 2017). Furthermore, technical support and resource availability are important for secondary education teachers in deciding to adopt mobile technology in class (Khlaif, 2018). For teachers in higher education, prior studies demonstrate that school support is an indicator of teachers' intention or readiness for online teaching (Porter & Graham, 2016; Scherer et al., 2021).

School support in our study is defined as psychological and material support from school administrators. School administrators are expected to address teachers' needs and provide technical assistance and educational resources. Again, the relationship between school support and the intention to use online teaching might be different in distinct contexts. We frame the fourth research hypothesis as follows: school support is negatively related to teachers' technostress during the pandemic (H4). We further hypothesize that school support relates to teachers' continuance intention to use online teaching beyond the pandemic when controlling the mediating role of technostress (H5).

### 2.4. Technological characteristics – privacy concerns

In past studies, researchers often apply the technology acceptance model (TAM) in regard to technological utilization (Scherer et al., 2019). TAM, nevertheless, is grounded in motivational aspects rather than technological aspects (Lee & Lehto, 2013). We would like to incorporate privacy concerns into the research model rather than perceived ease of use or perceived usefulness. Issues regarding information privacy have been highlighted in e-learning practice, swaying teachers' decisions on how to implement online teaching (Chou & Chen, 2016). Privacy issues are suspected to be a cause of stress fueled by technological advancements (Ayyagari et al., 2011; Lee, Son, & Kim, 2016). This constitutes an obstacle to the full utilization of technology (Joo & Shin, 2020; Zhou, 2011; Zhou & Li, 2014). To the best of our knowledge, the role of privacy concerns in decisions on integrating technology in education has not been empirically investigated (Kebritchi et al., 2017; Ziraba et al., 2020). While less investigated, the prospect of data breaches is quite an issue in online teaching during the recent COVID-19 pandemic (Caron, 2020; Strauss, 2020). In the initial stage of online teaching during the COVID-19 outbreak, teachers often adopted Zoom, but they were later prohibited from using Zoom at the behest of the Ministry of Education (MOE) in Taiwan. The primary reason for such prohibition is online privacy and safety concerns with "Zoom-bombing" incidents. These circumstances have raised teachers' awareness of privacy protection.

Therefore, we suspect that privacy concerns might lead to teachers' technostress (H6) and, in turn, to the discontinuance of online teaching after the pandemic (H7).

## 2.5. Other plausible factors

In addition to self-efficacy, school support and privacy concerns, variables such as gender, prior online teaching and learning experience shed some light on teachers' readiness for online teaching during the pandemic. Scherer et al. (2021) classify 739 professors from 58 countries into 3 groups to reflect their readiness for online teaching during the pandemic. So-called readiness is considered in terms of teachers' self-efficacy and institutional support. Teachers in the group with greater readiness are often female, have prior online teaching experience and have a tendency to avoid uncertainty (Scherer et al., 2021). On the other hand, gender is not linked to the technostress of high school teachers in Turkey (Özgür, 2020) or university teachers in China (Li & Wang, 2021). Knipprath et al. (2018) show that teaching experience, not gender, is negatively related to teachers' attitudes toward integrated science, technology, engineering and mathematics education (STEM education). Based on the qualitative findings, teachers' prior experience with tablets is important in bringing about technology integration in classrooms (Khlaif, 2018).

Based on our 7 research hypotheses, we illustrate the research model in Fig. 2 with the incorporation of demographic variables. One open-ended question is included to address our research question of whether there are any other factors that we need to attend to in regard to online teaching (RQ).

## 3. Research instrument and method

### 3.1. Research instrument

The main research instrument was a self-developed questionnaire based on prior studies that was modified slightly for the pandemic context. For instance, an item representing technostress in adopting a digital textbook by Verkijika (2019) reads "I feel drained from tasks that require me to read or study using technology". This sentence was modified to "As COVID-19 became a pandemic, I felt drained from tasks requiring me to implement online teaching." The study of Petko et al. (2018) requests teachers to self-report their ability to support students in online discussions as a measurement of self-efficacy. We phrased the corresponding item in the current study as "I feel confident that I can support students to utilize technology and experience online-teaching." An example item of school support reads "Many colleagues cared about the difficulties I faced in the process of project-based learning" (Lam et al., 2010). This statement was modified to "As COVID-19 became a pandemic, school administrators solved the difficulties I have experienced in the process of online teaching." In a study on teachers' problematic internet behavior by Chou and Chou (2016), an item reads "I think that the personal data I registered on several websites will be misused by the service providers or others." In the current study, this statement was changed to "I think that someone will misuse the personal data I registered on online teaching platforms."

A five-point Likert scale was adopted such that higher scores reflect greater agreement. Teachers were asked questions to quantify their stress from practicing/implementing online teaching (Items T1 to T4) and their perceived self-efficacy in guiding and responding to students in online teaching contexts (Items E1 to E4). Whether they were substantially supported by school administrators was also investigated (Items S1 to S4). Teachers were also asked to what extent they were concerned with privacy invasions during online teaching (Items P1 to P4). Additionally, one open-ended question inquired about the respondents' thoughts on the online teaching
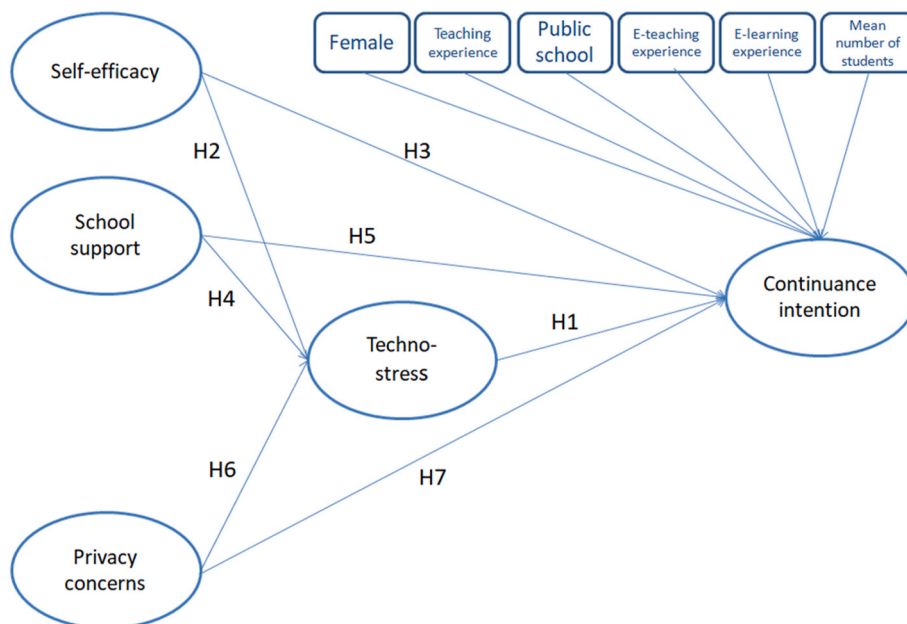


