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Investigation of the Relationship between Teachers' Problem Solving Skills and Technostress Levels

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This study aims to examine the relationship between teachers' problem solving abilities and their levels of technostress. The sample was selected using a stratified random sampling method, encompassing participants from 81 provinces of Türkiye. The final study group consisted of 3143 teachers working in public schools during the 2020 - 2021 academic year. To assess teachers' problem solving abilities, the "Adult Problem Solving Skills Scale" was utilized, while the "Teachers' Technostress Levels Scale" was employed to measure their technostress levels. Data analysis was conducted using multiple linear regression, One - Way Analysis of Variance (ANOVA) and Multivariate Analysis of Variance (MANOVA). The findings revealed that teachers generally exhibited high problem solving skills and moderate levels of technostress. Moreover, significant differences were observed in problem solving skills based on educational status, seniority and type, but no significant differences were found according to gender or teaching specialization. Additionally, technostress levels varied significantly across gender, seniority, teaching specialization, educational status and school type. The study further identified a significant negative correlation between technostress and problem solving skills, suggesting that technostress has a notable detrimental effect on teachers' problem solving abilities. Based on the findings obtained, recommendations have been made.

Introduction

The rapid development and transformation of technology in contemporary society have led to an expectation that individuals must keep pace with these changes. In the current era, individuals are required to possess the skills necessary for quick and thorough thinking, as well as the ability to access, process and produce information. However, challenges may arise in the process of utilizing the technologies required to acquire and apply these skills. Overcoming these challenges cannot be achieved through mere memorization of basic information and processes. Instead, it necessitates the cultivation of individuals who are not only comfortable with technology but also capable of solving problems and serving as role models (Lesh and

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Zavojewsky, 2007). To effectively address a problem, it is essential to first understand the problem situation. A problem arises when there is a gap between the current state and the desired state and there is uncertainty about how to bridge this gap (Öğülmüs, 2001). Cüceloğlu (2009) defines a problem as a situation that hinders the achievement of an individual's goals. Dewey (1938) further describes problems as circumstances that challenge individuals by perplexing the human mind, thereby causing both physical and mental discomfort (Karasar, 2008).

Problem Solving

The nature of problems varies based on their solutions and levels of difficulty. While some problems can be addressed through logical reasoning, others require emotional maturity. Additionally, certain problems necessitate adopting a different perspective to achieve resolution. A shared characteristic in problem solving processes is the removal of obstacles that hinder goal attainment (Cüceloğlu, 2009). A problem, often defined as a situation where an immediate solution is not apparent (Krulik and Rudnick, 1989), initiates its resolution process with the individual's motivation to address it. According to Morgan (1993), problem solving entails understanding and bridging the gap between obstacles encountered on the path toward a goal and the goal itself. This process requires not only domain-specific knowledge but also the selection and application of cognitive strategies appropriate to the context. The critical aspect of problem solving lies in identifying the tools or strategies that facilitate goal achievement and taking action (Senemoğlu, 1997). Problem solving extends beyond determining the result of a mathematical problem; it involves confronting novel situations, devising effective solutions (Gail, 1996), planning responses, overcoming challenges, creating opportunities, or demonstrating interest in addressing an issue (Ülger, 2003). The problem solving skills play a critical role in stimulating cognitive processes and ultimately contribute positively to individuals' mental development (Brown, 2003; Giganti, 2004; Gökkurt et al., 2015; Manuel, 1998; Martinez, 1998; Naser, 2008; Willoughby, 1985). Individuals engaged in problem solving not only apply previously acquired knowledge but also gain new insights that support future learning. The ability to address challenges encountered throughout life is directly linked to one's problem solving proficiency (Açıkgöz, 2003). A fundamental aim of the educational process is to equip individuals with systematic thinking skills that enable them to resolve real life problems effectively (Kuru, 2000). Teachers with strong problem solving skills positively influence students by incorporating these skills into their teaching practices more frequently (Sarı and Bozgeyikli, 2003). Consequently, fostering effective problem solving abilities should be a central objective of educational systems (Naser, 2008). It is essential to recognize that problem solving represents the cornerstone of 21st century teaching methodologies.

