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The Effect of Professional Development Programs on Teachers' Self-Efficacy Beliefs in Science Teaching: A Meta-Analysis Study

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The Effect of Professional Development Programs on Teachers' Self-Efficacy Beliefs in Science Teaching: A Meta-Analysis Study

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Abstract

This study examined the effect size of professional development programs on teachers' science teaching by meta-analysis method. For this purpose, literature review was made on existing national and international studies. In this context, master's thesis, doctoral dissertation, and articles conducted between 1990 and 2019 were appropriate for the research problem and had statistical data to be included in the meta-analysis study were reviewed and investigated in Turkish and English from national and international databases. As a result of the literature review, 1072 national and international related studies were reached. Among these studies, it was determined that 14 studies (N=969) met the inclusion criteria. The effect sizes and the combined effect size of the studies were calculated using "Comprehensive Meta-Analysis v2.0 (CMA) Statistical Package Program".

In the studies combined with random effects in the model, the effect size of professional development programs on teachers' self-efficacy beliefs in science teaching was found to be "moderate". As a result of the heterogeneity test, the study was found to have a high level of heterogeneity.Moderator analysis was performed in order to determine the sources of high levels of heterogeneity between studies. As a result of the ANOVA similarity analysis conducted for the publication type and branch categorical moderators, it was determined that the effect sizes of teachers' science teaching self-efficacy beliefs differed significantly according to the branch variable. As a result of the meta-regression analysis conducted for publication year, sample size, and application period, which were assessed as continuous variables, it was found that publication year and sample size as moderators caused significant differences in the effect sizes of science education teachers' self-efficacy beliefs. Teacher professional development programs were found to have a positive influence on science education teachers' self-efficacy beliefs, and teachers were suggested to be encouraged to participate in such programs.

Keywords: Professional development programs, Science teaching self-efficacy Beliefs, Self-efficacy, Effect size, Meta-analysis

Introduction

The teaching profession, one of the most important components of the education system, is carried out by people who manage the learning and teaching process at different levels of education and have high qualifications in terms of general culture, professional knowledge and skills, and expertise (Ada & Unal, 2009).The competencies of a teacher enhance the quality and qualification of the education. Professional development is seen as an important component of education reforms in recent years in increasing teacher quality (Borko, 2004; Hiebert, Gallimore & Stigler, 2002; Higgins &Parkons, 2009; Loucks-Horsley, Love, Stiles, Mundry, Love & Hewson, 2003). Professional development of teachers is accepted as a dynamic process that occurs throughout the teacher's life and covers different learning types (Menezes, 2011; Özer, 2005; Villegas-Reimers, 2003). According to Blandford (2000), professional development provides significant contributions to increasing professional performance, correcting inefficient practices, facilitating the implementation of educational policies, and ensuring change. This is supported by studies showing that the lack of professional development is an important reason why primary school teachers cannot teach science course effectively (Madden, 2016; Martin, 2016; Prentiss Bennett, 2016; Trimmell 2015).

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In this context, some programs are prepared and applied for teachers to ensure their professional development. Studies have shown that teachers' teaching skills and performances would be improved with long-term professional development programs applied practically in teaching environments (Banilower, Boyd, Pasley, & Weiss, 2005; Garet, Porter, Desimone, Birman &Yoon, 2001; Guskey, 2003). According to Avalos (2011), professional development programs for teachers should teach new things to teachers and teach new things to teachers and give them the chance to practice what they have learned. Desimone (2009) sees the professional development programs as many activities and interaction experiences where teachers can increase their knowledge and skills and improve their teaching practices. A change that took place in teachers' knowledge, beliefs, attitudes and self-efficacies was that teachers showed a strong relationship with the classroom practices (Fishman, Marx, Best & Tal, 2003; Haney, Lumpe & Czerniak, 2002; Luft & Hewson, 2014). Professional development and teaching practices have been shown as a way in studies conducted to improve self-efficacy (Posnanski, 2002, Cakiroglu, Capa-Aydin & Hoy 2012).

Self-efficacy is based on Bandura's social cognitive behavior and motivation theory and defined as the belief that individuals can overcome a difficult situation or task (Bandura, 1997). Self-efficacy, which is associated with many aspects of the individuals such as cognitive, affective, motivational, and decision-making, affects how individuals cope with difficulties, motivate themselves, and make important decisions about their lives (Bandura, 2002). On the other hand, self-efficacy is also evaluated as a measure of individuals' trust on abilities to perform complex tasks successfully (Mintzes, Marcum, Messerschmidt-Yates & Mark, 2013). Therefore, high self-efficacy level of teachers affects their efficient teaching performance as well as the success levels of students (Bleicher, 2006).

Self-efficacy concept defined by Bandura (1977) has been defined specifically for many areas. When this concept is applied to science teaching, it is called as "science teaching self-efficacy belief". Science teaching self-efficacy belief is defined as the teacher's belief that he/she will positively affect students' behaviors and success and can teach science effectively (Dembo & Gibson, 1985). Science education self-efficacy belief is closely related with the teachers' beliefs about science teaching and in-class activities. Teachers with a high level of science teaching self-efficacy have characteristics such as using student-centered teaching methods and techniques, sparing more time on teaching science, and showing a tendency to conduct research-based teaching.

On the other hand, teachers with low level of science teaching self-efficacy belief prefer to use teacher-centred approaches such as reading information from a book and explaining them verbally (Schriver & Czerniak, 1999). In other words, there is a positive correlation between science teaching self-efficacy beliefs and science teaching practices (Bhattacharyya, Volk & Lumpe, 2009; Czerniak & Shriver, 1994). For this reason, it is necessary to provide opportunities to increase teachers' self-efficacy beliefs (Ramakrishnan & Salleh, 2018). In this context, professional development programs involve extensive activities, including designing teaching practices (Avidav, 2000) and providing teachers opportunities to share their experiences with their colleagues and increase their professional knowledge (Vescio, Ross & Adems, 2008).

In the literature, there are studies that state that professional development programs are effective on teachers' self-efficacy beliefs in science teaching (Atia, 2012; Deniz & Akerson, 2013; Eshach, 2003; Ewing-Taylor, 2012) or they have no effect (Luera & Murray, 2016; Peters-Burton, Merz, Ramirez & Saroughi, 2015). It is evident that there are inconsistencies regarding the effect of professional development programs on science classroom teachers' self-efficacy beliefs. Therefore, there is a need to gather the studies under one umbrella to reanalyze them and make new decisions (Sağlam & Yuksel, 2007). When examining the relevant literature, there are national and international studies with independent and different results that investigate the effect of professional development programs on teachers' self-efficacy beliefs in science education; however, a meta-analysis on this topic was not found.

Aim of the Study

The purpose of the present study is to examine national and international studies that examine the effects of professional development programs on science teachers' self-efficacy beliefs through a meta-analysis. This meta-analysis is intended to provide information about the effect of in-service training programs on science teachers' self-efficacy beliefs and to serve to clarify inconsistencies in studies of teachers' self-efficacy beliefs.
Based on these points, answers to the following questions were sought within the scope of the study:

1. What is the overall effect level of the professional development programs on teachers' science teaching self-efficacy beliefs?

2. Does the general effect of the professional development programs on teachers' science teaching self-efficacy beliefs differ significantly according to the study moderators (publication type, branch, publication year, sample size and application time)?

Method

Research Design

In this study, a meta-analysis method from quantitative research synthesis methods was used. Meta-analysis is a statistical method used for combining experimental results obtained from individual studies, synthesizing and interpreting them in the form of effect size (Card, 2012; Wolf, 1986).

Data Collection and Selection Criteria

In this meta-analysis study investigating the effect of professional development programs on science teaching self-efficacy beliefs, "Eric, Science Direct, Web of Science, Taylor & Francis Online, Scopus, JSTOR, Ulakbim, Google Academic, Proquest and YÖK National Thesis Center" databases were used in the literature review to reach the individuals' studies. In conducting the literature review, "professional development and science teaching self-efficacy beliefs", "professional development and self-efficacy", "scale/tool for science teaching self-efficacy beliefs", "self-efficacy beliefs for professional development and science teaching", "self-efficacy beliefs for professional development and science teaching", "professional development and self-efficacy", "scale/tool for science teaching self-efficacy beliefs", and "self-efficacy (beliefs) (related to/for/of) science teaching" were used as keywords.. As a result of the literature review and examinations, 1072 studies were reached. Among these studies, 14 studies (N=969) met the inclusion criteria and contained appropriate data.

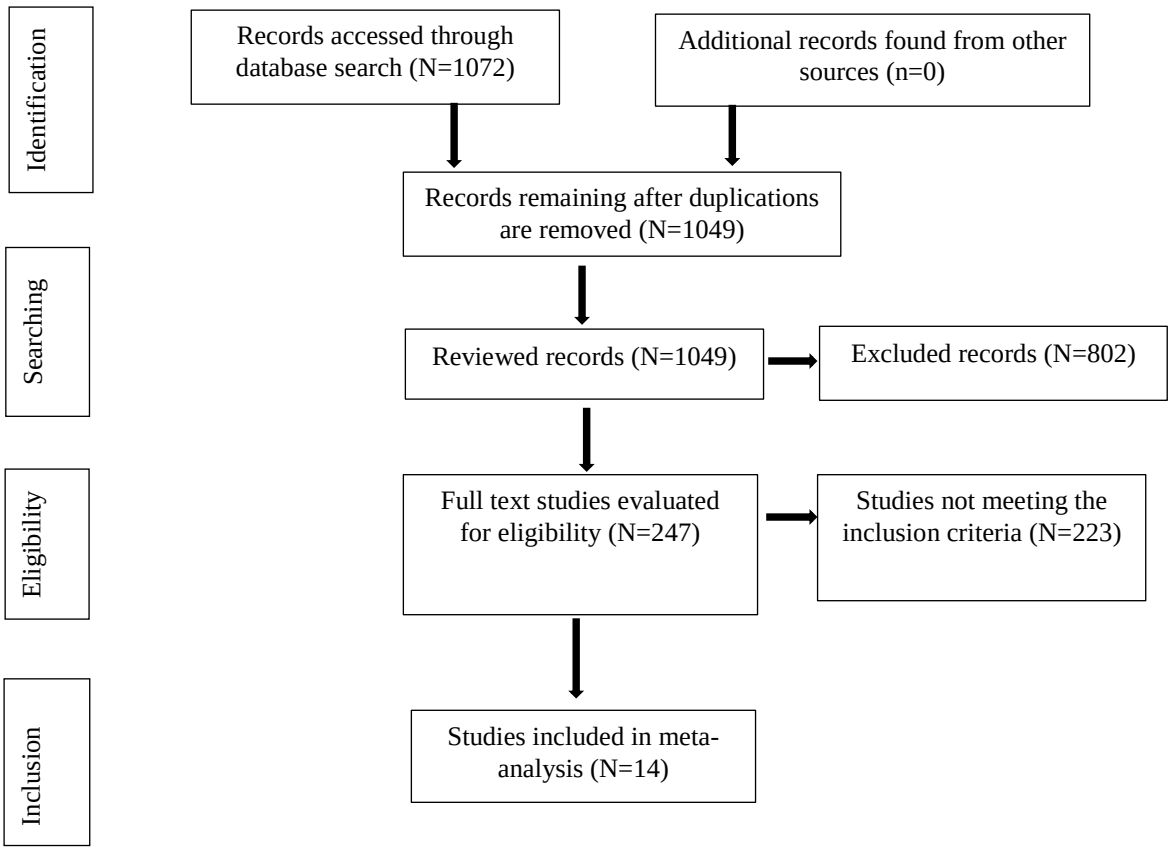

Figure 1. Flow Chart for Selection of Studies

While selecting the studies to be included in the meta-analysis, the following criteria were taken into consideration:

1) Having been published between 1990-2019 for studies in the meta-analysis. Self-efficacy concept defined by Bandura (1977) has been defined specifically for many areas. When this concept is applied to science teaching,

it is called "science teaching self-efficacy belief". Science teaching self-efficacy belief was introduced into the literature by Enoch and Riggs (1990). For this reason, 1990 was chosen as the starting year.
2) Being published or unpublished master's theses, doctoral dissertations, articles in electronic academic journals, and papers presented in congresses and symposiums.
3) Being conducted with teachers for studies in the meta-analysis.
4) Investigating the effect of professional development programs (conferences, workshop, in-service programs) on teachers' science teaching self-efficacy beliefs by the studies included in the meta-analysis and using *"Science Teaching Self-Efficacy Beliefs Scale"* to collect data in these studies
5) Being studies with pretest and posttest single-group gives arithmetic mean, sample size, standard deviation, t or p values to calculate the effect size of the studies.
6) Being published in Turkish or English for studies to be included in the analysis.