**Fig. 2.** Research model.

practiced due to the COVID-19 pandemic. Detailed descriptions of these items are depicted in Appendix A.

The respondent's continuance intention to use online teaching was constructed using three items. Teachers were asked whether, beyond the pandemic, they would continue implementing online teaching, advance online teaching pedagogies and adopt online teaching for remedial classes. The three items were aggregated as a factor to represent a teacher's continuance intention toward online teaching.

The statistical analysis software packages SPSS 22 and Mplus 7.0 were used, and the significance level was predetermined as .05.

### 3.2. Participants

The participants were in-service teachers in formal education in Taiwan. During the COVID-19 outbreak, the Taiwanese government was cognizant of the dangers of student clustering, and many measures were taken by the MOE in Taiwan. For example, the spring 2020 school semester was postponed for two weeks to prepare epidemic prevention materials. When the semester finally began, teachers erred on the side of caution and instructed the class in online learning in case of school closure. The requirements of the instruction varied from school to school, and the practices differed from classroom to classroom. Some conducted online teaching when students were at home, some did so by placing the teacher and students at different locations on campus, and others uploaded audiovisual materials for students' future access. A mix of asynchronous, synchronous and hybrid online teaching was implemented.

After being approved by the institutional review board of our research institute, we posted the questionnaires on various social networking sites, including the online teaching communities in Facebook. A Facebook group titled "Classes Suspended but Learning Continues" was one of the channels through which we collected the questionnaires (Classes Suspended but Learning Continues, n. d.). Paper questionnaires were also distributed via networks of educators and in various teachers' professional development workshops. Workshops on information literacy guided by the MOE in Taiwan were another channel used to collect questionnaires (workshop information can be found on the eteacher website https://eteacher.edu.tw). The instructions clearly stated that the target population was in-service teachers in primary, secondary and higher education who (have) implemented or practiced online teaching due to the COVID-19 pandemic. To avoid repeated completion, we did not provide any rewards for submitting the questionnaires. Approximately 20–30 min were required to complete one questionnaire. Overall, we collected 293 self-selected online questionnaires and 221 paper questionnaires anonymously from June 10 to November 30 in 2020. We coded questionnaires from I001 to I293 and P001 to P221 to represent online and paper surveys, respectively.

Among the 514 returned questionnaires, 488 were considered valid. Some of the invalid questionnaires had a substantial amount of missing data, and some had unreasonable values, such as filling in 6 on a 5-point Likert scale. Of the respondents, 108 (22.1%) teachers served in primary education, 207 (42.4%) were in secondary education and 168 (34.4%) were in higher education. As seen in Table 1, 278 were female (57.0%). The mean age was 43.0 yr with a standard deviation of 8.3 yr. The average teaching experience was 15.0 yr with a standard deviation of 8.2 yr. The mean number of students in the respondents' online teaching courses due to the pandemic was 33 students, with a standard deviation of 27 students. Approximately sixty percent of the respondents (N = 305, 62.5%) had online learning experience before the COVID-19 outbreak; that is, they experienced online learning during their student lives or took online courses on the internet after graduation. In addition, approximately forty percent of the respondents (N = 214, 43.9%) had teaching experience in online contexts before the COVID-19 outbreak: they either recorded teaching videos or offered online courses.

**Table 1**
Descriptive statistics.

|  | Size | Percentage (%) |
|---|---|---|
| Gender | | |
| Male | 209 | 42.8 |
| Female | 278 | 57.0 |
| Missing | 1 | 0.2 |
| Teaching level | | |
| Primary education | 108 | 22.1 |
| Secondary education | 207 | 42.4 |
| Higher Education | 168 | 34.4 |
| Missing | 5 | 1.0 |
| Age | | |
| 23-29 | 29 | 5.9 |
| 30-39 | 122 | 25.0 |
| 40-49 | 224 | 45.9 |
| 50-59 | 96 | 19.7 |
| 60-65 | 10 | 2.0 |
| Missing | 7 | 1.4 |
| Teaching experience | | |
| 0-10 | 165 | 33.8 |
| 11-20 | 203 | 41.6 |
| 21-30 | 100 | 20.5 |
| 31 or above | 13 | 2.7 |
| Missing | 7 | 1.4 |

## 4. Research results

### 4.1. Confirmatory factor analysis

The 16 items were subjected to confirmatory factor analysis to establish a factor structure ($\chi^2 = 177.86$, df $= 98$, p $< .001$; C. I.of RMSEA $= [.03, .05]$, CFI $= .99$, SRMR $= .03$). The correlation matrix of these items is shown in Appendix B. While the chi-squared statistic is significant, the overall goodness-of-fit indices support the acceptability of the four-factor model. The factor loadings show that convergent validity is present ($\lambda_s > .76$). The Cronbach's alpha reliabilities of the factors "school support," "self-efficacy," "privacy concerns" and "technostress" are 0.92, 0.92, 0.87 and 0.92, respectively. There is no high factor correlation indicating poor discriminant validity (see Fig. 3). Common factor bias is minimal according to Harman's one-factor approach (Harman, 1967). The factor with the greatest eigenvalue explains only 36.01% of the total variance.

### 4.2. Measurement invariance of the factor structure

The context of online teaching differs greatly across education levels. To gain a holistic view of teachers' continuance intention to use online teaching beyond the pandemic, a multigroup analysis was applied to the research model. The measurement invariance of the research instrument was maintained across the three groups considering the thresholds ($\Delta$CFI $\leq .01$; $\Delta$SRMR $\leq .015$) (see Table 2).