Technostress

Technology makes significant contributions to the field of education, as it does to all areas of life. Because one of the main objectives of education is to raise individuals in line with the needs of society, it is expected from the educational structure to keep up with the technological development (Akkoyunlu, 1995). Projects realized in recent years regarding the integration of technology into education have made technology an important component in education. Within the framework of various projects realized by the Turkish Ministry of National Education, schools are equipped with many technological tools and equipment such as interactive boards, tablet computer sets, three-dimensional printers, coding and robotic materials. Moreover, in recent years, virtual reality environments (Dalgarno and Lee, 2010; Papachristos et al., 2014) and augmented reality technologies (Lee, 2012) have been used more extensively in educational activities and these technologies are considered as an important potential in respect of their contribution to education. Thus, the interest in three-dimensional technologies such as virtual reality and augmented reality has increased and these technologies have started to be used more actively in the education world (Küçük-Avcı, Çoklar and İstanbullu, 2019). Teachers should be well-equipped in the use of technology, in addition to pedagogical and content knowledge, to use technologies more effectively in teaching and learning processes (Koehler and Mishra, 2005). However, changing and advancing technology policies in the field of education and working under adverse conditions and stress lead to deterioration in teachers' interest in their duties and in the quality and quantity of the services they render (Baysal, 1995), whereas they are seen to negatively affect teachers' individual health and psychology (Belacastro, 1982). The necessity for teachers to keep themselves up to date for technological developments and the expectations from teachers constitute a technology-oriented stress situation for the individual. This situation, which has been included in the literature as "Technostress," is defined as the individual's stress reactions such as anxiety, concern, fear, anger and uneasiness when he experiences a stress process because of technology-related reasons (Weil and Rosen, 1997; Yener, 2018). Wang, Shu and Tu (2008) define technostress as any direct or indirect negative effect of technology on attitudes, thoughts, behaviors, or psychology (Kaymaz, 2019). Technostress (Brod, 1982), which is a modern adaptation disease resulting from not being able to adapt to new technologies, has various effects on individuals, both medically and psychologically (Akınoğlu, 1993). The change in educational methods during the COVID-19 pandemic has brought the concept of technostress into prominence. Although educational institutions and educators have plans and strategies to benefit from technology more in their teaching activities, the sudden outbreak of the COVID-19 pandemic has resulted in the necessity of implementing changes, which are probably expected to occur within months or years, in a short time and rapidly (Daniel, 2020).

Importance of the Study

The nature of problem situations, the structure of problem solving and strategies to enhance success in problem solving have been extensively studied by educators and psychologists (Kılıç and Samancı, 2005). A review of the literature reveals that problem solving skills have been examined in relation to various factors, including emotional intelligence, epistemological beliefs, psychological resilience, political skills, decision-making abilities, self-efficacy, the use of scientific process skills and perceptions of psychological capital (Anık, 2018; Baysal, Arkan and Demirbaş, 2011; Erzen, 2020; Güler, 2006; Huang and Flores, 2011; Karışan, Bilican and Şenler, 2017; Kaya, 2008; Kefi, Çeliköz and Erişen, 2013; Kesgin, 2006; Kourmousi et al., 2016; Özgenel and Bozkurt, 2020; Pekdoğan, 2020; Sığırtmaç and Özbek, 2011; Udeani and Adeyemo, 2011; Vanek, 2017; Yılmaz, 2014). Studies on technostress reveal that only a small portion of research has focused on teachers. However, there has been a noticeable increase in studies involving teachers since the onset of the COVID-19 pandemic (Çetin, 2017; Çoklar, Efilti and Şahin, 2017; Dong et al., 2019; Lee and Lim, 2020; Li and Wang, 2020; Merchán and López-Arquillos, 2021; Mokh et al., 2021).

A review of the literature reveals a lack of research addressing problem solving skills and technostress in conjunction. A review of the literature reveals a lack of studies addressing problem solving skills and technostress together (Arslan, 2022; Brod, 1982; Ragu-Nathan et al., 2008; Stich et al., 2017). Brod (1982), who first introduced the concept of technostress, emphasized that technological pressures could hinder individuals' cognitive processes and thereby negatively affect their problem solving skills. Furthermore, Ragu-Nathan et al. (2008) highlighted the critical role of problem solving skills in overcoming the adverse effects of technostress. Similarly, Stich et al. (2017) argued that technostress could increase individuals' cognitive load, thereby slowing down their problem solving processes. In the current technological era, teachers frequently rely on technology to address various problems. However, the stress associated with technology use may influence their problem solving experiences. Given this context, examining the interplay between the emotional states induced by the necessity of using technology and teachers' ability to solve existing or potential problems emerges as an important area of study.

Purpose of the Study

This study aimed to explore the relationship between teachers' problem solving skills and their levels of technostress. To achieve this objective, the following research questions were addressed:

(1) What are the levels of teachers' problem solving skills?
(2) What are the levels of technostress among teachers?
(3) Do teachers' proble solving skill levels and technostress levels differ significantly based on variables such as gender, seniority, branch, educational background and school type?
(4) Does technostress influence problem solving skills and if so, to what extent?

Method

Sample

The study sample comprises teachers employed in public schools. During the data collection process, a total of 3205 teachers from various branches working in schools affiliated with the Ministry of National Education during the 2020–2021 academic year were selected using the stratified sampling method. After excluding extreme values from the dataset to satisfy the assumptions required for the chosen data analysis methods, the final analysis was conducted with data from 3143 participants. Demographic characteristics of the teachers who constitute the participant group are given in Table 1. When Table 1 below is reviewed, genders of the participants can be said to be evenly distributed. Most of the teachers have undergraduate degrees (n=2530) and are married (n=2467). Concerning the institutions where the participants work, the participants working in secondary school (n=1316) represent the highest number, while kindergarten teachers constitute the group with the lowest number of participants, with approximately 9%.