The exclusion criteria of this meta-analysis study were determined as studies not examining the effect of the professional development programs on teachers' science teaching self-efficacy beliefs, qualitative studies, and descriptive survey studies.

Data Coding

One of the critical steps for combining or comparing the results of the study to be included in the meta-analysis study is to encode the data. The first task for this purpose is to develop a coding form to classify studies meeting the inclusion criteria (Lipsey & Wilson, 2001).

In this study, a coding form consisting of three parts as "study identity", "study content" and "data in the study" was developed. The first part of the form contains the title of the study, the name of the study, the name of the author or authors, the year of publication, the country, the type of publication, the publication status and the study pattern to record the studies that have emerged from the literature review. The second part includes information such as sample group, branch, the scale used, sample size, and application time. The third part consists of the sections for recording numerical data such as arithmetic mean, sample size, standard deviation, t value, and p-value in the individual studies.

The detailed explanation of the literature review in meta-analysis studies, recording of the studies reached as a result of the review using coding form, and obtaining similar results by other researchers using the same steps affect the reliability (Card, 2012). With the inclusion and exclusion criteria determined in this study, literature review was performed and the reliability was tried to be ensured by recording the studies reached as a result of the review into the coding form. It is also recommended to ensure the reliability of the coding form in meta-analysis studies (Card, 2012; Petitti, 2000). Agreement rate and Cohen's Kappa statistics are widely used while performing reliability analysis between the coders in synthesizing the studies. In this study, the agreement between the coders was calculated as 93.3%. It is stated that when the variables are categorical, the agreement rate can be affected by the chance factor and a rate higher than expected can be obtained (Hartmann, 1977).
For this reason, using Cohen's Kappa statistics providing more reliable results against the chance factor is recommended (Card, 2012). The kappa reliability value between coders was calculated as 0.90. This value indicates that there is a "very good level of agreement" between the coders according to the interpretation classification proposed by Landis & Koch (1977).

Data Analysis and Interpretation

Effect sizes constitute the basis of meta-analysis. Effect size indicates the sensitivity of an experimental procedure and the size of the experimental effect (Thalheimer & Cook, 2002). Combining the effect sizes obtained from the individual studies to be included in meta-analysis studies is done using statistical models. Two models including "fixed effects model" and "random effects model" are preferred in the literature. The fixed effects model assumes that there is only one effect size in all studies, and the sample variations' deviations in the effect sizes are caused by the sample variations (Card, 2012). The random-effects model does not include the assumption indicating that there is only one average effect size in the studies included in the analysis.

Conversely, effect sizes are thought to vary across studies and this variation is due to central tendency and study variance (Card, 2012). Researchers should decide which of these models to use prior to analysis (Borenstein, Hedges, Higgins & Rothstein, 2010). All analyses were conducted using the random effects model, taking into account that factors such as the individual studies included, conducted with teachers from different industries, in different countries, and with different sample sizes, may lead to variations in effect sizes.

While interpreting the effect sizes obtained as a result of the analysis performed using statistical models in the meta-analysis studies, some classifications are used to interpret the obtained results' level. There is more than one classification in the literature. One of the most used of these is the classification of Cohen et al. (2007). According to Cohen et al., effect size classification is as follows (2007):

- $0 \leq$ Effect size value ≤ 0.20: Effect level is Poor,
- $0.21 \leq$ Effect size value ≤ 0.50: Effect level is modest,
- $0.51 \leq$ Effect size value ≤ 1.00: Effect level is moderate,
- $1.01 \leq$ Effect size value: Effect level is strong.

One of the issues to consider in meta-analyses is publication bias. Publication bias is a condition that occurs because studies with statistically significant and positive results tend not to be published compared to studies with negative and statistically insignificant results. Due to this situation, it is very likely that the average effect size value is high (Borenstein, Cooper, Hedges & Valentine, 2009). In this study, the funnel plot, Orwin's fail-safe N, and Duval and Tweedie's trim and fill methods were used to assess publication bias.
In the study, Q (Cochran's Q) and I^2 statistics were benefited to evaluate heterogeneity. Cochran's Q can be used to measure heterogeneity and is calculated as the sum of the differences of the weighted squares between the effects of combined studies and the individual study with the weights used in the combining method (Borenstein et al., 2009). I^2 statistics, on the other hand, is a statistic that includes heterogeneity against chance factor and shows the percentage of variance in studies included in the analysis (Higgins & Thompson 2002; Higgins, Thompson, Deeks & Altman, 2002).

In the present study, analogue ANOVA similarity analysis was performed to analyze the categorical moderators. Analog ANOVA is a technique that shows whether effect sizes differ significantly between subgroups of categorical variables (Lipsey and Wilson, 2001). This analysis examines whether the difference between subgroups [between group (Qb)] is statistically significant or not. Meta-regression analysis was conducted to analyze the continuous moderators.

In this meta-analysis study, the Comprehensive Meta Analysis Version 2 (CMA Ver. 2.0) statistical package (Borenstein, Hedges, Higgins, & Rothstein, 2005) was used for effect sizes, heterogeneity tests, moderator, meta-regression, and publication bias analyzes. The SPSS 22.0 package program was used to calculate the inter-coder agreement rate and Cohen's kappa statistic. The value of 0.05 was accepted as a reference for statistical significance.

Results

Findings of Descriptive Analysis

Table 1 shows the distribution of the studies, included in the meta-analysis, in terms of the variables of their publication year, publication type, country, branch and the scale type used.

Table 1. Descriptive results of studies included in the meta-analysis

Variables	**Frequency (f)**	**Percentage (%)**
Publication Year		
1998	1	7.14
2000	1	7.14
2002	1	7.14
2003	1	7.14
2010	1	7.14
2012	3	21.42
2013	1	7.14
2014	2	14.28
2015	2	14.28
2016	1	7.14
Publication Type		
Article	10	71.42

Master's Thesis	1	7.14
Doctoral Dissertation	3	21.44
Country		
USA	13	92.86
Israel	1	7.14
Branch		
Science Fields (Science, Biology, Chemistry)	6	42.86
Other Fields (Primary + Preschool)	8	57.14
Scale used		
Ready Scale	13	92.86
Adapted Scale	1	7.14

When Table 1 was examined, 2012 in terms of year of publication, article in terms of type of publication, ABD in terms of countries, other areas (primary + preschool) in terms of branches, and finished scale in terms of scale used were the variables according to which most studies were conducted.

Publication Bias Results

"Funnel Plot, Orwin's fail-safe N, Duval and Tweedie's trim and fill" methods were used to evaluate the publication bias in this study.

Figure 2 shows the funnel plot results of the studies included in the meta-analysis.

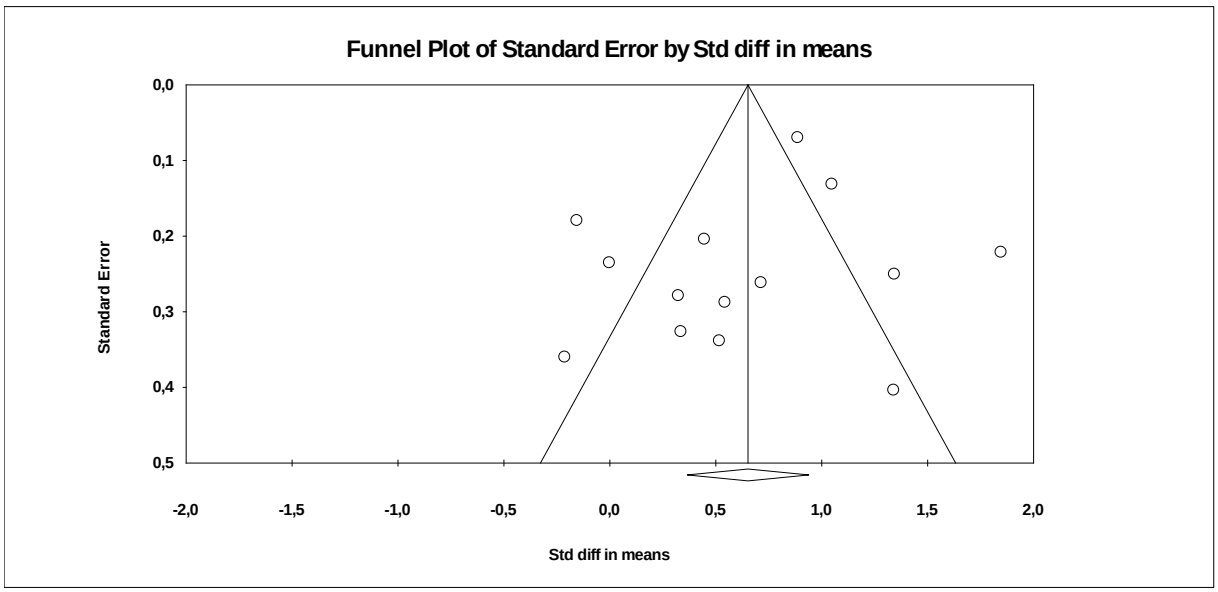

Figure 2. Funnel plot of the studies included in the meta-analysis

When Figure 2 was examined, it was seen that eight studies were situated in the left of the average effect size and 6 studies were situated in the right of the average effect size. The studies are expected to be distributed symmetrically on both sides of the average effect size in the funnel plot. However, it cannot be asserted to be fully symmetrical when the current shape was examined. On the other hand, the publication bias results of the studies included in the meta-analysis for the "Orwin's Fail-Safe N and Duval and Tweedie's trim and fill" methods were also given (Table 2).

Table 2. Testing results of publication bias

Number of Studies Included	Number of studies required for Orwin's Fail-Safe N "Poor" SMD	Duval and Tweedie's trim and fill method	
		Number of trimmed studies	Observed (Filled) for SMD
14	SOF 1070 for 0.01	1	0.652 (0.706)

SMD: Standardized Mean Difference

When Table 2 was examined, the number of studies that may reduce the effect size to a Poor level according to the Orwin's Fail-Safe N was seen to be 1070. This number is approximately 77 times of the number of studies included in the present study. 14 studies used in the study were all of studies conducted in Turkey and abroad for the research question, and reaching further 1070 studies is out of possibility. In literature, when the Orwin's Fail-Safe N is more than 5-10 times the number of studies included, it is interpreted that there is no publication bias problem for meta-analysis (Borenstein et al., 2009).

Duval and Tweedie's trim and fill method is another test used in publication bias. In this test, points causing the deterioration of the symmetry in the Funnel Plot are determined, and these points are temporarily filled in the second stage, and the general effect size is calculated again. The increase in the difference between the two general effects is interpreted as the likelihood of publication bias (Card, 2012). According to Table 2, there was no difference between the effect size value (0.652) observed and the virtual effect size (0.706) formed to correct the effect caused by publication bias.

Findings of General Effect Size

Fourteen studies investigating the effect of professional development programs on teachers' science teaching self-efficacy beliefs were combined under the random-effects model, and Table 3 shows their results.