### 4.3. Multigroup analysis

In regard to the multigroup analysis, the chi-squared statistic of the model is significant ($\chi^2 = 1239.65$, df $= 806$, p $< .001$), but several other fit indices are considered when confirming the suitability of the research model (C.I.of RMSEA $= [.05, .06]$, CFI $= .94$, SRMR $= .075$). According to the analytical results, some of the covariates are associated with continuance intention (see Table 3). For primary education teachers, teachers serving in public schools are less willing to continue online teaching after the pandemic than are teachers in private schools ($\beta = -.17, p = .04$). Technostress is negatively associated with continuance intention after accounting for other variables ($\beta = -.34$, p $= .01$). Additionally, self-efficacy is positively related to continuance intention directly ($\beta = .30$, p $= .02$) and indirectly through technostress ($\beta = .20$, p $= .01$). Privacy concerns are indirectly and negatively related to continuance intention ($\beta = -.14$, p $= .03$).

For secondary education teachers, teachers with online teaching experience are more willing to continue online teaching after the pandemic than are those without experience($\beta = .19, p < .01$). Technostress is again negatively associated with continuance intention after accounting for other variables ($\beta = -.18$, p $= .03$). Self-efficacy is positively related to continuance intention directly ($\beta = .38$, p $< .01$) and indirectly through technostress ($\beta = .09$, p $= .04$). Privacy concerns are indirectly and negatively related to continuance intention ($\beta = -.08$, p $= .04$). Moreover, school support is directly and positively related to continuance intention ($\beta = .18$, p $= .01$).

For higher education teachers, female teachers are more likely to continue online teaching after the pandemic than are their male counterparts($\beta = .21, p < .01$). Teachers with online learning experience are more inclined to continue online teaching after the pandemic than are those without experience ($\beta = .16, p = .04$). Continuance intention is positively and directly related to self-efficacy only ($\beta = .47$, p $< .01$) and not to other constructs. Moreover, technostress is negatively related to self-efficacy ($\beta = -.48$, p $< .01$) and positively related to privacy concerns ($\beta = .35$, p $< .01$).
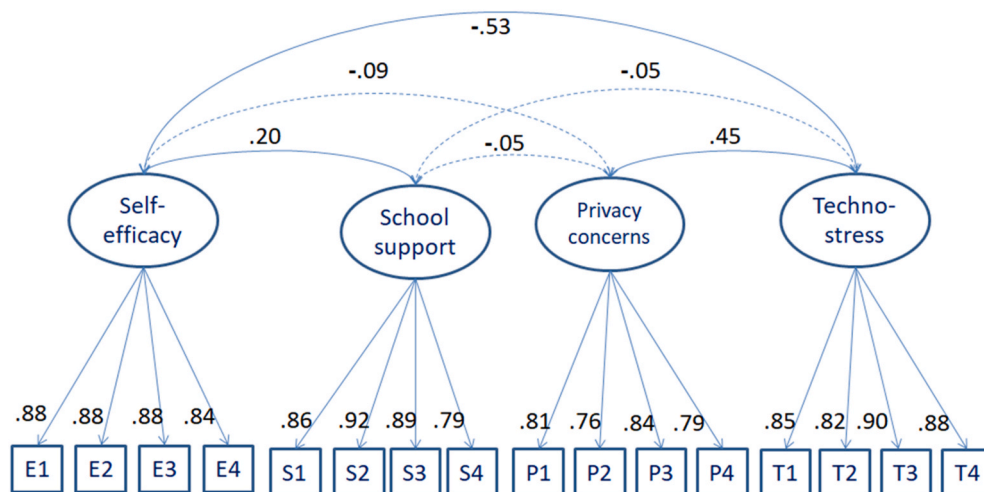


Fig. 3. Confirmatory factor analysis.

**Table 2**
Measurement invariance of the factor structure.

|  | $\chi^2_{(df)}$ | RMSEA | CFI | SRMR | $\Delta\chi^2_{(df)}$ |
|---|---|---|---|---|---|
| Primary education (n = 108) | $157.32_{98}$ |  |  |  |  |
|    Secondary education (n = 207) | $136.08_{98}$ |  |  |  |  |
|    Higher education (n = 168) | $163.82_{98}$ |  |  |  |  |
| Equal form (configural) | $457.22_{294}$ | .059 [.048, .069] | .972 | .044 |  |
| Equal factor loadings (weak) | $503.40_{318}$ | .060 [.050, .070] | .969 | .054 | $46.18_{24}$ p = .004 |
| Equal intercepts (strong) | $586.53_{342}$ | .067 [.057, .076] | .958 | .068 | $83.13_{24}$ p < .001 |

**Table 3**
Multigroup analysis.

|  | Primary education | | Secondary education | | Higher education | |
|---|---|---|---|---|---|---|
|  | Dependent variable: Continuance intention toward online teaching | | | | | |
| Covariates | coefficient | p-value | coefficient | p-value | coefficient | p-value |
| Gender (male: 0, female: 1) | .01 | .95 | .09 | .16 | .21 | < .01 |
| Teaching experience (in years) | − .03 | .70 | .09 | .15 | .02 | .83 |
| Serving in a public school (no: 0, yes: 1) | − .17 | .04 | − .04 | .55 | − .06 | .42 |
| E-learning experience (no: 0, yes: 1) | .15 | .08 | − .08 | .23 | .16 | .04 |
| E-teaching experience (no: 0, yes: 1) | .06 | .52 | .19 | < .01 | .11 | .15 |
| Mean number of students | .04 | .66 | − .11 | .07 | .08 | .29 |
| Direct Effects | Dependent variable: Continuance intention to use online teaching | | | | | |
| Technostress | − .34 | .01 | − .18 | .03 | .02 | .85 |
| Self-efficacy | .30 | .02 | .38 | < .01 | .47 | < .01 |
| School support | .03 | .77 | .18 | .01 | .03 | .68 |
| Privacy concerns | .04 | .73 | − .02 | .79 | .14 | .12 |
| R-squared | 38.2% | | 37.1% | | 31.4% | |
| Indirect effects | Dependent variable: Technostress | | | | | |
| School support | .05 | .57 | .10 | .11 | .04 | .53 |
| Self-efficacy | − .58 | < .01 | − .47 | < .01 | − .48 | < .01 |
| Privacy concerns | .40 | < .01 | .42 | < .01 | .35 | < .01 |
| R-squared | 49.5% | | 38.4% | | 43.8% | |