Table 1. Participant's Demographic Information

Variable	n	f	%
Gender	Male	1613	51.32
	Female	1530	48.68
Age	20 – 30	521	16.58
	31 – 35	657	20.90
	36 – 40	761	24.21
	41 – 50	516	16.42
	51 +	688	21.89
Educational Status	Undergraduate	2530	80.50
	Graduate	613	19.50
School Type	Primary School	786	25.01
	Secondary School	1316	41.87
	High School	1041	33.12
Seniority	1 – 5 Year	493	15.69
	6 – 10 Year	640	20.36
	11 – 15 Year	667	21.22
	16 – 20 Year	515	16.39
	21 – 25 Year	444	14.13
	26 + Year	384	12.22
Marital Status	Single	676	21.51
	Married	2467	78.49
Branch	Information Technology	599	19.06
	Branch Teachers	1812	57.65
	Primary School Teachers	732	23.29
Total		3143	100

Data Collection Tool

In addition to the personal information form, two different data collection tools were used in the study. The Problem solving Skills Scale for Adults, developed by Yaman and Dede (2008), consists of 18 items and five factors. It was prepared in a 5-point Likert type. The internal consistency coefficient of the scale (Cronbach's alpha coefficient) was found to be .88. The internal consistency coefficients of the factors forming the scale are .95 for Factor-1, .98 for Factor-2, .82 for Factor-3, .82 for Factor-4 and .87 for Factor-5 (Yaman and Dede, 2008). Confirmatory Factor Analysis (CFA) was carried out for the measurement tool. While Brown (2015) reports that CFA is affected by large data sets and can decrease the $\chi2/sd$ ratio, Kline (2014) considers more than 200 participants to be acceptable in the process of specifying the number of samples required for CFA. Therefore, 251 teachers were randomly selected to perform CFA. The fit indices obtained from the measurement model tested with JASP 0.11.1.0 software and the good fit values obtained are stated in Table 2.

Table 2. Fit Indices and Obtained Values

Fit Indices	Obtained Value	Criteria	Reference
χ^2/sd	4.215	$0\leq \chi2/sd\leq5$	Sümer (2000)
RMSEA	.068	0≤RMSEA≤.07	Steiger (2007)
SRMR	.047	0≤SRMR≤.05	Kenny (2010)
NFI	.897	.90≤NFI≤1	Bentler and Bonnet (1980)
CFI	.920	.90≤CFI≤1	Huck (2012)
TLI	.910	.90≤TLI≤1	Schumacker and Lomax (1996)

Upon reviewing Table 2 and the fit values observed in terms of recommended fit values, $\chi2/sd$, RMSEA, SRMR, NFI, TLI and CFI fit indices were found to be in the appropriate range.

The second measurement tool, the Teachers' Technostress Levels Defining Scale, developed by Çoklar et al. (2017), consists of 28 items and five factors. The internal consistency coefficient of the scale (Cronbach's alpha coefficient) was found to be .917 and the Spearman-Brown coefficient calculated for splitting into two halves was obtained as .845. The internal consistency coefficients (Cronbach's alpha coefficient) of the factors forming the scale took values ranging between .712 and .788 (Çoklar et al., 2017). To apply CFA to the measurement tool, 704 teachers were randomly selected. The fit indices obtained from the measurement model tested with JASP 0.11.1.0 software and the good fit values obtained are given in the Table 3.

Table 3. Fit Indices and Obtained Values

Fit Indices	**Obtained Value**	**Criteria**	**Reference**
χ^2/sd	4.215	0≤ χ2/sd≤5	Sümer (2000)
RMSEA	.068	0≤RMSEA≤.07	Steiger (2007)
SRMR	.047	0≤SRMR≤.05	Kenny (2010)
NFI	.897	.90≤NFI≤1	Bentler and Bonnet (1980)
CFI	.920	.90≤CFI≤1	Huck (2012)
TLI	.910	.90≤TLI≤1	Schumacker and Lomax (1996)

Upon reviewing Table 3 and the fit values observed in terms of recommended fit values, χ2/sd, RMSEA, SRMR, NFI, TLI and CFI fit indices were found to be in the appropriate range. Consequently, the 5-factor structure of the Problem Solving Skills Scale for Adults and the 5-factor structure of the Teachers' Technostress Levels Defining Scale were confirmed for the sample of this study at the end of the CFA process.

Data Analysis

Statistical Package for the Social Sciences (SPSS) 23.0 and JASP 0.11.1.0 software were used in the analysis of the data obtained in the study. Before the analysis, it was tested whether the data were normally distributed. To this end, kurtosis and skewness values were used. Huck (2012) expresses that the kurtosis and skewness values should vary between -1 and +1 for the data to be normally distributed. In this study, the skewness and kurtosis coefficients regarding the data collected with the Problem Solving Skills Scale for Adults were determined as -.058 and .061, respectively. The skewness and kurtosis coefficients regarding the data collected with the Teachers' Technostress Levels Defining Scale were obtained as .046 and .168, respectively. According to these values, the data can be said to be normally distributed. Moreover, the distribution of the data was found to be normal when q-q and detrended q-q graphs were examined.

The statistical methods used to answer the research questions consisted of descriptive statistics, multiple linear regression analysis and multivariate analysis of variance (MANOVA). One-Way Analysis of Variance (ANOVA) and Product-moment correlation analysis were performed as supporting analyses to regression and MANOVA. The practical effect sizes of the significant differences detected in the analyses were evaluated by analysing eta-squared (η^2) indices. For small, medium and large effect sizes, values of .01, .06 and .14 were taken into consideration (Huck, 2012).

Findings

Kurtosis and skewness coefficients and descriptive statistics were reviewed to determine whether the obtained data were normally distributed. Values related to the participants' problem solving skill scores are given in Table 4.