Table 3. Combined results of teachers' science teaching self-efficacy beliefs

Model	k	ES	SE	Confidence interval of 95%		Z	P
				Lower Limit	Upper Limit		
Random Effects Model	14	0.652	0.146	0.365	0.939	4.455	0.000

k: Number of studies ES: Effect size SE: Standard Error

When Table 3 was examined, it was observed that the average effect size value of 14 studies included in the meta-analysis was calculated as 0.652 (confidence interval of 95%, lower limit of 0.365 and upper limit of 0.939) according to random-effects model. This average effect size value is a moderate effect size range according to Cohen et al. (2007). In other words, the effect of the professional development programs on teachers' science teaching self-efficacy beliefs was moderate in favor of the posttest.

Table 4 shows the heterogeneity test results of 14 studies included in the study.

Table 4. Heterogeneity test results

Q value	df	Chi-square (χ^2)	P value	I^2
90.679	13	22.362	0.000	85.664

When Table 4 was examined, it was determined that Q value (90.679) was higher than the 13 degrees of freedom chi-square table value (22.362). This result means that distribution of the effect sizes was heterogeneous. When I^2 value showing the heterogeneity value was examined, it was seen to be 85.664. This value showed that there was a high level of heterogeneity among the studies included in the meta-analysis.

Figure 3 shows the forest plot showing the statistics of each study included in the meta-analysis. When Figure 3 was examined, it was seen that the highest effect size value was 1.848 (Eshach, 2003) and the lowest effect size value was 0.000 (Gado, Verma & Simonis, 2008). It was calculated that the effect size value was in favor of the pretest in 2 studies (Luera & Murray, 2016; Peters-Burton et al., 2015) and in favor of the posttest in 12 studies. It was determined that p-value was statistically significant in 7 studies ($p<0.05$) and statistically insignificant in 7 studies ($p>0.05$).

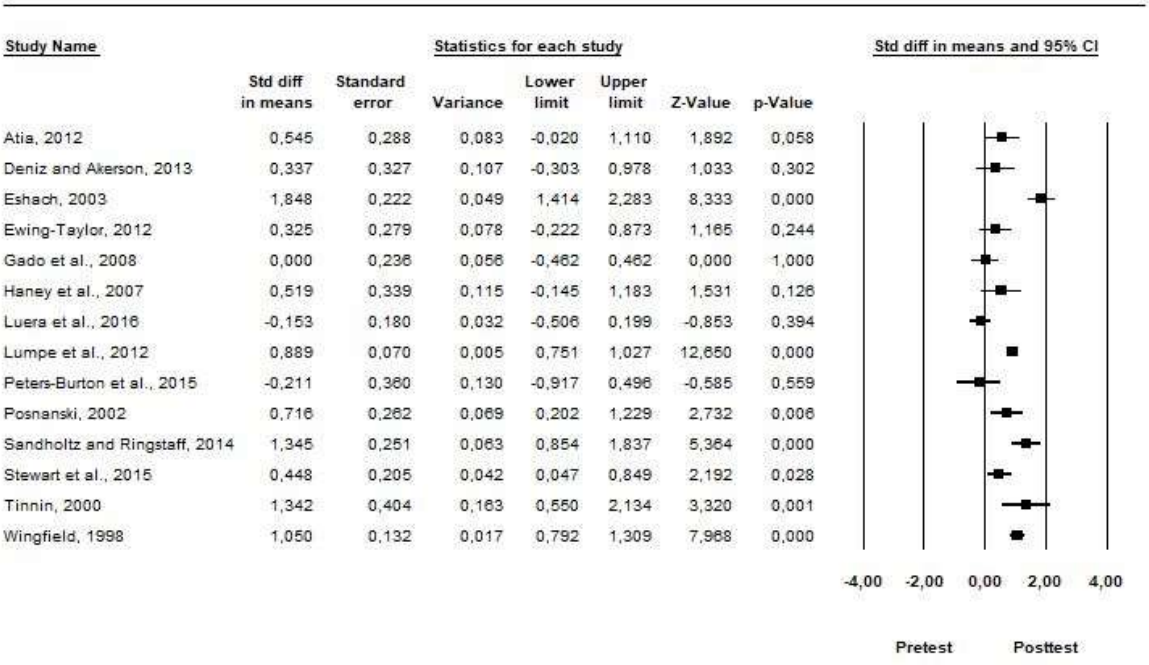

Figure 3. Forest plot of the studies included in the meta-analysis

Findings of Moderator Analysis

As a result of the heterogeneity test, the study was found to have a high degree of heterogeneity. In such cases, the possible reasons for the heterogeneity of effect sizes should be investigated. Each characteristic of each study included in the current study was recorded and classified on the coding form. As a result of this classification, it is hypothesized that publication year, publication type, sample size, industry, scale used, and country variables may be the moderators. However, due to the insufficient number of subsets of the scale and country variables used, they could not be included in the moderator analysis. Moreover, when reviewing the literature, it was found that many studies included similar variables in the moderator analysis (Chesnut and Burley, 2015; Huang, 2016; Turhan, 2020; Yıldırım et al., 2019).

To explain the high level of heterogeneity between the studies in this research, the variables of publication year, publication type, sample size, branch and application time were determined as potential moderator variables. Analog ANOVA similarity analysis was conducted by considering the publication type and branch variables as categorical variables. The meta-regression analysis was performed by considering the variables of publication year, sample size and application time as continuous variables.

Table 5 shows analog ANOVA similarity results for the publication type and branch moderators.

Table 5. Categorical Moderator Analysis Results

				95% Confidence			
Moderators	**K**	**ES**	**SE**	**Lower**	**Upper**	**Qb**	**p**
Publication type						0.546	0.460
Article	10	0.591	0.195	0.209	0.972		
Thesis	4	0.804	0.214	0.385	1.224		
Branch						21.281	0.000*
Other fields	8	1.022	0.140	0.747	1.296		
Science Fields	6	0.143	0.129	-0.111	0.396		

***p<0.05**

When the moderators were examined by type of publication in Table 5, it was found that the effect size of articles was 0.591 (95% confidence interval, lower bound of 0.209, upper bound of 0.972), the value of effect size for dissertation studies was 0.804 (95% confidence interval, lower bound of 0.385, upper bound of 0.1.224) and these

values of effect size do not represent a significant difference by type of publication (Qb=0.546, p=0.460). When examined by branch, the average effect size value for the studies from the other fields was 1.022 (95% confidence interval, lower bound 0.747, upper bound 1.296), the effect size value for the studies from the field of science was 0.143 (95% confidence interval, lower bound -0.111, upper bound 0.396) and these effect size values represent a significant difference in terms of branch (Qb=21.281, p=0.000).

Figure 4 shows meta-regression results for the publication year moderator.

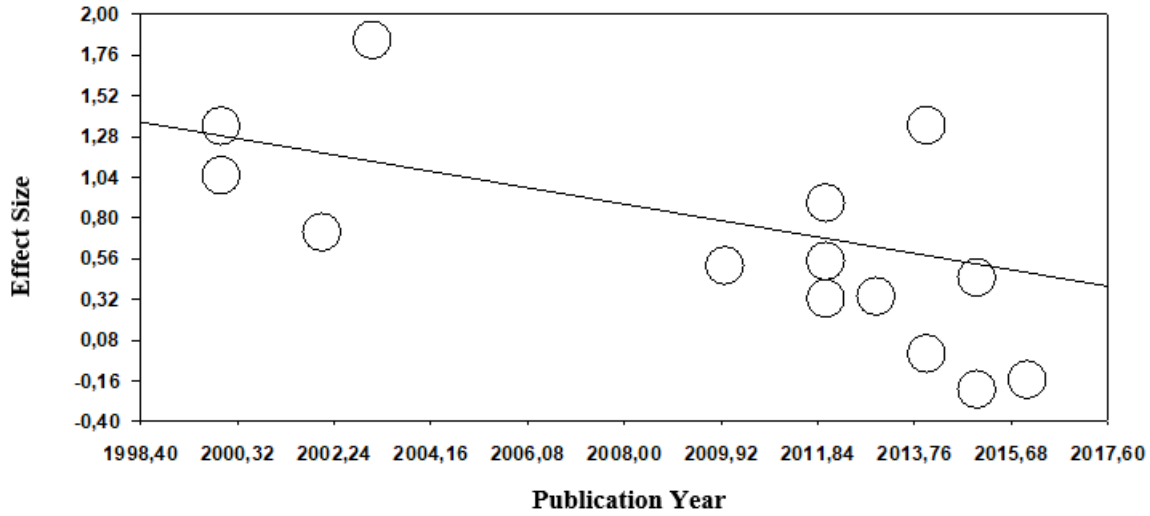

Figure 4. Correlation between publication years and effect sizes

Examining Figure 4, it was found that the slope of the line decreases as the year of publication progresses from the past to the present. Table 6 shows the results of the statistical significance of this decrease.

Table 6. Statistical results for the publication year and the effect sizes

	Point Estimation	Standard error	Lower Limit	Upper Limit	Z value	p-value
Slope	-0.05039	0.00923	-0.06849	-0.03229	-5.45604	0.00000*
Intercept	102.05758	18.56367	65.67345	138.44171		

*p<0.05

When Table 6 was examined, the publication year progressing from past to the present caused a decrease of 0.050 in the effect size. This decrease was seen to be statistically significant (p<0.05).

Figure 5 shows meta- regression results for the sample size moderator.

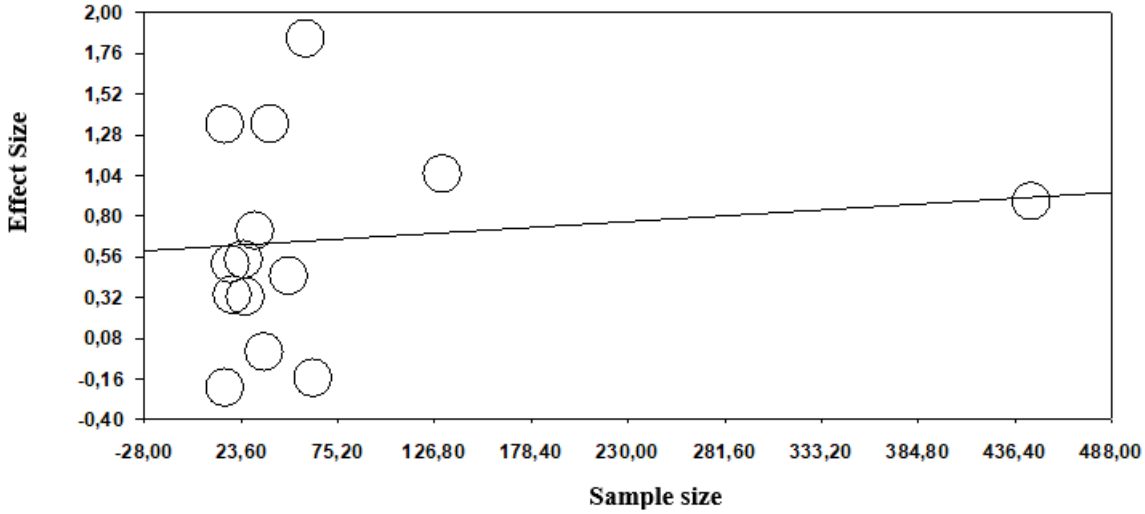

Figure 5. Correlation between the sample size and the effect sizes

When Figure 5 was examined, an increase was observed in the line slope with the increasing sample size. Table 7 shows statistical significance results regarding this increase.

Table 7. Statistical results regarding the sample size and effect sizes

	Point Estimation	Standard error	Lower Limit	Upper Limit	Z value	P value
Slope	0.00067	0.00025	0.00018	0.00115	2.70837	0.00676*
Intercept	0.61506	0.07555	0.46698	0.76314		

*p<0.05

When Table 7 was examined, it was seen that there was an increase of 0.00067 in the effect size with the increasing sample size and this increase was statistically significant (p<0.05).