## 5. Discussion

### 5.1. Role of technostress in online teaching

In P-E fit theory, negative consequences arise due to stress. H1 hypothesizes that teachers' technostress is negatively related to their continuance intention toward online teaching beyond the pandemic. This hypothesis is partially supported. The empirical result shows that technostress is related to teachers' discontinuance intention to use online teaching among primary and secondary education teachers but not among higher education teachers. This finding is consistent with prior studies using a K-12 teacher sample (Joo et al., 2016). According to the past findings using a university teacher sample, techno overload (working longer or faster due to technology demands) has no significant relation with work performance (Li & Wang, 2021). With regard to the nonsignificant result among higher education faculty in the current study, we tentatively reason that technostress has no effect on university teachers' work performance and, in turn, no influence on their continuance intention toward online teaching. Self-efficacy may play a more important role in determining whether to undertake online teaching. Other factors, such as teachers' autonomy, attitudes toward change, student maturity and teaching hours, are also plausible reasons (Scherer et al., 2021; Sokal et al., 2020). This evidence-based result provides insight for policymakers to prompt sustainable online teaching among K-12 formal education.

As the role of teachers in online teaching will not diminish, the top priority is teachers' well-being. The relationships between technostress and school support, self-efficacy and privacy concerns are unanimous among teachers at different teaching levels:

teachers' technostress is not related to school support, negatively related to self-efficacy, and positively related to privacy concerns. The related implications will be discussed in the following sections.

## 5.2. Self-efficacy matters in online teaching

P-E fit theory highlights the fit between personal abilities and environmental demands in addressing strain. Self-efficacy reflects teacher-perceived abilities. Past research has indicated that self-efficacy in using technology is linked to low technostress (Liu et al., 2019; Qi, 2019; Tarafdar et al., 2015). H2 aims to confirm the negative association between self-efficacy and technostress during the pandemic. The results show that teachers' perceived self-efficacy in delivering engaging instruction online is associated with a lower level of technostress. This finding parallels that of a recent study (Sokal et al., 2020). What might increase teachers' technostress is the lack of effective strategies for enhancing teachers' proper and timely responses to students' online learning. In the settings of online teaching, it is difficult for teachers to detect students' doubt because students' facial expressions are not in plain sight. Courses such as "online pedagogies" in guiding teachers how to provide interactive and engaging instructions are thus recommended in teacher education.

H3 is also confirmed, as the empirical results show that self-efficacy is positively related to teachers' continuance intention to use online teaching. This finding is consistent with past findings (Kwon et al., 2019; Liaw et al., 2007; Petko et al., 2018). Therefore, the higher a teacher's self-efficacy is, the more willing the teacher is to continue online teaching in the future. We acknowledge that students' learning losses might consequently arise if teachers are reluctant to teach online. Equipping teachers with necessary pedagogical and technical skills is necessary for full-scale online teaching. For example, teachers would perceive higher self-efficacy when they can utilize the interactive whiteboard or embed audiovisual materials to engage students. As a result, providing related courses in formal teacher education to cultivate sophisticated skills is favorable in the long run (König et al., 2020; Tondeur et al., 2019). Additionally, policymakers can plan just-in-time professional development for teachers to learn online communication skills such as document annotation. We also suggest that policymakers assist teachers in partnering with local and international schools that have practiced online teaching. Through the exchange of ideas, teachers can learn from peers as a way to foster confidence.

Another way to strengthen teachers' self-efficacy is allowing teachers to do what they are good at, that is, real-time problem resolution. Policymakers can adopt other teaching modalities, such as TV broadcasts of government-mandated curricula (Taiwan Public Televsion Service, n.d.), and teachers can be given the opportunity to conduct differentiated instruction and teacher-parent communication. Thanks to user-friendly technology, people in modern society have good online communication skills. Instead of offering online classes, teachers only need to schedule time online to answer students' questions or communicate with parents.

## 5.3. School support matters less in online teaching

H4 is not upheld, as teachers' technostress is not related to school support. This finding is inconsistent with past studies (Dong et al., 2020; Joo et al., 2016; Li & Wang, 2021; Özgür, 2020). One possible reason is that in Taiwan, people outside schools assume the responsibility of education when confronted with an unprecedented disaster. Not only did the telecom industries provide equipment and digital accessibility free of charge, but competent others spontaneously offered professional development and instructional resources. In the Facebook Group titled "community of synchronous online teaching in Taiwan (Community of Synchronous Online Teaching, n.d.), there is a variety of shared resources. The themes include listed others for consulting, curated applications of online meetings, phased tasks to implement online teaching, and online teaching pedagogies. The purpose of this Facebook page is to make online teaching easy for in-service teachers. As a supplement to online teaching, teachers can flip through informative pages on videotaping with a beautifying filter or different backgrounds. The MOE in Taiwan even consistently updates a website devoted to online teaching/learning to assist teachers in delivering instruction successfully (Ministry of Education, 2020). Since P-E fit theory can actually be elaborated as person-job fit, person-organization fit, person-team fit, etc., it suggests that other environmental factors, such as colleagues' collaboration and school values, might better explain teachers' technostress in the face of the pandemic (van Vianen, 2018). Because teachers generally stay at home for online teaching during the pandemic, online social networks' support, rather than school administrators' support, would be a plausible inhibitor of technostress.

With regard to H5, school support is merely associated with continuance intention among teachers in secondary education. Compared to secondary education classes, primary education classes are usually self-contained; that is, a single homeroom teacher takes charge of a plurality of subjects. For this reason, secondary education teachers, rather than primary education teachers, may need coordination from school to develop the teaching protocols. In addition, we tentatively reason that miscellaneous formats of online teaching have been promoted in universities for years such that professors have had more available resources and support from schools. Distinguishing school support into social, technical and material support might help explain the diverse analytical results (König et al., 2020; Knipprath et al., 2018).