Table 4. Descriptive Statistics of Problem Solving Skills of the Participants

Scale	**n**	**Min**	**Max**	**X̄**	**Sd**	**Skewness**	**Kurtosis**
Problem Solving	3143	44	90	73.76	7.828	-.058	.061

Factors	**n**	**X̄**	**Sd**	**Level**
Thinking about the Effects of the Problem's Solution	3143	4.060	.525	High
Problem Solving Through Modeling	3143	3.894	.536	High
Searching for Alternative Solutions	3143	4.007	.598	High
Determination in Implementing the Solution	3143	4.302	.528	High
Analysing the Encountered Problem	3143	4.281	.511	High

As can be seen in Table 4, the participant with the lowest score received 44 and the participant with the highest score received 90 from the measurement tool. The total mean score of 3143 participants was found to be 73.76 and the standard deviation to be 7.828. Accordingly, the arithmetic mean of the participants' total mean scores (n=73.76) is 4.098 and the problem solving skill levels of the teachers participating in the study can be said to be high. In addition, the highest mean among the factors is observed in the “Thinking the Effects of the Problem's Solution” factor ($\bar{X}$=4.302), whereas the lowest mean is observed in the "Problem Solving Through Modeling" factor ($\bar{X}$=3.894).

Kurtosis and skewness coefficients and descriptive statistics were reviewed to determine whether the obtained data were normally distributed. Values related to the technostress scores of the participants are given in Table 5.

Table 5. Descriptive Statistics of Technostress of the Participants

Scale	**n**	**Min**	**Max**	**X̄**	**Sd**
Technostress	3143	28	129	71.37	16.196

Factors	**n**	**X̄**	**Sd**	**Level**
Learning - Teaching Process Oriented	3143	2.700	.664	Medium
Profession Oriented	3143	2.086	.640	Low
Technical Issue Oriented	3143	2.793	.760	Medium
Personal Oriented	3143	2.248	.773	Low
Social Oriented	3143	2.988	.753	Medium

As can be seen in Table 5, the participant with the lowest score received 28 and the participant with the highest score received 129 from the measurement tool. The total mean score of 3143 participants was found to be 71.37 and the standard deviation to be 16.196. Accordingly, the arithmetic mean of the participants' total mean scores (X=71.37) is 2.549 and the technostress levels of the teachers participating in the study can be said to be medium. In addition, the highest mean among the factors is observed in the "Social Oriented" factor ($\bar{X}$=2.988), whereas the lowest mean is observed in the "Profession Oriented" factor ($\bar{X}$=2.086).

Whether the participants' problem solving skills and technostress levels differed by gender, seniority, branch, educational status and school type was compared with MANOVA and the prerequisites related to the test were. Because the MANOVA test result was found significant, the inter-subject test results were analysed. The relevant statistics are presented in Table 6.

Table 6. Comparison of the Participants' Problem Solving Skills and Technostress Levels According to Gender

Independent Variable	Pillai's Trace	F	Hypothesis df	Error df	Sig.	η^2	Observed Power
Gender	.015	23.447	2.000	3140.000	.000	.015	1.000
Seniority	.995	3.777	4.000	6278.000	.005	.002	.893
Branch	.034	27.345	4.000	6280.000	.000	.017	1.000
Educational Status	.994	8.834	2.000	3140.000	.000	.006	.972
School Type	.994	4.828	4.000	6278.000	.001	.003	.958

When problem solving skills and technostress variables are examined together in Table 6, a significant difference in the gender, branch, educational status and school type variables is observed ($p<.05$). Although a sufficient sample size (n=3143) was achieved according to the power value in the variables in which a significant difference was observed, the effect sizes was small (η^2 (gender, branch, educational status) < .06) (Cohen, 1988). Thus, gender, seniority, branch, educational status and school type variables affect the problem solving skill and technostress level together in the presence of a low effect size. To interpret the related research questions in more detail, how the dependent variables included in MANOVA changed compared to the independent variables was analysed with ANOVA (Table 7).

Table 7. Comparison of the Participants' Problem Solving Skills and Technostress Levels According to Gender

Source of Variance	Dependent Variable	Sum of Squares	Sd	Mean Square	F	Sig.	η^2
Gender	Problem Solving	.228	1	.228	1.207	.272	.000
	Technostress	14.064	1	14.064	42.592	.000	.013
	Problem Solving	594.059	3141				
	Technostress	1037.137	3141				
Seniority	Problem Solving	1.264	2	.632	3.346	.035	.002
	Technostress	2.336	2	1.168	3.497	.030	.002
	Problem Solving	593.024	3140				
	Technostress	1048.864	3140				
Branch	Problem Solving	.763	2	.381	2.018	.133	.001
	Technostress	33.741	2	16.870	52.064	.000	.032
	Problem Solving	593.525	3140				
	Technostress	1017.459	3140				
Educational Status	Problem Solving	1.393	1	1.393	7.377	.007	.002
	Technostress	4.222	1	4.222	12.666	.000	.004
	Problem Solving	592.895	3141				
	Technostress	1046.978	3141				
School Type	Problem Solving	1.132	2	.566	2.995	.045	.002
	Technostress	3.738	2	1.869	5.603	.004	.004
	Problem Solving	593.156	3140				
	Technostress	1047.462	3140				
			3143				

Upon reviewing Table 7, it was concluded that the problem solving skills and technostress levels of the participants differed significantly when examined together.