It was determined that the application time in the studies included in the meta-analysis was given in hours. However, the application time was not specified in 3 studies (Peters-Burton et al., 2015; Tinnin, 2000; Wingfield, 1998). Therefore, 11 studies were included in the analysis. Figure 6 shows meta-regression results for the application time (hour) moderator.

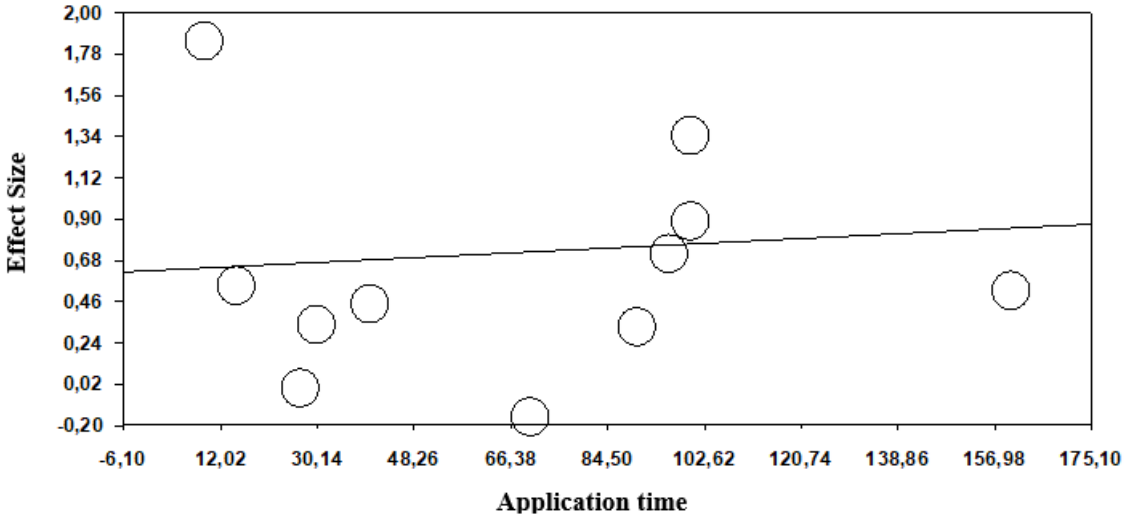

Figure 6. Correlation between the application time and the effect sizes

When Figure 6 was examined, it was observed that there was an increase in the line slope with the increasing application time. Table 8 shows statistical significance results for this increase.

Table 8. Statistical results of the application time and effect sizes.

	Point Estimation	Standard error	Lower Limit	Upper Limit	Z value	P value
Slope	0.00141	0.00155	-0.00163	0.00444	0.90679	0.36452
Intercept	0.62744	0.13649	0.35992	0.89497		

When Table 8 was examined, it was found that increasing the application time resulted in an increase in effect size of 0.00141. However, this increase did not result in a statistically significant difference in effect size ($p > 0.05$).

Conclusion and Discussion

The study included 14 studies that examined teachers' self-efficacy beliefs in science classrooms in the meta-analysis. It was found that the majority of these studies were conducted in 2012 according to the categorical descriptive characteristics. "Articles" according to the type of publication, "USA" according to the countries, "other fields" according to the industries, "finished scale" according to the scale used were the most studied categories. Another finding was that there was no study in Turkey that met the criteria of the present study.
It was also concluded that the publication bias was low in 14 studies determined for the meta-analysis and it was not enough to change the effect size classification. As a result of the combination made under the random-effects model, the average effect size value was determined as 0.652. This effect size value found under the random-effects model was in a moderate level according to the classification of Cohen et al. (2007). Deehan (2017) suggested that professional development practices such as the nature of science teaching can positively improve teachers' science teaching efficacy beliefs.

When the effect sizes of the individual studies included in the meta-analysis were examined, the result indicated that teachers' self-efficacy beliefs were moderate in the studies with moderate effect sizes (Atia, 2012; Haney, Jing, Keil, & Zoffel, 2007; Lumpe, Czerniak, Haney, & Beltyukova, 2012; Posnanski, 2002), as well as the studies that examined teachers' self-efficacy beliefs using the meta-analysis method (Chesnut and Burley, 2015; Kalkan, 2020; Shoji, Cieslak, Smoktunowiez, Rogala, Benight, & Luszczynska, 2016), supports the current study. However, among the studies included in the meta-analysis, those with a small effect size (Deniz and Akerson, 2013; Ewing-Taylor, 2012; Peters-Burton et al., 2015; Stewart et al., 2015) and the meta-analysis study that found that teachers' self-efficacy levels are low (Klassen and Tze, 2014) differ from the findings of the current study. The reason for this difference may be that the other meta-analysis studies in the literature examined teachers' self-efficacy beliefs, whereas this study examined teachers' self-efficacy beliefs in science teaching.

A moderator analysis was conducted to explain the high degree of heterogeneity between the studies. The results of the moderator analysis suggest that the moderators industry, publication year, and sample size have a statistically significant effect on the effect sizes of teachers' self-efficacy beliefs in science education. When the results for the branch moderator were examined, it was found that science teachers (science, biology, and chemistry teachers) had lower self-efficacy beliefs about teaching science than teachers of other subjects (classroom teachers and preschool teachers). There are many studies that conclude that science teachers' self-efficacy beliefs should be higher because they have a science degree (Hechter, 2008; Jarett, 1999). In these studies, the number of science classes completed and a science-focused school experience are found to have a positive impact on teachers' self-efficacy beliefs. (Cripe, 2009; Hechter, 2008; Jarrett, 1999).

When analyzing the results of the publication year moderator, it was found that the effect sizes of teachers' self-efficacy beliefs in science education decreased from 1990 to 2019 (Eshach, 2003; Luera et. al., 2016). This could be related to the inhomogeneous distribution of the studies included in the meta-analysis in terms of publication years.

When the results were evaluated for the moderator of sample size, it was found that increasing sample size had a positive effect on teachers' self-efficacy beliefs in science teaching. According to Bandura (2003), social modeling or indirect experiences are among the resources that improve self-efficacy. Individuals can learn from observing others or from the experiences they have with others. Social models are important aids to learning, especially when one's own competence is limited (Pajares, 2002). This situation suggests that high participation professional

development programs enriched teachers' professional experiences and increased their self-efficacy beliefs in science teaching by providing opportunities to examine practices.

Recommendations

Recommendations for Researchers

- When the studies included in the meta-analysis were examined by publication year, it was found that teachers' self-efficacy beliefs in science teaching have decreased from the past to the present. Researchers may investigate the reasons for this.This meta-analysis study covered the studies conducted between 1990 – 2019. In a new meta-analysis study, the study can be repeated by extending this time interval.
- When the studies in the research were examined in terms of countries, it was determined that there was no study in Turkey investigating the effect of professional development programs on teachers' science teaching self-efficacy beliefs. It can be recommended for researchers to design studies on this subject.
- In this present meta-analysis study, the effect sizes on teachers' science teaching self-efficacy beliefs were examined. In a new meta-analysis study, the correlation between the science teaching self-efficacy beliefs and different variables such as attitude, motivation can be investigated.
- This study investigated the effect of professional development programs on teachers' science teaching self-efficacy beliefs with meta-analysis method. A new study can be planned with other systematic synthesis methods on this subject.

Recommendations for Implementers

Increasing the sample size in the study resulted in a statistical increase in teachers' self-efficacy beliefs in science teaching. Teachers' participation in professional development programs can be encouraged.

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(* shows the studies included in the meta-analysis.)

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How Central is the PISA Outcomes on Human Development?

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How Central is the PISA Outcomes on Human Development?

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Abstract

In contrast to traditional statistical approaches, which assume the existence of a latent common cause leading to the emergence and covariance of indicators, network modeling assumes that latent features emerge because of interactions between indicators. Clearly, such a way of treating the results of the Program for International Student Assessment and other development indicators better reflects the mutual interactions among indicators. With this aim, the network pattern of development indicators was uncovered and graphically represented, the most important and least important indicators were identified. In addition, the indicators that are more closely related to the results of the Program for International Student Assessment were also identified. The United Nations Development Program data were used for the analyzes. Data from 2015 for sixty-six countries were used, consisting of thirteen development indicators. The data were analyzed in the statistical program R using the package "qgraph". The results showed that Program for International Student Assessment scores were not central to other development indicators, while they were closely associated with gender inequality, secondary school completion rate, and unequal life expectancies. These findings were discussed based on the existing literature and some recommendations were made for policy makers and for future research.

Keywords: PISA, network modeling, development indicators

Introduction

PISA (Program for International Student Assessment) was developed in 1997 by the member countries of OECD (Organization for Economic Cooperation and Development) to evaluate students' performance in reading, mathematics, and science (OECD, 2001). The PISA mastery scores are expected to assess how much 15-year-old students have the knowledge and skills necessary for their participation in the labor market and society (OECD, 2006). The main aim of PISA is directly related to the measurement of the knowledge and skills of students, to associate these with the data collected from students, teachers, schools and educational systems to understand the differences between performances and then improve those educational systems (OECD, 2019). In other words, the worldwide data obtained by PISA are used to determine the factors associated with student achievement and to establish standards for increasing the quality of education systems (OECD, 2017).

Although it was originally developed for the OECD countries, in the following years, PISA has been turned into a global standard and is currently used in over 70 countries and economies. Currently, no other educational work has received such a substantive media coverage (Grek, 2009) and such a high interest from general population (Pongratz, 2006). Importantly, since the first results were published, reforms of all school systems have been shaped by PISA data to some extend (see Takayama, 2009). This general interest is understandable because a well-educated population is crucial to a country's economic and social development. After world war II, they are improving educational quality and expanding mass education have become a more important component for development at the global level (Chabbott & Ramirez, 2000, p. 163). More and better education has come to be seen as a prelude to rapid economic development world widely. According to this perspicacity, education promotes economic growth and foster development in people's lives through many channels (Barro, 1997). Therefore, societies have an irrepressible interest in ensuring that children and adults have access to better educational opportunities (OECD, 2010). In line with this reality, the PISA results is currently used by the United Nations (UN) system as an important indicator to track progress towards the sustainable development goals established by the international community as a plan to achieve a better and more sustainable development for all (OECD, 2018, p. 2). Toward achieving a sustainable development, the United Nations track the development of

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countries with some indicators. Those indicators were grouped into six sub-titles (demography, education, environmental sustainability, gender, human security, income/composition of resources, inequality, mobility and communication, poverty, socio-economic sustainability, trade and financial flows, work/employment, and vulnerability). the PISA results are also seen as a development indicator under the subtitle of education.

Although many empirical studies show a positive relationship between development and education, the effects of education on development are uncertain (Chabbott & Ramirez, 2000, p. 163). A positive effect of education on economic, political and cultural development is widely assumed in most of the modern and modernizing world. Accordingly, many studies consider education as a lever for development (Bloom, Canning, Chan, & Luca, 2014; Clark & Royer; 2013; Cinnirella & Streb, 2017), but contrary to this general assumption, it is clear that this relationship is reciprocal rather than causal (Afşar, 2009), as developments in other areas and spending on education also promote educational outcomes (Baldacci, Guin-Sui, & de Mello, 2004) and the relationship between development indicators is dynamic rather than causal. For this reason, instead of modeling the relationship between education and developmental indicators with causal models, a different approach is needed to realize better how the PISA results is associated with other development indicators.

In the last few decades, the common latent cause model has been one of the most widely used approaches to identify latent traits in social sciences (i.e. van Borkulo et al., 2015; Beard et al., 2016). Based on this approach, it is possible to make inferences about the existence of a hypothetical causes and effects. This approach helps in examining causal relationships between latent traits (Kelava & Brandt, 2014). It also made important contributions to our understanding of the educational and psychological phenomena under study. In this framework, variables are generally considered passive indicators of some common causes. When indicators are considered passive, it means that they are grouped together based on a common cause (Fried, 2015). Consistent with this understanding, indicators have generally been considered passive indicators of a latent trait (development) and have been modeled in several studies using a traditional factor analytic approach (e.g., Ganegodage, Rambaldi, Rao, & Tang, 2006; Qiu, Sung, Davis, & Tchernis, 2018).