## 5.4. Role of privacy concerns in online teaching

Privacy concerns serve as a valid extension to P-E fit theory in explaining teachers' technostress. Online teaching requires substantial amounts of data to be stored. For H6, the empirical results indicate that privacy concerns are a stressor among teachers at different levels. The Taiwanese government's shift from advocating to prohibiting the adoption of Zoom to deliver instruction is one driving force. H6 captures teachers' attention on information privacy. As stressful as it can be to implement online teaching and facilitate students' learning, we suggest that governments keep close tabs on the information security of online platforms. Teachers,

students and even parents should also acquaint themselves with basic data protection knowledge such that privacy concerns can be lowered.

Because of the mediating role of technostress, privacy concerns have no direct relationship with teachers' intention to continue online teaching beyond the pandemic in this study. H7 is not supported because technostress completely mediates the relationship between privacy concerns and continuance intention among teachers at the three teaching levels. It is unreasonable to expect teachers to discern privacy risks behind platform use. The education authorities can provide curated examples of software or platforms adopted in the other schools and publicize the issues that occurred in the past. Providing guidance in combating privacy incidents is definitely helpful in shielding teachers and students from online threats (Chou & Chen, 2016). This scenario represents an opportunity to educate teachers about basic data protection and reinforce their sense of being cybercitizens.

### 5.5. Other factors worth attention

To answer the research question, we gathered 56 responses from the open-ended questions. Some of the responses were merely wishes, and some were similar to the factors under the current study. For example, teachers wished the pandemic would end soon. Additionally, teachers replied that their school should assist their video recording. In addition, we found some interesting thoughts from the responses to the open-ended question. These responses help to clarify the research question. We grouped these responses into advantages and disadvantages of implementing online instruction. In particular, discovering helpful teaching strategies and teaching resources was favored, as was eliminating commutes.

> *I learned various teaching strategies that I can utilize in daily instruction.* (I83, elementary school teacher)

> *The beauty of online teaching lies in the rich teaching resources.* (I102, middle-school teacher)

> *I found that my teaching gains more flexibility. I expect to integrate face-to-face and online teaching after the pandemic.* (I30, university professor)

In contrast, teachers were concerned with the difficulties of interacting with students online. Students' learning effectiveness and attendance rates constituted the primary implementation challenges.

> *Students have attention deficiencies and poor learning results. The effectiveness of online learning is much worse than that of face-to face learning.* (P107, elementary school teacher)

> *Students' learning capacity is not good enough.* (I115, high-school teacher)

> *There is poor student-teacher interaction. Additionally, we have a hard time controlling the quality of the internet.* (P127, university professor)

How teachers perceive their mandated online teaching could be a measure of their continuance intention beyond the pandemic. In addition to teachers' self-efficacy and privacy concerns, policymakers can develop strategies to expand the benefits and overcome the difficulties teachers encountered. Teachers relish the flexibility of online teaching. They can make time for other activities, such as household chores or online learning for themselves. Signaling to teachers which resources are designed to serve that goal definitely arouses continuance intention. This is also a good chance to prompt "online lesson study" as a nationwide, even worldwide, task (Wang et al., 2019). Teachers can collaborate with others, peer-observe classroom practices and consequently refine their teaching practices.

Teachers were most worried about students' academic experience and performance. This is an important matter that warrants further research. A high drop-out rate has been an issue inherent to online learning. In mandated online teaching, most schools require teachers to take attendance. Although this might help reduce the drop-out rate, it does not guarantee students' academic performance. Internet etiquette and self-discipline are essential skills for students to make a further step toward successful online teaching (Chang & Chou, 2015). Policymakers are thus recommended to provide appropriate related resources to guide students.

## 6. Conclusion and research limitations

Worldwide, there have been 219 million COVID-19 cases and counting. A considerable number of teachers and students have experienced suspended schooling. Although regular attendance at school might be generally supported in the future, we still need to prepare for unforeseeable serious outbreaks and prepare for teaching online. As opposed to the hasty transition to online teaching during the pandemic, we need to develop adaptive responses and prevent students from experiencing learning losses. Policymakers must proceed to improve teacher education and professional development.

When investigating teachers' technostress in mandated online teaching, it is nearly impossible to obtain a complete picture of teachers' stress. P-E fit theory serves as a relevant model, taking personal and environmental factors into account. As school administrators' support matters less in the current study, we suggest taking online social networks' support into account in the next study to reflect the characteristics of connected life. In terms of privacy concerns, the current research expands our understanding of teachers' technostress amid the pandemic and their continuance intention to use online teaching beyond the pandemic. Nuances among teachers at different teaching levels are observed in the empirical results. The responses to the open-ended question also add value to the static nature of the data and indicate that teachers' autonomy and students' learning outcomes contribute to teachers' continuance intention of online teaching. While teachers face stress related to data protection and learning facilitation in the unforeseeable future, useful teaching resources are favored. In general, policymakers and teachers can attend to teachers' privacy concerns and self-efficacy. Cultivating the concerned individuals' knowledge of data protection and online pedagogy helps to mitigate

teachers' technostress and improve their capacity. It definitely supports the continuance of online teaching if messages that multiple resources are at teachers' disposal are conveyed to teachers. As a result, teachers are more willing to advance their online teaching skills.

Future research directions are suggested based on the limitations of the current study. The first suggestion is related to the survey design. Constructing the mechanism to guarantee personal data protection and avoid repeated completion of the questionnaires is definitely merited. As the survey results do not permit causal inference, future studies with qualitative interviews or case studies could help to corroborate these empirical results. Second, our sample is teachers who implemented or practiced online teaching during the COVID-19 pandemic. This implies that these teachers are more receptive than those who did not practice online teaching at all. Completely different results may be obtained when steering learning from school to at home at scale. For teachers who have never tried online teaching, the factors related to their technostress and intentions would be completely different. Their viewpoints are worth investigating as a contrast with the current sample. In addition, teachers in different subjects and disciplines may possess distinct perceptions. Consequently, readers should be cautious about generalizing the results. We expect to study how science teachers conduct experiments and how physical education teachers implement team exercises. Last, we did not examine students' learning effectiveness, although our qualitative results indicate that it is a considerable concern. Therefore, we expect further research on assessing students' learning as a result of large-scale online teaching. The development of various effective assessments is another field that merits attention.