Accordingly, when problem solving skills and technostress levels are examined together, it is observed that the variable that leads to a significant difference in terms of the gender variable is the technostress levels of the participants. Considering the findings, the technostress levels of the female participants ($\bar{X}$=2.618) are higher than those of the male participants ($\bar{X}$=2.484).

It was concluded that both problem solving skills ($F_{(2, 3140)} = 3.346$, $p<.05$) and technostress levels of the participants differed significantly according to their seniority ($F_{(2, 3140)} = 3.497$, $p<.05$).

It was concluded that the problem solving skills of the participants did not differ significantly according to their branches ($F_{(2, 3140)} = 2.018$, $p>.05$), but technostress levels differed significantly ($F_{(2, 3140)} = 52.064$, $p<.05$). Accordingly, when problem solving skills and technostress levels are examined together, it is observed that the variable that leads to a significant difference in terms of the branch variable is the technostress level.

While the problem solving skills of the participants who had bachelor's degrees ($\bar{X}$= 4.087) were at a lower level than the problem solving skills of the participants who had graduate degrees ($\bar{X}$=4.140), the technostress levels of the participants who had bachelor's degrees ($\bar{X}$=2.567) were higher than the technostress levels of the participants who had graduate degrees ($\bar{X}$=2.474).

It was concluded that both problem solving skills ($F_{(2, 3140)} = 2.995$, $p<.05$) and technostress levels of the participants differed significantly according to their school type ($F_{(2, 3140)} = 5.603$, $p<.05$).

The changes in the participants' technostress levels between their seniorities, branches and school types are given in Table 8.

Table 8. Scheffe Tests of the Participants Problem Solving Skills and Technostress Levels According to Seniority

Dependent Variable	**(I) Seniority**	**(J) Seniority**	$\Delta\bar{x}_{(I-J)}$	**Sh**	**p**
Problem Solving	21 + Year	1-10 Year	.049*	.020	.039
Technostress	21 + Year	11-20 Year	.066*	.026	.035
	(I) Branch	**(J) Branch**			
Technostress	Information Technology	Branch Teachers	-.269*	.0268	.000
		Primary School Teachers	-.248*	.0313	.000
	(I) School Type	**(J) School Type**			
Problem Solving	Primary School	Secondary School	.048*	.020	.034
Technostress	Secondary School	Primary School	-.067*	.026	.032
		High School	-.072*	.024	.008

When Table 8 is viewed, it is seen that the problem solving skill levels of the participants who have seniority of 21 years and longer ($\bar{X}$=4.131) are higher than those of the participants whose seniority is between 1 and 10 years ($\bar{X}$=4.081). Moreover, the technostress levels of the participants who have seniority of 21 years and longer ($\bar{X}$=2.582) are higher than the problem solving skill levels of the participants whose seniority is between 11 and 20 years ($\bar{X}$=2.516).

The technostress levels of the participants whose branch is Information Technologies ($\bar{X}$=2.336) seem to be lower than the technostress levels of the participants who are preschool and primary school teachers ($\bar{X}$=2.584) and teachers of all other branches ($\bar{X}$=2.605).

The problem solving skills of the participants working in primary school ($\bar{X}$=4.128) are at a higher level than the problem solving skills of the participants working in secondary school ($\bar{X}$=4.081). Furthermore, the technostress levels of the participants working in secondary school ($\bar{X}$=2.508) are lower than the levels of both participants working in primary school ($\bar{X}$=2.575) and participants working in high school ($\bar{X}$=2.581).

Multiple regression analysis was conducted to identify the role of Learning and Teaching Process Oriented, Profession Oriented, Technical Issue Oriented, Personal Oriented and Social Oriented factors that form technostress in problem solving skills and the results are given in Table 9.

Table 9. The Results of the Regression Analysis Between Technostress and Problem Solving Skills' Factors

Model	R	R^2	R^2 Change	sh	F	P
1	.240[a]	.058	.056	.42251	38.423	.000

When Table 9 is reviewed, it is observed that the regression model created explains 5.8% of the variance regarding problem solving skills (R^2=.058, $F_{(5,3137)}$ = 38.423, p=.000). Although the rate is low, the role of technostress in problem solving skills seems to be at a low level and significant in light of the findings. The roles of technostress in problem solving skills based on the factors are presented in Table 10.

Table 10. The Results of the Regression Analysis Between Technostress and Problem Solving Skills' Factors

Variables	B	Sh	β	t	p	VIF	Tolerance
Constant	4.273	.036		120.071	.000		
Learning - Teaching Process Oriented	-.022	.016	-.034	-1.360	.174	2.058	.486
Profession Oriented	-.074	.017	-.108	-4.270	.000	2.148	.466
Technical Issue Oriented	.037	.014	.065	2.681	.007	1.972	.507
Personal Oriented	-.126	.014	-.224	-9.191	.000	1.976	.506
Social Oriented	.073	.014	.126	5.109	.000	2.019	.495

Upon reviewing Table 10, the Profession Oriented, Technical Issue Oriented, Personal Oriented and Social Oriented dimensions of technostress were found to have a significant role in the problem solving skill ($\beta_{profession}$ = -.108, p<.05; $\beta_{technical}$ = .065, p<.05; $\beta_{personal}$ = -.224, p<.05; β_{social} = .126, p<.05). Moreover, the dimension of Learning and Teaching Process Oriented was found to play no significant role in problem solving skills ($\beta_{learning\text{-}teaching}$ = -.034, p>.05).