On the other hand, it may be better to regard indicators as dynamic systems. One branch of this new understanding consider observable variables as causal systems or networks (Cramer, Waldorp, van der Maas, & Borsboom, 2010). The network modeling has already been proposed as an alternative method to solve psychometric problems (Borsboom & Cramer, 2013) because, handling of data in this manner enable to see the dynamic nature of the relationships among indicators and to detect the most, the least important and the abundant indicators in a network.

In contrast to the traditional psychometric approach, which assumes the existence of a latent trait that causes the emergence and covariance of indicators, network psychometrics assumes that indicators exist because of interactions between them (Borsboom, 2017). In this context, variables are considered to be properties that interact directly with each other and do not arise because of a common latent characteristic (i.e., development). Similarly, it is possible to consider development indicators as network units that interact with each other. The existence of these units depends on their interaction with each other and is reinforced by the existence of each other.
It was stated that network analysis will transform our understanding of social constructs to a certain extent (Mcnally, 2016). This analysis, which used a quite new approach, has started to take place in the psychology literature in the last 10 years. There is even more opportunity in the field of education to fully understand the network structure of related concepts. With the proliferation of network analysis, a number of important findings such as understanding practically more important variables, better understanding of underlying mechanisms, and examining protective factors could be achieved. In addition, this new model will help to better understand social phenomena because it provides different information than the ones provided by the common latent model. This new technique can also be used with longitudinal (Snijders, 2009) or multi-group (Kim & Leskovic, 2012) data. This flexibility will also facilitate the widespread use of this approach.

Regarding the novelty of network modeling in educational research and the potential of network modeling to provide new insights on phenomena under investigation, this study aims to understand the network structure of development indicators of United Nations and see how central the PISA results in this network. By this aim, network pattern of development indicators was revealed and graphically represented, the most and the least central indicators were detected.

Method

Participants and Data

The data of the current study were obtained at the country level. Data consisted of development indicators of countries released by UNDP (United Nations Development Program). The data are available on the program's website (http://hdr.undp.org/en/data) and consist of 150 global human development indicators for over 190 different countries. Those indicators cover different aspects of human development under different dimensions: income, inequality, education, health etc. The key dimensions (longevity, education and income) of human development were measured with combined score, named as human development index (HDI). In order to prevent overlapping of indicators, HDI was not included in the current study. The educational quality of countries is investigated with different indicators including the PISA results. Instead of using science and mathematics reading literacy scores separately for the current study, the combined PISA score was calculated and used. This score was simply obtained by calculating arithmetic average of reading, science and mathematics literacy scores. Because these scores are highly correlated (the correlation between science and reading scores is .96; the correlation between science and math scores is .98; the correlation between math and reading scores is .94) and they are standardized scores with a mean of 500 and a standard deviation of 100, the unweighted arithmetic mean was used as an indicator of success from PISA.

For 2015 assessment, there were only 72 countries with available PISA scores. On the other hand, the data was available for 67 countries in the UNDP database. In addition, Qatar was removed from the database because the data was missing for some key development indicators. Hence, development indicators of 66 countries were included in the final dataset. These variables were selected based on two criteria: (1) availability of data for the 66 countries included; (2) the indicators selected must come from different development dimensions (health, education, gender inequality, power, labour, employment and vulnerability, socio-economic sustainability, demography and environmental sustainability) and be as diverse as possible. On the other hand, as with other model prediction techniques, as the number of nodes to be estimated increases, more parameters need to be estimated, which requires a larger sample size (Epskamp, Borsboom, & Fried, 2018). Given the number of countries included in the dataset, only the representative indicators for each dimension and with complete data were included. For the current study, thirteen different development indicator was selected to estimate the network structure. They are as follows: combined PISA score (PIS); gross domestic product (GDP) per capita; unemployment percentage of the total labor force (Unm); net migration rate (Mgr); percentage of total population living in the urban area (r)); percentage of the total population access to the internet(Int); mortality rate attributed to unsafe water, sanitation and hygiene services (Mrt); life expectancy at birth (Lfx); percentage of GDP for current health expenditure (Hlt); inequality in life expectancy (Inq); gender inequality index (GII); gender development index (GDI); the percentage of the population with at least some secondary education (ScE).

Network Analysis

Networks are abstract models consisting of a set of nodes, a set of edges connecting nodes, and information about the nature of the nodes and the edges (De Nooy, Mrvar, & Batagelj, 2011). In the psychometric network approach, all indicator variables are represented as nodes and the association of these variables as edges in a graphical network model. For example, how often a person had sleep problems in the past week is represented as a node in the network model. For the current study, each developmental indicator was considered a node in the network. These nodes are connected by edges and show the relationship between the nodes. The main advantage of the network approach is that it also allows us to measure the overall importance of the indicators.

The edges in the networks could be weighted or unweighted. In weighted networks, a value or a coefficient is indicating the magnitude of connection representing the association of nodes while in unweighted networks, nodes are connected with edges which don't specify such a magnitude. For weighted edges, the magnitude of association is graphically represented by the thickness of the edge and numerically can range from - / + 1. The closer the value is to +1 or -1, the greater the edge strength and the stronger the relationship between the nodes. In the graphical representation, a negative relationship is usually represented by a red line and a positive relationship by a green line. The value zero means that there is no edge connecting the nodes.

Furthermore, the edges of the networks can be directed or undirected. Undirected networks consist of edges or simple lines connecting the pair of nodes where the direction of this relationship is not specified. In this case, arrows are not present at the end points of the colored lines. On the other hand, in directed networks, there are arrows on one or both end of the edge specifying the direction of predictions and causal relationships.

The analysis is based on network psychometrics and consists of two main steps: (1) the statistical model is estimated; (2) using graph theory, the undirected and weighted network structure is plotted. (Newman, 2010). In more concrete terms, in the first step, the edge weights were estimated using one of three different correlation coefficients: (a) simple correlation; (b) partial correlations; and (c) regularized partial correlations. Perhaps the simplest way to calculate a network of a psychological construct is to draw an edge between any two related nodes and represent the association with Pearson correlation. In this way, an undirected, weighted and signed (sign indicates the direction of the relationship) network could obtained (Cramer et al., 2012). Networks based on simple correlations may be useful for visualizing a complex relationship patterns. Still, the main limitation of such networks is that it is not possible to see whether the observed relationship is due to the real interaction between the two variables or the confusing effect of other variables in the network.

Due to this limitation in using the correlation coefficients, using partial correlation coefficients to estimate a network became common in constructing networks in data assumed to have multivariate normality (McNally et al., 2015). Such networks are also known as Gaussian Graphic Models (GGM; Lauritzen, 1996). On the other hand, like simple correlations, use of partial correlations carry an inherent limitation. Due to the sampling variability, when the partial correlation network is estimated, zero value can almost never be estimated between the two nodes. Even though the two variables are conditionally independent, estimations most likely yield relatively small partial correlation values and these small values will be represented as weak edges in the model. These negligible links are called spurious (Costantini, et al., 2015). Karl Pearson (1897) was the first person who pointed to the concept of spurious correlation and explained it as a significant correlation between the two variables that don't actually exist. It occurs due to a third variable omitted during the data collection process (also termed as confounding factors). In addition, sampling error and biased estimated can also inflate the correlation values (Abelson, 2012). The reason why they are called spurious is that they represent relationships that do not exist. Controlling these pseudo-connections is desirable because their existence in partial correlation networks cause biased positive relationships. In addition, controlling also reduce the number of parameters estimated and the risk of overfitting.

For this reason, partial correlation networks are generally estimated using regularization techniques commonly used in machine learning. In this way, possibly fake edges are removed in the model and sparser connections can be obtained. In this way, the interpretability of the network prediction is increased. Regularized estimation is achieved using LASSO (the Least Absolute Shrinkage and Selection Operator) or Graphical-LASSO (GLASSO), a variant of LASSO (Epskamp et al., 2018).

In practice, LASSO shrinks the partial correlation coefficients when predicting the network model. LASSO uses a penalization approach to compute the values by adding absolute parameter values. In more concrete terms, small coefficients are estimated as zero. In this way, fewer connections retained in an estimated network which is called a sparse network. LASSO controls the degree of regularization using an adjustment parameter. This regularization parameter is selected for minimizing the Extended Bayesian Information Criterion (EBIC; Chen & Chen 2008). The adjustment parameter can be set between 0 to 1. If it is set lower, fewer connections are removed, resulting in less sparse connections in the network model. On the other hand, if the parameter is set high, too many connections are eliminated and cause some of the real connections to be eliminated and spurious connections. A well accepted recommendation is to set tuning parameter as .5 (Foygel & Drton, 2015). The penalization approach has been reported to perform well in predicting the actual network structure (Foygel & Drton, 2010; Friedman, Hastie, & Tibshirani, 2008; Meinshausen, & Bühlmann, 2006).

The main advantage of the network analysis approach is that they also allow us to specify important nodes/symptoms/indicators. Centrality indices determine the importance of the nodes in a network. They allow us to evaluate the relative importance of nodes based on where the node is located in the network and on the pattern of connections. Generally speaking, a node is central if it has many connections while it is regarded as peripheral if it has a few connections with other nodes.

In simple terms, the centrality of a node can be defined by how strong its connections to neighboring nodes are. This definition corresponds to the strength of the node (Barrat, Barthélemy, Pastor-Satorras, & Vespignani., 2004). The strength centrality indices refer to the extent of a node's connections with other nodes. If the strength parameter of a node is high, it means that it influences many other nodes. The strength of a node is obtained by simply adding all the edges connected to a node. If the network is formed with partial correlations, the node strength is equal to the sum of the partial correlation coefficients between the node and all other nodes.

Moreover, the centrality of a node can be defined by the shortness of the direct or indirect edges connecting it to other nodes. This type of operational definition of centrality corresponds to closeness (Freeman, 1978). The

Closeness Centrality Index is defined as the inverse of the sum of the distances between a node and all other nodes in the network. If the Closeness Centrality Index of a node is high, it is a node that can predict other nodes well. Node strength indicates how strongly a node is connected to other nodes in the network, while closeness indicates how strongly a node is indirectly connected to other nodes in the network.

Finally, centrality is also defined according to how important it is to the interactions of other nodes with each other. Defining centrality in this way is known as betweenness (Brandes, 2001). The value of betweenness index is determined by calculating how often a particular node is the shortest path between two other nodes. It quantitatively indicates how many of the shortest paths between the two nodes lead to that node. The higher the Betweenness value, the more important the node becomes for connecting other nodes.Further estimations were made to calculate the clustering coefficients of each indicator. Formally, the clustering coefficient indicates to what degree nodes in an estimated network cluster together. This coefficient provide evidence for the abundance of given a node in a trio of nodes. In more straightforward terms, if two nodes do notneed a third node to be connected, this third node is called abundant because it doesn't give any function to connect different nodes. Thereby, the clustering coefficient value of this node become higher (Masuda, Sakaki, Ezaki, & Watanabe, 2018).