## Credit author statement

Hui-Lien Chou: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Visualization. Chien Chou: Methodology, Investigation, Resources, Data curation, Writing – review & editing, Funding acquisition.

## Acknowledgement

## Appendix A. Survey Items

| Factor | Item number | Item description |
|---|---|---|
| | | As COVID-19 became a pandemic, … |
| Technostress | T1 | I felt drained from tasks requiring me to implement online teaching. |
| | T2 | I felt tired of discussing online teaching with my colleagues. |
| | T3 | I felt exhausted from implementing online teaching. |
| | T4 | I'm deeply frustrated by implementing online teaching. |
| Self-efficacy | E1 | I feel confident that I'm acquainted with online teaching software and platforms. |
| | E2 | I feel confident that I can achieve the preset teaching objective when adopting online teaching. |
| | E3 | I feel confident that I can evaluate the appropriateness of the software and platforms for online teaching. |
| | E4 | I feel confident that I can support students to utilize technology and experience online teaching. |
| School support | S1 | school administrators cared about the needs I have encountered in the process of online teaching. |
| | S2 | school administrators solved the difficulties I have experienced in the process of online teaching. |
| | S3 | school administrators provided me with practical advice and information concerning online teaching. |
| | S4 | school administrators offered me practical hardware and software concerning online teaching. |
| Privacy concerns | P1 | I think someone will steal the personal data that I stored in the computers when I implement online teaching. |
| | P2 | I think someone will intervene my online teaching through the software vulnerabilities. |
| | P3 | I think that someone will misuse the personal data I registered on online teaching platforms |
| | P4 | I think there is a great possibility that someone will misappropriate my sounds and images in the online teaching. |

## Appendix B. Correlation Matrix of the Items

| | E1 | E2 | E3 | E4 | S1 | S2 | S3 | S4 | P1 | P2 | P3 | P4 | T1 | T2 | T3 | T4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E1 | 3.58 | | | | | | | | | | | | | | | |
| E2 | .79 | 3.45 | | | | | | | | | | | | | | |
| E3 | .78 | .77 | 3.40 | | | | | | | | | | | | | |
| E4 | .73 | .73 | .76 | 3.43 | | | | | | | | | | | | |
| S1 | .18 | .17 | .12 | .13 | 3.84 | | | | | | | | | | | |
| S2 | .17 | .20 | .12 | .15 | .81 | 3.68 | | | | | | | | | | |
| S3 | .15 | .18 | .14 | .14 | .73 | .82 | 3.84 | | | | | | | | | |
| S4 | .16 | .17 | .14 | .10 | .68 | .70 | .74 | 3.90 | | | | | | | | |
| P1 | -.07 | -.03 | -.05 | -.04 | -.02 | -.03 | -.03 | .01 | 3.04 | | | | | | | |
| P2 | -.12 | -.08 | -.09 | -.10 | -.04 | -.04 | -.05 | -.01 | .64 | 2.98 | | | | | | |
| P3 | -.12 | -.07 | -.05 | -.06 | -.05 | -.06 | -.03 | -.04 | .67 | .62 | 3.17 | | | | | |

(*continued*)

| | E1 | E2 | E3 | E4 | S1 | S2 | S3 | S4 | P1 | P2 | P3 | P4 | T1 | T2 | T3 | T4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P4 | -.03 | -.03 | -.02 | -.03 | -.02 | -.05 | -.02 | .03 | .63 | .58 | .69 | 3.25 | | | | |
| T1 | -.43 | -.42 | -.39 | -.39 | .03 | -.02 | -.02 | -.01 | .33 | .33 | .30 | .28 | 2.77 | | | |
| T2 | -.34 | -.33 | -.30 | -.36 | <-.01 | -.05 | -.06 | -.03 | .34 | .30 | .31 | .28 | .73 | 2.58 | | |
| T3 | -.38 | -.39 | -.35 | -.44 | -.01 | -.04 | -.05 | -.04 | .34 | .34 | .31 | .29 | .76 | .74 | 2.69 | |
| T4 | -.46 | -.47 | -.42 | -.47 | -.03 | -.06 | -.07 | -.05 | .34 | .33 | .31 | .29 | .73 | .71 | .80 | 2.48 |

Note: Mean values are shown in the diagonal.

# References

Adukaite, A., van Zyl, I., Er, Ş., & Cantoni, L. (2017). Teacher perceptions on the use of digital gamified learning in tourism education: The case of South African secondary schools. *Computers & Education, 111*, 172–190. https://doi.org/10.1016/j.compedu.2017.04.008

Al-Fudail, M., & Mellar, H. (2008). Investigating teacher stress when using technology. *Computers & Education, 51*(3), 1103–1110. https://doi.org/10.1016/j.compedu.2007.11.004

Ayyagari, R., Grover, V., & Purvis, R. (2011). Technostress: Technological antecedents and implications. *MIS Quarterly, 35*(4), 831. https://doi.org/10.2307/41409963

Bakar, N. S. A., Maat, S. M., & Rosli, R. (2018). A systematic review of teacher's Self-efficacy and technology integration. *International Journal of Academic Research in Business and Social Sciences, 8*(8), 557. https://doi.org/10.6007/IJARBSS/v8-i8/4611

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191.

Bandura, A. (2006). Guide for constructing self-efficacy scales. In T. Urdan, & F. Pajares (Eds.), *Self-efficacy beliefs of adolescents* (Vol. 5, pp. 307–337). Information Age Publishing.

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of peking university. *Human Behavior and Emerging Technologies, 2*(2), 113–115. https://doi.org/10.1002/hbe2.191

Brod, C. (1984). *Technostress : The human cost of the computer revolution*. Addison-Wesley.