Conclusion and Discussion

The findings of the study indicate that teachers possess high levels of problem solving skills. An examination of the sub-dimensions of the measurement tool reveals that skills such as considering the potential effects of problem resolution, solving problems through modeling, exploring alternative solutions, demonstrating determination in implementing identified solutions and analyzing encountered problems are all at high levels. These findings align with the results of several studies in the literature (Anık, 2018; Arslan et al., 2022; Bozkulak, 2010; Çetin-Dalgıç, 2021; Düzgün, 2011; Gürer, 2021; Kılıç, 2021; Mete, 2018; Özgenel and Bozkurt, 2020; Tavlı, 2009; Varış, 2008). The findings suggest that teachers are proficient in analyzing problems, utilizing models for problem solving, identifying alternative solutions and reflecting on the implications of their resolutions. Similarly; Şahin, Şahin and Heppner (1993) reported that individuals who perceive themselves as competent in problem solving are more assertive and achieve higher academic success. Based on these findings, it can be concluded that teachers demonstrate a positive social approach and are proficient both in overcoming challenges and achieving academic success.

When the problem solving skill levels and technostress levels of teachers are examined together, a significant difference emerges with respect to the gender variable. The gender variable has a low effect size on both problem solving skills and technostress levels. Notably, this significant difference related to gender is primarily attributed to variations in participants' technostress levels when both variables are analyzed simultaneously. The findings indicate that teachers' problem solving skill levels do not differ significantly based on the gender variable. This result aligns with numerous studies in the literature (Akın-Kösterelioğlu, 2007; Altuntaş, 2008; Anık, 2018; Bağçeci and Kinay, 2013; Bal, 2011; Bozkulak, 2010; Bozkurt and Üstün, 2003; Çetin, 2011; Çetin-Dalgıç, 2021; Demirtaş and Dönmez, 2008; Düzgün, 2011; Ertuğrul and Kutluca, 2020; Erzen, 2020; Güler, 2006; Gürer, 2021; Izgar et al., 2004; İnan, 2015; Kılıç, 2021; Nacar and Tümkaya, 2011; Öncü, 2019; Özgenel and Bozkurt, 2020; Pehlivan and Konukman, 2004; Sarıca, 2015; Tavlı, 2009; Tekin, 2019; Tuzcuoğlu and Mirzeoğlu, 2018). The lack of variation in problem solving skill levels based on the gender variable can be attributed to the uniformity of educational opportunities, professional experiences and career advancements, which do not differ by gender. From the perspective of gender roles, it is expected that men and women share responsibilities equally across all areas of life (Dökmen, 2012). In this context, it is plausible to assume that the problem solving skill levels of male and female teachers are similar due to the equitable distribution of roles and comparable responsibilities they undertake in their personal and professional lives.

Based on the findings of the study, significant differences were observed in teachers' technostress levels concerning the gender variable. Specifically, female teachers were found to experience higher levels of technostress compared to their male counterparts. This result aligns with previous studies in the literature (Abilleira et al., 2021; Çoklar and Şahin, 2011; Jena and Mahanti, 2014; Kalkan, 2018; Karakaya, 2013; Kaplan, 2021; Kuday and Akpınar, 2020; Marchiori, Mainardes and Rodrigues, 2019; Merchan and Lopez-Arquillos, 2021; Morris and Venkatesh, 2000; Shepherd, 2004; Syvänen et al., 2016; Tarafdar et al., 2011). Jena and Mahanti (2014) suggest that women are more likely to use technology out of necessity, whereas men tend to engage with it out of personal interest. Additionally, gender differences in the technology adaptation process (Morris and Venkatesh, 2000) may contribute to the observed disparities in technology-related stress levels. These findings provide further insight into the influence of gender on technostress and underscore the need for tailored interventions to address these differences.

When teachers' problem solving skills and technostress levels are analyzed together, a significant difference is observed with respect to the seniority variable. The findings indicate that seniority has a low effect size on both problem solving skills and technostress levels when considered simultaneously. The study reveals that teachers' problem solving skill levels differ significantly based on their seniority. Specifically, teachers with 21 or more years of seniority exhibit higher problem solving skill levels compared to those with 10 or fewer years of seniority. These results are consistent with previous studies in the literature (Anık, 2018; Çetin, 2011; Düzgün, 2011; Nacar and Tümkaya, 2011; Öncü, 2019; Öztürk, 2013). The higher problem solving skills of more senior teachers can be attributed to their accumulated experience, as experience provides individuals with the knowledge of effective strategies to address challenges (Çalık et al., 2013). Consequently, it is reasonable to predict that increased experience positively influences an individual's problem solving abilities. Additionally, the findings related to seniority align with the observation that teachers' problem solving skills improve with increasing age and technological proficiency. These results underscore the importance of experience and professional development in enhancing problem solving competencies among educators.