Statistical Analysis

Before starting analysis part, it was investigated whether or not the assumption of multivariate normal distribution was met. To this aim, the Mahalanobis distances were calculated and assessed at $p<0.001$ significance level. As Epskamp, Maris, Waldorp and Borsboom (2016) pointed out, network modelling was the only assumption. After checking the assumption, the analyzes of the study were carried out in two steps. In the first step, the network structure of 21 BDI items was estimated by using the "*qgraph*" package (Epskamp et al., 2012) available in R program (R Core Team, 2019). The estimated model was undirected and weighted. Even the unweighted networks only concern whether or not two nodes are connected, the weighted networks also take the strengths of the connection between each node pair into account. The strength of the connection is determined with the centrality indices and clustering coefficient. These concepts will be introduced at the end of this part. GLASSO regularization was applied to obtain a sparse network where spurious connections were estimated as exactly zero. In this way of analyzing the data, false positive relationships can be reduced. In the GLASSO approach, the edges correspond to the partial correlation coefficients between the nodes. In this way the relationship between two symptoms can be obtained after controlling for the effects of other indicators. A shrinkage parameter was used to minimize the EBIC. Doing so aimed to increase the accuracy of the estimated network structure (van Borkulo et al., 2014). In addition, using the Fruchterman-Reingold algorithm (Fruchterman & Reingold, 1991), stronger nodes were placed at the center of the network. In the second step, centrality indices (strength, closeness, betweenness) and clustering coefficients were estimated. There are four different clustering coefficients available in qgraph package: clustering coefficient for unweighted networks (Watts & Strogatz, 1998), Zhang's clustering coefficient (Zhang & Horvath, 2005), Onnela's clustering coefficient (Onnela, Saramaki, Kertesz, & Kaski, 2005), and Barrat's weighted clustering Coefficient (Barrat et al., 2004). Zhang's clustering coefficient was selected to report and discuss because of the similarity of findings of other coefficients. Finally, Small Worldedness Index was calculated to see whether or not development indicators have a small world topography.

Results

The assumption of multivariate normality was investigated by calculating the Mahalanobis distances. The results suggested that there was no violation to this assumption at $p<0.001$ significance level. As mentioned in previous session, the network model of development indicators was estimated as weighted and undirected using the qgraph package in R environment. 13 different development indicators, selected from the UNDP database, were represented by one node in this network. The GLASSO algorithm was used for estimation. For this reason, the edges connecting nodes represent partial correlation coefficients between symptoms. These partial correlation coefficients representing the relationship between the two nodes can be regarded as the edge-weight. When performing GLASSO regularization, a tuning parameter that controls the model's sparsity by minimizing EBIC was utilized. In this way, the Type I error was controlled by narrowing down all the parameters with near-zero values. In addition, using the Fruchterman-Reingold algorithm, more central parameters were placed in the middle of the graph.

The Pearson correlations and regularized partial correlations obtained from the estimated network model were given in Table 1. The results showed that the combined PISA score is highly correlated with "GII", "HDI" and "Ineqlife" indexes at $p<0.01$ *level*. On the others hand, it has no significant relationships with "Mobile", "Migration" and "Urb%" indexes. Regarding the regularized partial correlations, some of the values were estimated as zero because they were spurious. After controlling the effect of all other indexes, the highest partial

correlations of the combined PISA score were observed for "Sec. Ed" and "GDI". This result implies that the conventional Pearson correlations can be misleading to see how the PISA scores are related to other development indexes because the indexes that are highly related to the PISA scores are totally different when investigated with a network approach using regularized partial correlations.

Table 1. Pearson Correlations and Regularized Partial Correlations Between Development Indexes

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	PIS	-			.07	-.22		.08	.03	-.18	.06			.23
2	HDI	.77**	-					.14	.09		.11	.16		
3	Urb%	.15	.47**	-			-.04			.10	-.20		-.01	-.12
4	Mort	-.37**	-.49	-.24*	-									.10
5	GDI	.34**	.24	-.12	-.25*	-	-.04	-.13		.30	-.03	.04		-.06
6	GII	-.79**	-.80**	-.12	.47**	-.19	-	.15			.06			.03
7	Ineqlife	-.74**	-.84**	-.30*	.55**	-.25*	.85**	-	.16	-.25	.08			
8	Internet	.63**	.84**	.51**	-.60**	.25*	-.68**	-.79**	-	-.02	.31	.20	-.09	
9	Mobile	.05	.10	.06	-.05	.20	.00	-.06	.05	-	-.24			-.10
10	Migr	-.08	.08	.43**	-.08	-.18	.20	-.16	.30*	.03	-			.13
11	Agr	-.42**	-.71**	-.64**	.42**	-.05	.46**	.54**	-.69**	-.14	-.29*	-	-.04	
12	Unemp	-.23	-.11	-.17	-.20	-.20	-.12	-.07	-.16	-.14	-.27*	.08	-	
13	Sec. Ed	.67**	.62**	.02	-.51**	.36**	-.60**	-.65**	.63**	.06	-.04	-.28*	-.13	-

Note: the lower diagonal values are the Pearson correlations; the upper diagonal values are regularized partial correlations; the missing parts in upper diagonal represent zero correlations estimated as such after regularization process; *p<0.05; **p<0.01.

The results for the estimated network are shown graphically in Figure 1 below. As figure was examined, it could be seen that some of the edges were represented by green lines while red lines represented some others. That is, regularized partial correlation coefficients calculated for some connections had a negative value. In this prediction, 37 of the 78 edges (47.4%) between the nodes were estimated differently from zero. It implies that, all the indicators are tightly connected directly or indirectly.

Furthermore, the edges are not of equal thickness. Some edges are thicker, while others are thinner. This is an indication that some of the nodes are relatively more connected with each other. In the figure, thicker edges represent stronger connections. The strongest link is between "*the Inequality in life expectancy*" - "*the life expectancy at birth*" and "*the Inequality in life expectancy*" – "*The percentage of the total population access to the internet*" indicator pairs. However, the association between those node pairs were negative. On the other hand, the highest positive association was observed between "*GDP*" and "*the percentage of total population access to the internet*" node pair.

If we look at the development indicators associated with the PISA results, the results showed seven edges connecting the PISA results to other indicators in the network. These indicators were "*the Gender Inequality Index*", "*the percentage of population with at least some secondary education*", "*the Inequality in life expectancy*", "*the Gender Development Index*", "*the life expectancy at birth*", "*the percentage of total population access to the internet*" and (GDP). Especially, the association of the PISA results with gender inequality, the percentage of the population with at least some secondary education and inequality in life expectancy was found as higher. Interestingly, the association of PISA outcomes with GDP is relatively lower when all other development indices in the network were controlled. On the other hand, no association was found between the results of PISA and "unemployment as a percentage of total labor force", "net migration rate", "total population living in urban areas", "unsafe water mortality rate", "sanitation and hygiene services", "current health expenditure as a percentage of GDP" and "life expectancy inequality". This result implies that when we control for other variables in the network, these indicators are completely independent of the results from PISA.

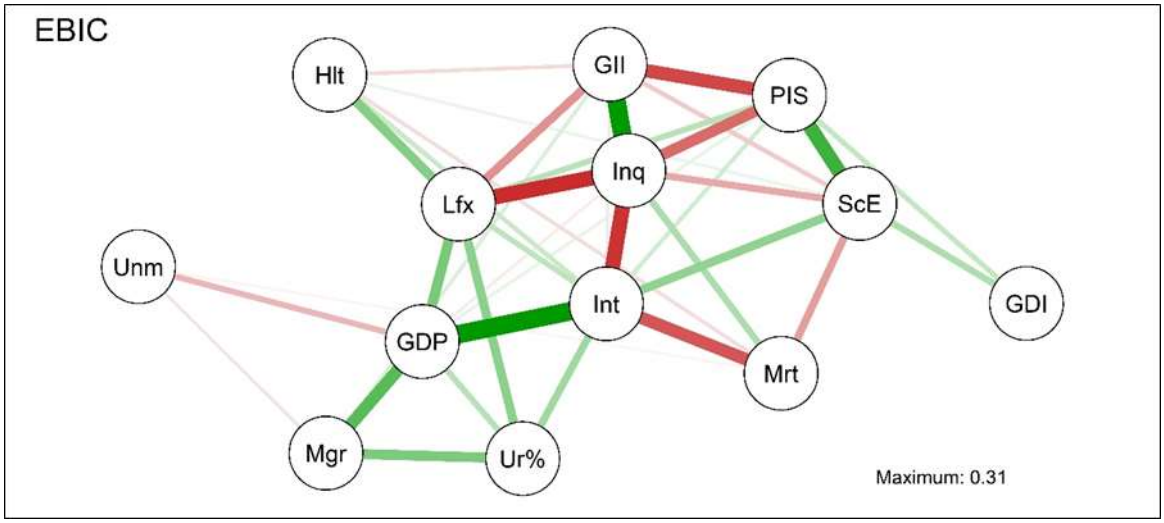

Figure 1. Centre Estimated network for human development indicators

One of the most important features of network analysis is that it identifies the most central and peripheral nodes using centrality indices. As mentioned earlier, the more connections a node has, the more centrally it is located and the centrality is determined mainly by strength, closeness and betweenness indices. The centrality criteria for the model predicted for development indicators were given in Figure 2. Each centrality value is standardized so they can be compared and they are on the same scale. Accordingly, "*percentage of total population access to the internet*", "*the inequality in life expectancy*" and "*the life expectancy at birth*" are the indicators with highest centrality indices. On the other hand, the PISA results was classified the fifth indicator in terms of the magnitude of strength centrality indice. In indice value of the PISA results is slightly less than the one for GDP indicator. This result implies that the PISA results are not at the top four development indicators in terms of the importance in the network.

When the index of closeness was analyzed, slightly similar results are observed. Accordingly, the highest values were estimated for the "*the percentage of total population access to the internet*", "*the inequality in life expectancy*" and "*GDP*" indicators, while The PISA results took only the seventh position in terms of the magnitude of closeness index. The result implies that the PISA results is relatively more distant than some other indicators in the network, less indirect connection and less close to them. In addition, it has relatively less predictive power in comparison to the indicators with higher closeness index values.

Lastly, the results for betweenness index values revealed similar findings. The highest values were observed for "*the percentage of total population access to the internet*", "*the inequality in life expectancy*" and "*GDP*" indicators. On the other hand, the PISA results took sixth position in terms of the magnitude of the betweenness indice value. The result suggests that PISA results are relatively less important for the interactions of other indicators compared to the indicators with higher betweenness values. In other word, the PISA results provide a bridge for the connections of other indicators less than some of the other indicator.

In addition, the Small-worldness index has been calculated as a global indicator of centrality. This value was estimated to be 1.38. Humphries & Gurney (2008) stated that if the small World index calculated for a network is greater than 1, the network has small-world property. Accordingly, this finding is evidence that the network of development indicators shows small world topography. The main reason for this situation is that development indicators form a high-density network.

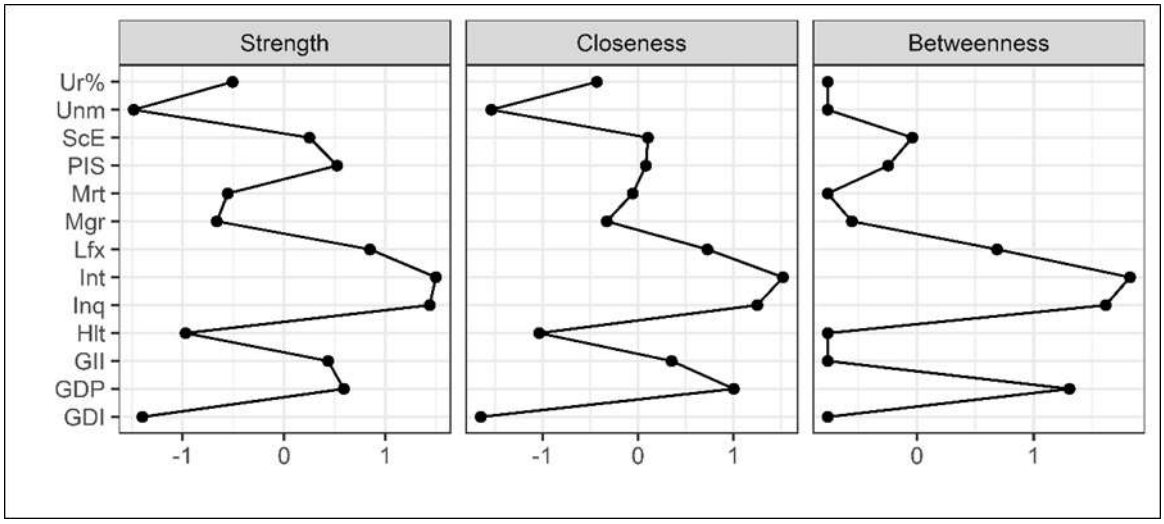

Figure 1. Standardized centrality indices for human development indicators

One The results for Zhang's clustering coefficients are shown in Figure 3. According to this, by far the highest value was observed for the GDP indicator. It can be said that this indicator is the most locally abundant. The local frequency of these nodes depends on the connections of the neighboring nodes. For example, "net migration rate" and "share of total population living in cities" are neighboring nodes of the GDP indicator, but they are already connected and do not need GDP to stay connected. In other words, for a country, the net migration rate and the percentage of the total population living in urban areas are conceptually linked indicators by themselves. This relationship exists independently of the GDP of that country. On the other hand, the indicator PISA has been classified as the fifth rich indicator and plays a relatively larger role in the relationship with other indicators.