Califf, C. B., & Brooks, S. (2020). An empirical study of techno-stressors, literacy facilitation, burnout, and turnover intention as experienced by K-12 teachers. *Computers & Education, 157*, 103971. https://doi.org/10.1016/j.compedu.2020.103971

Caron, C. (2020, August 21). *How to protect your family's privacy during remote learning*. The New York Times. https://www.nytimes.com/2020/08/20/parenting/online-school-privacy.html

Carrillo, C., & Flores, M. A. (2020). COVID-19 and teacher education: A literature review of online teaching and learning practices. *European Journal of Teacher Education, 43*(4), 466–487. https://doi.org/10.1080/02619768.2020.1821184

Chang, C.-M., Chou, C. (2015). An exploratory study of young students' care virtues of e-character education: The Taiwanese teachers' perspective. *Journal of Moral Education, 44*(4), 516–530. https://doi.org/10.1080/03057240.2015.1048791

Chen, J. V., Tran, A., & Nguyen, T. (2019). Understanding the discontinuance behavior of mobile shoppers as a consequence of technostress: An application of the stress-coping theory. *Computers in Human Behavior, 95*, 83–93. https://doi.org/10.1016/j.chb.2019.01.022

Chou, C. (2003). Incidences and correlates of internet anxiety among high school teachers in Taiwan. *Computers in Human Behavior, 19*(6), 731–749. https://doi.org/10.1016/S0747-5632(03)00010-4

Chou, H.-L., & Chen, C.-H. (2016). Beyond identifying privacy issues in e-learning settings – implications for instructional designers. *Computers & Education, 103*, 124–133. https://doi.org/10.1016/j.compedu.2016.10.002

Chou, H.-L., & Chou, C. (2016). An analysis of multiple factors relating to teachers' problematic information security behavior. *Computers in Human Behavior, 65*, 334–345. https://doi.org/10.1016/j.chb.2016.08.034

n.d. Classes Suspended but Learning Continues. Home [Facebook page]. Facebook. Retrieved May 28, 2021, from https://www.facebook.com/groups/641574063056137/

n.d. Community of Synchronous Online Teaching. Home [Facebook page]. Facebook. Retrieved May 28, 2021, from https://www.facebook.com/groups/1011192722620224/

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. https://doi.org/10.1007/s40299-019-00461-5

Dyment, J. E., & Downing, J. J. (2020). Online initial teacher education: Ac systematic review of the literature. *Asia-Pacific Journal of Teacher Education, 48*(3), 316–333. https://doi.org/10.1080/1359866X.2019.1631254

Edwards, J. R., & Cooper, C. L. (1990). The person-environment fit approach to stress: Recurring problems and some suggested solutions. *Journal of Organizational Behavior, 11*(4), 293–307.

Harman, H. H. (1967). *Modern factor analysis* (2nd ed.). University of Chicago Press.

Hwang, I., & Cha, O. (2018). Examining technostress creators and role stress as potential threats to employees' information security compliance. *Computers in Human Behavior, 81*, 282–293. https://doi.org/10.1016/j.chb.2017.12.022

Jena, R. K. (2015). Technostress in ICT enabled collaborative learning environment: An empirical study among Indian academician. *Computers in Human Behavior, 51*, 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. https://doi.org/10.1016/j.compedu.2015.12.004

Joo, J., & Shin, M. M. (2020). Resolving the tension between full utilization of contact tracing app services and user stress as an effort to control the COVID-19 pandemic. *Service Business, 14*(4), 1–18. https://doi.org/10.1007/s11628-020-00424-7

Kebritchi, M., Lipschuetz, A., & Santiague, L. (2017). Issues and challenges for teaching successful online courses in higher education: A literature review. *Journal of Educational Technology Systems, 46*(1), 4–29. https://doi.org/10.1177/0047239516661713

Khlaif, Z. (2018). Teachers' perceptions of factors affecting their adoption and acceptance of mobile technology in K-12 settings. *Computers in the Schools, 35*(1), 49–67. https://doi.org/10.1080/07380569.2018.1428001

Knipprath, H., Thibaut, L., Dehaene, W., & Depaepe, F. (2018). How school context and personal factors relate to teachers' attitudes toward teaching integrated STEM. *International Journal of Technology and Design Education, 28*(3), 631–651. https://doi.org/10.1007/s10798-017-9416-1

König, J., Jäger-Biela, D. J., & Glutsch, N. (2020). Adapting to online teaching during COVID-19 school closure: Teacher education and teacher competence effects among early career teachers in Germany. *European Journal of Teacher Education, 43*(4), 608–622. https://doi.org/10.1080/02619768.2020.1809650

Kwon, K., Ottenbreit-Leftwich, A., Sari, A. R., Khlaif, Z., Zhu, M., Nadir, H., & Gok, F. (2019). Teachers' self-efficacy matters: Exploring the integration of mobile computing device in middle schools. *TechTrends, 63*(6), 682–692. https://doi.org/10.1007/s11528-019-00402-5

Lam, S.-f., Cheng, R. W.-y., & Choy, H. C. (2010). School support and teacher motivation to implement project-based learning. *Learning and Instruction, 20*(6), 487–497. https://doi.org/10.1016/j.learninstruc.2009.07.003

Lee, C., Lee, C. C., & Kim, S. (2016). Understanding information security stress: Focusing on the type of information security compliance activity. *Computers & Security, 59*, 60–70. https://doi.org/10.1016/j.cose.2016.02.004

Lee, D. Y., & Lehto, M. R. (2013). User acceptance of YouTube for procedural learning: An extension of the technology acceptance model. *Computers & Education, 61*, 193–208. https://doi.org/10.1016/j.compedu.2012.10.001

Lee, A. R., Son, S.-M., & Kim, K. K. (2016). Information and communication technology overload and social networking service fatigue: A stress perspective. *Computers in Human Behavior, 55*, 51–61. https://doi.org/10.1016/j.chb.2015.08.011

Liaw, S.-S., Huang, H.-M., & Chen, G.-D. (2007). Surveying instructor and learner attitudes toward e-learning. *Computers & Education, 49*(4), 1066–1080. https://doi.org/10.1016/j.compedu.2006.01.001

Liu, C.-F., Cheng, T.-J., & Chen, C.-T. (2019). Exploring the factors that influence physician technostress from using mobile electronic medical records. *Informatics for Health and Social Care, 44*(1), 92–104. https://doi.org/10.1080/17538157.2017.1364250

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. https://doi.org/10.1007/s10111-020-00625-0

MacIntyre, P. D., Gregersen, T., & Mercer, S. (2020). Language teachers' coping strategies during the Covid-19 conversion to online teaching: Correlations with stress, wellbeing and negative emotions. *System, 94*, 102352. https://doi.org/10.1016/j.system.2020.102352

August 26 Ministry of Education. (2020). *No learning suspended due to the pandemic - Online teaching toolkit. Learning Cloud* https://learning.cloud.edu.tw/onlinelearning/.