The findings of the study indicate that teachers' technostress levels differ significantly based on their seniority. Specifically, teachers with 21 or more years of seniority exhibit higher technostress levels compared to those with 20 or fewer years of seniority. These results are consistent with previous studies in the literature (Abilleira et al., 2021; Atan, 2021; Çetin and Bülbül, 2017; Kaplan, 2021; Kuday and Akpınar, 2020; Li and Wang, 2020; Merchan and Lopez-Arquillos, 2021; Özgür, 2020; Syvänen et al., 2016). The integration of technology into education may pose challenges for teachers with higher seniority, potentially due to difficulties in keeping pace with technological advancements as they age. Teachers with extensive seniority have often spent a significant portion of both their educational and professional lives in environments shaped by traditional educational methods, largely devoid of technology. As a result, senior teachers accustomed to conventional practices may struggle to adapt to new approaches, exhibit reluctance to adopt them and even resist change (Can, 2006). This resistance is likely to contribute to higher levels of technostress among this group. Conversely, teachers with lower seniority are generally more familiar with technological innovations from an early age, which may help reduce their susceptibility to technostress. These findings suggest that the generational divide in exposure to and comfort with technology plays a critical role in shaping technostress levels across varying seniority levels.

When teachers' problem solving skills and technostress levels are analyzed together, a significant difference emerges concerning the branch variable. However, the branch variable exhibits a low effect size on both problem solving skills and technostress levels when considered simultaneously. This significant difference primarily originates from variations in participants' technostress levels. The findings indicate that teachers' problem solving skill levels do not significantly differ based on the branch variable. These results align with previous studies in the literature (Akın-Kösterelioğlu, 2007; Altuntaş, 2008; Bağçeci and Kinay, 2013; Çetin-Dalgıç, 2021; Demirtaş and Dönmez, 2008; Gürer, 2021; Kesgin, 2006; Pehlivan and Konukman, 2004; Yerlikaya, 2004; Yılmaz, 2014). The lack of differentiation in problem solving skills by professional branch may be attributed to the general nature of these skills, which are not directly tied to professional or technical subjects. Additionally, the similarity in training during undergraduate education and professional development, which fosters problem solving abilities, may contribute to the absence of branch-specific differences. This suggests that foundational problem solving training provided in teacher education programs equips individuals with broadly applicable skills, irrespective of their specific teaching branch.

The findings of the study reveal that teachers' technostress levels differ significantly based on the branch variable. Specifically, Information Technology (IT) teachers exhibit lower technostress levels compared to primary school teachers and teachers of other branches. These results are consistent with findings in the literature (Bakioğlu and Çevik, 2020; Kaplan, 2021; Kuday and Akpınar, 2020). The lower technostress levels among IT teachers can be attributed to their continuous engagement with technology, which is inherent to their branch. This regular interaction likely reduces their stress related to technology use. However, Arslan, Tozkoparan and Kurt (2019), in their study on teachers' nomophobia and FoMO (Fear of Missing Out) levels, identified IT teachers as having the highest levels of nomophobia and FoMO. This suggests that for IT teachers, the primary source of stress is not technology itself but the fear of being disconnected from it. The significant difference in technostress levels across branches, contrasted with the lack of variation in problem solving skill levels, can be explained by the nature of the problems being addressed. Since the problems evaluated in this study are not exclusively technological, the uniformity in problem solving skills across branches reflects the broader, non-specialized nature of these challenges.

When the levels of teachers' problem solving skills and technostress are examined together, a significant difference is observed in relation to the variable of educational status. This variable, however, demonstrates a low effect size on both problem solving skills and technostress levels when analyzed simultaneously. The findings of the study reveal that teachers' problem solving skill levels vary significantly based on their educational status. Specifically, teachers with bachelor's degrees exhibit lower problem solving skills compared to those holding master's or doctoral degrees. These findings are consistent with previous studies in the literature (Arkan, 2011; Demircan, 2018; Demirtaş, 2016; Erzen, 2020; Izgar et al., 2004; Öztürk, 2013; Varış, 2008). During graduate education, teachers engage in research-oriented activities, which provide opportunities to develop new skills or enhance their existing ones. Consequently, it can be argued that teachers with advanced degrees are better equipped with the knowledge and skills necessary to effectively address the challenges they encounter.

The findings of the study indicate that teachers' technostress levels vary significantly based on their educational status. Specifically, teachers holding bachelor's degrees exhibit higher technostress levels compared to those with master's or doctoral degrees. These results align with previous studies in the literature (Altıntaş, 2020; Hsiao, 2017; Kaymaz, 2019; Krishnan, 2017; Marchiori et al., 2019; Ragu-Nathan et al., 2008; Tarafdar et al., 2011; Türen et al., 2015). Graduate education is inherently research-oriented, necessitating the frequent use of technological tools as they provide the most efficient means to access information in modern times. Graduate students actively utilize technology while completing assignments, conducting projects and preparing academic publications. This consistent and purposeful engagement with technology is hypothesized to mitigate technostress levels in individuals.

When teachers' problem solving skill levels and technostress levels are analyzed collectively, a significant difference emerges concerning the school type variable. However, the effect size of the school type variable on both problem solving skills and technostress levels is relatively low when considered simultaneously. The study's findings indicate that teachers' problem solving skill levels vary significantly based on the type of school in which they work. Specifically, primary school teachers demonstrate higher problem solving skill levels compared to their counterparts in secondary schools. These findings align with previous studies in the literature (Anık, 2018; Bal, 2011; Izgar et al., 2004; Öztürk, 2013). In primary schools, students range from preschool to 4th grade, representing a younger age group that frequently seeks their teachers' assistance in resolving various problems. As a result, primary school teachers are more likely to employ decision-making mechanisms actively and serve as role models in problem solving. These responsibilities and expectations may contribute to the higher problem solving skill levels observed among primary school teachers.