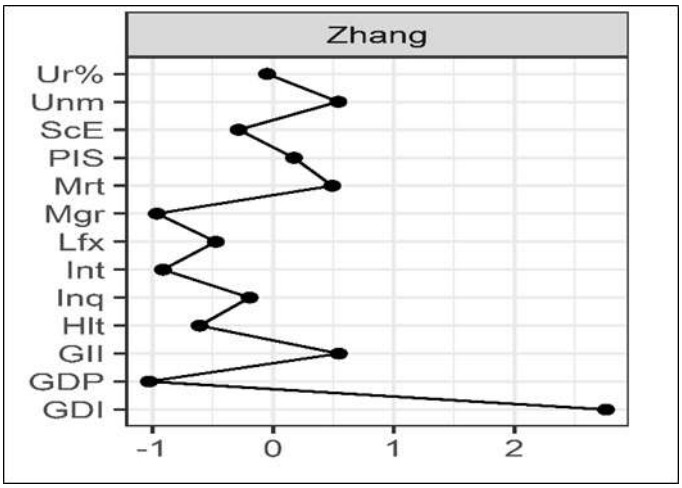

Figure 1. Clustering coefficient plots of human development indicators

Conclusion

As stated in the introduction part, this study aims to understand the network structure of the development indicators of United Nations and see how central the PISA results in this network. The results showed that all of the development indicators in the estimated network were connected directly or indirectly. Accordingly, they form a “small world” of a network. In small networks, the nodes need fewer intermediary nodes to connect indirectly (Watts & Strogatz, 1998). The practical implication of this finding is that, all the development indicators are directly or indirectly related but need less mediator nodes to be connected. They form a tightly interconnected network. In addition, one more implication is that, none of the indicators are abundant and contribute to the formation of the development indicators network.

On the other hand, some of these observed connections were positive while some others were negative. This result was clearly expected one because, some of the development indicators focus on negative outcomes. In contrast,

some others focus on the negative outcomes and their regularized partial correlations become positive or negative accordingly.

Centrality analysis has shown that some indicators had more influence on the network than the others. For example, the percentage of total population access to the internet, the inequality in life expectancy and the life expectancy at birth were the most central indicators on the network and, therefore, had a major impact on the persistence of other indicators. In addition, they have a potential to activate other indicators when they are activated. When this result was evaluated in terms of the PISA scores, if a country wants to enhance its PISA success, they need to invest more to improve internet access, equality in life expectancy, and average life expectancy. On the other hand, the GDI and unemployment rates were the least central indicators and have little effect on other developmental indicators, including the PISA scores. This result can also be deduced intuitively because the GDI (which is related to the gap in living standards by gender) and the unemployment rates are the result rather than the effect compared to other developmental indicators.

On the other hand, the PISA scores seemed to locate at middle position in terms of its centrality among other development indicators. Accordingly, the PISA scores are not the cause or the effect of development in absolute way. It effects some indicators while it is affected by some other indicators. For instance, internet access (as the most central node in the network) affect the PISA scores which further affects the GDP and the unemployment rates. Hence, as Chabbott & Ramirez (2000) pointed out, education is seen as a means to foster development. On the other hand, the current study results showed that the causal function between education and other development indicators is not totally unidirectional.

Looking at the practical implications, it is clear that policy makers should focus on the indicators with the higher centrality indices. After all, if one changes the most central nodes in a network model, it is expected that others will be changed as well, without having to make additional efforts to change the least central nodes.. The interventions that aim to improve those central indicators would later improve other indicators, including the PISA results. Today, the PISA exam results, their effects, and how to improve these results are generally discussed mainly by educators. They focus on the relationship between the PISA results and other education-related variables (i.e. Meroni, Vera-Toscano, & Costa, 2015; Mikk, Krips, Säälik, & Kalk, 2016).

On the other hand, the experts in other fields generally discussed the educational issues in economic approaches (Crespo, 2002). The findings from this current study showed that the PISA results are not the most central member of the development indicators in the network and that PISA results will not improve until more centrally located PISA indicators improve. For this reason, it should not be forgotten that PISA results are a part of a tightly intertwined development network, and it would be right for experts from different fields to work in cooperation to improve the PISA results. By combining the information from experts of different areas (economy, social services, etc.), policymakers could take more efficient actions in improving educational outcomes.

Recommendations

With this study, a better understanding of the structural relationship between different development indicators in the participating countries of PISA can be gained. Moreover, a clear picture of how the results of PISA are related to other development indicators can be obtained. However, in future studies, it would be valuable to compare the development indicators of OECD countries and other countries that later participated in the program. In this way, the impact of the inclusion of new countries in PISA on the network structure can be studied. Such a study can show how the situation of PISA results changed with the inclusion of other countries. Finally, as mentioned earlier, network modeling can be studied longitudinally. The network structure of development indicators can be studied in this way. By estimating network structure over time, researchers can understand how the centrality of PISA outcomes (and their influence on other development indicators) in the network changes over time.

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The Mediating Role of Organizational Happiness in the Relationship Between Work Engagement and Life Satisfaction: A Study on Teachers

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The Mediating Role of Organizational Happiness in the Relationship Between Work Engagement and Life Satisfaction: A Study on Teachers

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Abstract

This study aims to examine the mediating role of organizational happiness in the relationship between teachers' work engagement and life satisfaction. The study involved 767 teachers, 557 women (73%) and 210 men (27%). Data from the study were collected using the Work Engagement Scale, the Organisational Happiness Scale, and the Life Satisfaction Scale. Descriptive statistics, Pearson product moment correlation coefficient, path analysis and bootstrapping procedure were used in the analysis of the data to test the significance of the mediating effect. As a result of the study, it was found that there is a significant positive relationship between work engagement, organizational happiness and life satisfaction. The bootstrapping result showed that organizational happiness has a partially mediating role in the relationship between work engagement and life satisfaction. It is thought that the results obtained can be used to increase the life satisfaction of teachers. In addition, it can be said that the results obtained from the research will be a guide for future studies.

Keywords: Work engagement, Life satisfaction, Organizational happiness, Mediating effect

Introduction

As one of the most important actors in the educational process, teachers, with their qualified educational performance, have a great influence on the academic success of their students and the success of the educational system. However, in this process, teachers cope with many situations such as completing the education program on time, ensuring in-class discipline, communicating and cooperating with parents and colleagues, and meeting the demands and expectations of the school administration (Boakye & Ampiah, 2017; Dias-Lacy & Guirguis, 2017). All these factors undoubtedly create psychological pressure on teachers and have an impact on their life satisfaction as an individual. For that reason, it would not be right to expect professional success from a teacher with low life satisfaction.

Life satisfaction, one of the oldest indicators of well-being in individuals, has become the main focus of clinical psychology in recent years (Whalen, 2016). Life satisfaction, which is one of the basic psychological factors that people should have to be happy and make sense of their lives (Dağlı & Baysal, 2016) is defined as a positive evaluation of one's own life according to the criteria set by the individual (Diener, Emmons, Larsen & Griffin, 1985). Studies have shown that in addition to factors such as gender, education level, economic status, and religious beliefs, many factors related to an individual's work life influence an individual's life satisfaction (Tuzgol Dost, 2007; Mishra, Nielsen, Smyth & Newma 2014; Alleman, 2017; Hagmaier, Abele & Goebel, 2018). Because work is one of the important aspects of people's lives (Dulk, Groeneveld, Ollier-Malaterre & Valcour, 2013). Considering that people spend almost half of their daily waking hours at work (Wrzesniewski, McCauley, Rozin, & Schwartz, 1997), one will better understand the impact of work life on an individual's life satisfaction. There are many factors related to work that affect life satisfaction. One of them is work engagement, which is defined by the person doing his or her work with love and wholeheartedly (Schaufeli, Bakker & Salanova, 2006; Bakker, Schaufeli, Leiter & Taris, 2008; Khan, 2016; Şanlı, Altun & Tan, 2018). It is seen that the term engagement, put forward by Kahn (1990), has been translated into Turkish in different ways such as engagement, integration with work, being concentrated to work (Güneşer, 2007; Özkalp & Meydan, 2015), and there is no common usage on the translation of the concept. In this study, the expression of work engagement, which is considered one of the most common uses in the field, was used. Studies show a positive relationship between individuals' engagement

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in their jobs and their life satisfaction (Wrzesniewski, Rozin & Bennett, 2002; Garczynski, Waldrop, Rupprecht, Grawitch, 2013; Kavgacı & Çalık, 2017).

On the other hand, organizations formed by a large number of people can affect their happiness level by having positive and negative effects on their employees with their managerial characteristics and their cultural and psychological climate (Çetin, 2004; Juul, 2008; Harris, 2018). This concept, which is expressed as organizational happiness, expresses the degree of realization of the individual's goals and the organization's goals (Bulut, 2016). In this respect, organizational happiness affects the happiness of all individuals in the organization (Arslan & Polat, 2017). Studies show that organizational happiness is related to both work engagement (Coetzee & Rothmarm, 2005; Rothmarm & Jordaan, 2006; Money, Hillenbrand & Da Cámara, 2008; Field & Buitendach, 2011; Othman, Mahmud, Noranee & Noordin, 2018) and life satisfaction (Hamama, 2013; Bachtiar, Sudibjo & Bernarto, 2018). While examining the relationship between work engagement and life satisfaction based on this information, it is thought that organizational happiness may also mediate this relationship. There is no study examining the mediating role of organizational happiness between these two variables in the literature. In this context, the study was carried out to examine the mediating role of organizational happiness in the relationship between the teachers' work engagement and their life satisfaction, who work in schools where human relations are densely experienced and who assume great responsibilities in raising the next generation of society.

Conceptual Framework

Life Satisfaction

The concept of life satisfaction, first introduced by Neugarten in 1961 (Demirel, 2014), is defined as the level of people achieving their goals in life and a general assessment of life (Diener et al., 1985; Manning-Walsh, 2005). Life satisfaction, which is a concept that is widely studied in a global context as a measure of the quality of life of individuals (Ni Mhaolain et al., 2012; Kim & Kim, 2013), is frequently explained with the concept of "well-being" in the literature. The concept of well-being is examined under two headings as subjective well-being and psychological well-being. Subjective well-being is generally well-being composed of short-term pleasure-based activities and is often synonymous with happiness in positive psychology (Diener, 2000). Psychological well-being is concerned with longer-term well-being and development. Subjective well-being is also defined as the cognitive and emotional evaluation of a person's life (Tahiroğlu & Meydan, 2019). Subjective well-being includes three interrelated elements; positive emotions, negative emotions and life satisfaction. While positive emotions and negative emotions constitute the affective dimension of subjective well-being, life satisfaction constitutes the cognitive dimension of subjective well-being. Since well-being is conceptualized as self-actualization, social integration and positive orientation towards the task; job satisfaction, job performance and life satisfaction are frequently used as indicators (Alonso, Fernández-Salinero & Topa, 2019).