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*. https://doi.org/10.1016/j.chb.2020.106468

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). https://doi.org/10.3390/ijerph17218002

Penado Abilleira, M., Rodicio-García, M.-L., Ríos-de Deus, M. P., & Mosquera-González, M. J. (2021). Technostress in Spanish university teachers during the COVID-19 pandemic. *Frontiers in Psychology, 12*(496). https://doi.org/10.3389/fpsyg.2021.617650

Petko, D., Prasse, D., & Cantieni, A. (2018). The interplay of school readiness and teacher readiness for educational technology integration: A structural equation model. *Computers in the Schools, 35*(1), 1–18. https://doi.org/10.1080/07380569.2018.1428007

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. https://doi.org/10.1111/bjet.12269

Qi, C. (2019). A double-edged sword? Exploring the impact of students' academic usage of mobile devices on technostress and academic performance. *Behaviour & Information Technology, 38*(12), 1337–1354. https://doi.org/10.1080/0144929X.2019.1585476

Sadaf, A., & Johnson, B. L. (2017). Teachers' beliefs about integrating digital literacy into classroom practice: An investigation based on the theory of planned behavior. *Journal of Digital Learning in Teacher Education, 33*(4), 129–137. https://doi.org/10.1080/21532974.2017.1347534

Sadaf, A., Newby, T. J., & Ertmer, P. A. (2012). Exploring pre-service teachers' beliefs about using Web 2.0 technologies in K-12 classroom. *Computers & Education, 59*(3), 937–945. https://doi.org/10.1016/j.compedu.2012.04.001

Scherer, R., Howard, S. K., Tondeur, J., & Siddiq, F. (2021). Profiling teachers' readiness for online teaching and learning in higher education: Who's ready? *Computers in Human Behavior, 118*, 106675. https://doi.org/10.1016/j.chb.2020.106675

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education, 128*, 13–35. https://doi.org/10.1016/j.compedu.2018.09.009

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. https://doi.org/10.1080/10447318.2011.555313

Sokal, L., Trudel, L. E., & Babb, J. (2020). Canadian teachers' attitudes toward change, efficacy, and burnout during the COVID-19 pandemic. *International Journal of Educational Research Open, 1*, 100016. https://doi.org/10.1016/j.ijedro.2020.100016

Steelman, Z. R., & Soror, A. A. (2017). Why do you keep doing that? The biasing effects of mental states on IT continued usage intentions. *Computers in Human Behavior, 73*, 209–223. https://doi.org/10.1016/j.chb.2017.03.027

Strauss, V. (2020). *March 20. As schooling rapidly moves online across the country, concerns rise about student data privacy*. The Washington Post. https://www.nbcnews.com/think/opinion/covid-school-closings-raise-privacy-concerns-students-teachers-ncna1247717.

n.d. Taiwan Public Television Service. PTS kids [YouTube channel]. Retrieved May 28, 2021, from https://www.youtube.com/watch?v=yjmYQuJ6ydw

Tarafdar, M., Pullins, E. B., & Ragu-Nathan, T. S. (2015). Technostress: Negative effect on performance and possible mitigations. *Information Systems Journal, 25*(2), 103–132. https://doi.org/10.1111/isj.12042

Tondeur, J., Scherer, R., Baran, E., Siddiq, F., Valtonen, T., & Sointu, E. (2019). Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education. *British Journal of Educational Technology, 50*(3), 1189–1209. https://doi.org/10.1111/bjet.12748

Truzoli, R., Pirola, V., & Conte, S. (2021). The impact of risk and protective factors on online teaching experience in high school Italian teachers during the COVID-19 pandemic. *Journal of Computer Assisted Learning, 37*, 940–952. https://doi.org/10.1111/jcal.12533

Verkijika, S. F. (2019). Digital textbooks are useful but not everyone wants them: The role of technostress. *Computers & Education, 140*, 103591. https://doi.org/10.1016/j.compedu.2019.05.017

van Vianen, A. (2018). Person-environment fit: A review of its basic tenets. *Annual Review of Organizational Psychology and Organizational Behavior, 5*(1), 75–101. https://doi.org/10.1146/annurev-orgpsych-032117-104702

Wang, X., Tan, S. C., & Li, L. (2020). Technostress in university students' technology-enhanced learning: An investigation from multidimensional person-environment misfit. *Computers in Human Behavior, 105*, 106208. https://doi.org/10.1016/j.chb.2019.106208

Wang, A., Yu, S., Wang, M., & Chen, L. (2019). Effects of a visualization-based group awareness tool on in-service teachers' interaction behaviors and performance in a lesson study. *Interactive Learning Environments, 27*(5–6), 670–684. https://doi.org/10.1080/10494820.2019.1610454

Zheng, Y., Wang, J., Doll, W., Deng, X., & Williams, M. (2018). The impact of organisational support, technical support, and self-efficacy on faculty perceived benefits of using learning management system. *Behaviour & Information Technology, 37*(4), 311–319. https://doi.org/10.1080/0144929X.2018.1436590

Zhou, T. (2011). The impact of privacy concern on user adoption of location-based services. *Industrial Management & Data Systems, 111*(2), 212–226. https://doi.org/10.1108/02635571111115146

Zhou, T., & Li, H. (2014). Understanding mobile SNS continuance usage in China from the perspectives of social influence and privacy concern. *Computers in Human Behavior, 37*(C), 283–289. https://doi.org/10.1016/j.chb.2014.05.008

Ziraba, A., Akwene, G. C., Nkea, A.n. A. M., & Lwanga, S. C. (2020). The adoption and use of moodle learning management system in higher institutions of learning: A systematic literature review. *American Journal of Online and Distance Learning, 2*(1), 1–21. https://doi.org/10.47672/ajodl.489