The findings of the study reveal that teachers' technostress levels vary significantly based on the type of school where they work. Specifically, secondary school teachers exhibit lower technostress levels compared to both primary school and high school teachers. These results are consistent with previous research in the literature (Kaplan, 2021; Karadeniz and Zabcı, 2020; Kuday and Akpınar, 2020). Contemporary students, often referred to as "digital natives," are generally more proficient and active in using technology than their teachers. This dynamic may contribute to high school teachers feeling inadequate in the presence of their students when it comes to technology use. Additionally, the incomplete installation of interactive whiteboards in primary schools may have limited primary school teachers' opportunities to integrate technology into their lessons. Furthermore, primary school teachers often emphasize "learning by doing and experiencing" (Özyürek and Çavuş, 2016), a method particularly effective for primary school students who are in the concrete operational stage of cognitive development.

Consequently, primary school teachers may feel less inclined or less prepared to use technology actively in their teaching, potentially leading to increased technostress when required to do so. Supporting this perspective, Ayadın, Burgaz and Yeşilyurt (2020) found that primary school teachers experience high levels of stress, a finding that aligns with the results of this study.

The analysis conducted to examine the role of the factors constituting technostress—namely, "Learning and Teaching Process Oriented," "Profession Oriented," "Technical Issue Oriented," "Personal Oriented," and "Social Oriented"—in relation to problem solving skills revealed that the regression model explained approximately 5.8% of the variance in problem solving skills. While this indicates a modest explanatory power, it underscores the significance of various factors influencing problem solving abilities. In this context, the findings suggest that problem solving skills play a crucial role in mitigating technostress. Batıgün and Kayış (2014) emphasize that developing problem solving skills is essential for maintaining mental health, particularly in managing stressful situations, as these skills have a predictive effect on stress. They further assert that enhancing problem solving abilities can significantly alleviate stress. However, when examining the influence of technostress factors on problem solving skills, it was found that only the "Learning and Teaching Process Oriented" dimension did not have a significant effect. This may be attributed to the study's broad focus on adult problem solving skills, rather than skills specific to educational contexts. Dinç (2015) highlights that removing technology entirely from our lives, akin to cutting off a child's finger to address thumb-sucking behavior, is not a viable solution to addressing challenges associated with technology. Instead, learning to coexist with technology and fostering awareness about its usage are proposed as effective strategies for reducing technostress. Such measures are also expected to positively impact individuals' problem solving abilities. In conclusion, the technostress variable emerges as a critical factor influencing individuals' capacity to accurately identify problems, devise appropriate solutions and implement them effectively. Recognizing and managing technostress can thus contribute to the development and application of robust problem solving skills.

Based on the findings obtained in this study, the following recommendations have been proposed for researchers:

- In the contemporary era, characterized by the growing integration of technology in education, there is a need for more in-depth research into the impact of technostress on educators. These studies could contribute to addressing the challenges teachers face in using technology. Additionally, it is crucial to develop strategies for managing the stress levels of teachers during their adaptation process to new technologies.
- To enhance teachers' problem solving skills, greater emphasis should be placed on professional development programs. These programs can equip teachers with essential skills such as strategic thinking, analytical abilities and creative problem solving techniques.
- Akhtari et al. (2013) identified the primary causes of technostress as rapid technological advancements, inadequate user training and increased job pressure. Providing in-service training focused on enhancing teachers' technological proficiency can help mitigate the levels of technostress among educators. Additionally, programs that offer pedagogical and psychological support in information and communication technologies for teachers can facilitate their ability to cope with stress.
- Although teachers with 21 years or more of seniority exhibit higher problem solving skills, they also demonstrate higher levels of technostress compared to teachers with lower seniority. Therefore, initiatives could be implemented to help these experienced

teachers leverage the knowledge gained through their seniority in addressing technology-related challenges.

- The findings indicate that educational attainment positively influences both problem solving skills and technostress levels among teachers. Teachers could be encouraged to pursue further development through graduate education to enhance their skills and manage technostress more effectively.
- The technostress levels of Information Technologies teachers were found to be lower than those of teachers from other subject areas. To further assess the potential of Information Technologies teachers in terms of technology use skills, it could be beneficial to encourage collaboration between them and teachers from other disciplines in the application of educational technologies.
- According to Koçak and Eves (2010), one of the factors influencing teachers' problem solving skills is the quantity of educational seminars or courses attended by the participants. By providing opportunities for teachers to engage in more in-service training, it is possible to enhance their problem solving abilities.

Note

This study was produced from the doctoral thesis prepared by the first author under the supervision of the second author.

Conflict of Interest

There are no conflicts of interest regarding the publication of this article.

Informed Consent

Participants were informed about the study's objectives, procedures, and potential risks. They were informed that participation was voluntary and that they could withdraw from the study at any point if they felt reluctant without any consequences. All personal information was anonymized to protect participants' confidentiality.

Data Availability

The data are not publicly available due to privacy or ethical restrictions.

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