Life satisfaction is the ultimate goal of human existence and it is also an important factor in the working field. Life satisfaction, which is a psychological feature of people's perceptions of life, life expectations and satisfaction levels, impacts the organizational life of their employees. For this reason, life satisfaction can both trigger work-related results and be affected by work-related factors (Satilmis, Oznacar, Uzunboylu & Yılmaz, 2018; Hagmaier, Abele & Goebel, 2018). Current evidence that shows life satisfaction's enhancements on positive aspects of life, including success, health, and happiness, and the positive results of methods and strategies used to improve life satisfaction have shown that life satisfaction is worth studying (Naftali & Vella-Brodrick, 2008; Norrish & Vella-Brodrick, 2008).

In a rapidly changing world, teachers' attitudes towards their profession and their life satisfaction, who have great responsibilities in raising qualified individuals who can keep up with innovations and developments, are not only to affect themselves but also other elements of the education system (Şahin, 2010). In this context, it is reported that teachers with a high level of life satisfaction may be more beneficial for the development of children (İgnat & Clipa, 2012; Tahiroğlu, 2019). There are many studies in the literature on the life satisfaction of teachers. The results of these studies have shown that teachers' life satisfaction is positively related to variables such as job satisfaction (Demirel, 2014; Sarpkaya & Kırdök, 2019; Goetz et al., 2019), emotional intelligence level (İgnat & Clipa, 2012), work engagement (Ampofo, Coetzer & Poisat, 2017), and success (Çivitci, 2009). Additionally, Şirin and Şirin (2015) found that there is a significant negative relationship between teachers' life satisfaction and job alienation variables. Studies show that life satisfaction generally tends to show a positive relationship with variables that positively affect the individual.

Work Engagement

In the field of positive organizational psychology, one of the topics that has been frequently researched recently is the engagement of employees in their jobs (Sonnentag, 2003; Kulophas, Ruengtrakul & Wongwanich, 2015; Khan, 2016). Expressed as an individual's physical, cognitive and emotional commitment to work (Kahn, 1990), work engagement is a positive, satisfactory state-of-mind about work characterized by "vigour, dedication and absorption" (Schaufeli, Salanova, Gonzalez-Roma & Bakker, 2002). Among these concepts, vigour is related to physical strength and health. It has also been defined as higher energy, effort and mental endurance in the workplace to face challenges, expanded job demands and uncertainties. Dedication refers to a personal feeling of zeal, enthusiasm, inspiration, pleasure and challenge. It is the quality of the employee to be committed to their job or role. Absorption is a state of immersion and total engagement, which refers to a situation in which the individual has trouble stopping working and reduces one's chances of quitting (Saleem, Iqbal, Sandhu & Amin, 2018).

Although workplace commitment refers to positive attitudes toward the workplace and the organization, such as job satisfaction, organizational commitment, and low intention to quit, it actually has a different meaning than these (Demerouti, Bakker, Nachreiner & Schaufeli, 2001). In fact, studies have shown that employees who demonstrate high levels of job commitment are more positive about their jobs and organizations, treat their colleagues with more respect, help others increase their work efficiency, continuously improve their work-related skills, are very active, perform well in their roles and beyond, and adapt more easily to change (Schaufeli & Salanova, 2007; Bakker & Demerouti, 2009; Skaalvik & Skaalvik, 2013). Some research in organizational behaviour has revealed that there are some negative aspects of being engaged to work. For example; It has been found that the overconfidence of employees who are engaged in their jobs hinders their future performance (Vancouver, Thompson, Tischner & Putka, 2002) and that unrealistic optimism within the organization can lead to excessive resistance to their jobs (Armor & Taylor, 1998).

Teachers, who have taken on important roles, such as educating individuals in a society and building the country's next generation, carry out a very stressful and difficult process like teaching (Travers & Cooper, 1996; Akman & Akman, 2017). For this reason, teachers to be engaged in their workto be effective and efficient in their work. Thus, teachers' engagement in their jobs has attracted more and more attention from researchers and education politicians in recent years (Bakker, Demerouti & Lieke, 2012; Gamero-Burón & Lassibille, 2018; Zahed-Babelan, Koulaei, Moeinikia & Sharif, 2019; Granziera & Perera, 2019). The following factors are considered to be effective in this situation: the belief that teacher activity is the critical factor that increases variability in student achievement, the idea that teachers who are engaged in their jobs are less likely to experience burnout, and that workplace engagement is related to employee productivity and job involvement (Klassen, Aldhafri, Mansfield, Purwanto, Siu, Wong & Woods-McConney, 2012).

Organizational Happiness

Happiness is universal to all people in every culture because everyone seeks happiness (Fisher, 2010). Philosophers have viewed happiness as the highest and ultimate motivation for human action (Diener, 1984). It is pretty difficult to find a precise definition for a word such as "happiness" that is commonly used and has specific meanings in one or more professional or academic disciplines (Harris, 2018). Myers and Diener (1995) generally define "happiness" as a high frequency of positive effects, low frequency of negative effects, and general life satisfaction.

There are two types of the traditional perception of happiness in the literature. These are hedonic vision and eudaimonic vision (Ryan, Huta & Deci, 2008). Generally, these perceptions exist independently of each other. The hedonic view of subjective well-being is a view with a long history (Ryan & Deci, 2001) and is more concerned with people's subjective feelings and senses (Huang, 2016). Hedonism seeks to maximize pleasure and minimize suffering. In hedonism, the pursuit of pleasure is the way to reach happiness (Nafei, 2018).

Eudaimonic thought expresses moral actions. The most important representative of eudaimonic thought is Aristotle (Bulut, 2015). According to the eudaimonic view, happiness is defining one's virtues and living accordingly. The eudaimonic view defines happiness as a truly well-lived life with a sense of competence and purpose (Huang, 2016). Ryan et al. (2008) state that hedonic thinking leads to short-term happiness, and eudaimonic life leads to a more permanent happiness. Both of these approaches offer a path to happiness. Therefore, they cannot be considered completely independent of each other, because people can experience happiness in the hedonic way (experiencing immediate pleasure that leads to happiness) and the eudaimonic way (achieving long-lasting happiness in life in relation to the true self) (Ryan, Hutta & Deci, 2008; Ryan & Deci, 2001).

Happiness is important for both individuals and organizations (Simmons, 2014). As people desire to reach happiness, organizations want to reach happiness. A happy organization is one where the stakeholders are happy (Kumar, 2014). If the individuals in the organization are happy, this happines will also influence the organization after a while. When faced with such a situation, the happiness of individuals turn into the concept of organizational happiness (Moçoşoğlu & Kaya, 2018). Organizational happiness is therefore expressed as the coming together of the happiness of individuals within the organization, as an aspect of the culture or morality of the organization (Harris, 2018).

Happy employees are more committed to their jobs (Othman, Mahmud, Noranee & Noordin, 2018) and are more productive, so it can be said that organizational happiness is an important factor in increasing the productivity of organizations (Wesarat, Sharif, Majid & Halim, 2014). In addition, researches show that organizational happiness can help employees achieve career success, increase job satisfaction and encourage them to work harder; It also revealed that happy employees may have lower resigning rates (Oswald, Proto & Sgroi, 2009; Amabile & Kramer, 2011).

Organizational happiness consists of three dimensions: positive and negative emotions experienced in working life and realization of potential (Warr, 2007). Being happy, excited, cheerful, enthusiastic, proud, willing, content, peaceful and active in the workplace is included in the organizationally positive emotions dimension. Negative emotions dimension includes the feelings of being restless, nervous, impatient, anxious, stressed, depressed, distressed and sad at work and feeling bored and wasted. The realization of potential dimension includes using potential and skills in the workplace, showing superior aspects, developing talents, overcoming difficulties, doing the jobs you like, and reaching goals (Arslan & Polat, 2017).

While the studies conducted show positive relationships between organizational happiness and variables such as job-related productivity (Wright, 2006; Robertson & Cooper, 2011), job satisfaction (Fisher, 2010; Jones, Hill & Henn, 2015; Uzun & Kesicioğlu, 2019), organizational commitment (Field & Buitendach, 2011; Uyaroğlu, 2019), job performance (Wright & Bonett, 2007; Bachtiar, Sudibjo & Bernarto, 2018), it was also found to have negative relationships with some variables such as organizational cynicism (Kahveci & Köse, 2019), organizational silence (Moçoşoğlu & Kaya, 2018) and job burnout (Reza, & Leyli, 2016).

Organizational happiness is also a crucial issue for educational organizations. Human interaction in the education sector is higher than in other sectors. Therefore, teachers' organizational happiness directly affects their classroom activities and the quality of education (Uzun & Kesicioğlu, 2019). Bird and Markle (2012) argue that a happy school environment contributes to a student's academic success and improves other life skills such as healthy communication, lifelong success, and self-actualization. Leadership plays an important role in ensuring the happiness of employees. Leaders who care about employee well-being will see that their subordinates perform in their jobs (Othman, Mahmud, Noranee & Noordin, 2018). For these reasons, it is suggested that school administrators give more priority to the school environment, physical equipment, and education policy to ensure the schools' happiness (Sezer & Can, 2020).

Relations Between Organizational Happiness, Work Engagement and Life Satisfaction and Mediating Role of Organizational Happiness

Within the scope of the research, studies on organizational happiness, work engagement and life satisfaction were examined. However, there is no research in which these three variables were used together on both educational organizations and other organizations in the literature. As a result of the research, it has been revealed that employee engagement positively affects their life satisfaction (Hakanen & Schaufeli, 2012). However, organizations are places where people have intense relationships. Therefore, it is inevitable that many individual or organizational factors affect the relationship between individuals' engagement in their jobs and their life satisfaction. One of these factors that can positively affect the psychological state of the individual is the employees' happiness level within the organization, which is expressed as organizational happiness (Bülbül & Giray, 2011). It includes many different aspects such as happiness at work, work engagement and job satisfaction. These, in turn, lead to positive organizational results (Fisher, 2010). Employee happiness is important to ensure high productivity and one of the determinants of happiness is employee engagement (Bakker & Demerouti, 2009; Baruch, Swartz, Sirkis, Mirecki & Barak, 2013). Because happy employees are more committed to their jobs (Field & Buitendach, 2011; Othman, Mahmud, Noranee & Noordin, 2018), therefore, it can be said that there is a positive relationship between employees' work engagement and organizational happiness.

On the other hand, people are happy to reach life satisfaction (Tahiroğlu & Meydan, 2019). As an indicator of individual happiness at work, research has shown that there is a positive relationship between organizational

happiness and individual life satisfaction (Bülbül & Giray, 2011; Aydintan & Koç, 2016). Hence, the benefit of fostering employee happiness goes beyond individual well-being to the overall organization (Berkland et all., 2017). With this information, it was thought that organizational happiness is related to both work engagement and the employees' life satisfaction; therefore, organizational happiness might have a mediating role in the relationship between these two variables.

The Purpose of the Study

This study aims to examine the relationship between organizational happiness, work engagement, and life satisfaction according to teachers' views. In this direction, answers to the following questions were sought in the study.

1. How are teachers' perceptions of organizational happiness, engagement in work and life satisfaction?
2. Is there a significant relationship between organizational happiness, work engagement and life satisfaction?
3. Is there a mediating effect of organizational happiness in the relationship between work engagement and life satisfaction?

Method

Research Design

This research, which examines the relationships between teachers' work engagement, organizational happiness and life satisfaction levels, was designed in the correlational research model. Correlational study is concerned with establishing relationships between two or more variables in the same population or between the same variables in two populations (Leedy & Ormrod 2010). The mediating role of organizational happiness in the relationship between work engagement and life satisfaction was tested using structural equation modeling.

Population and Sample

The research population is 30604 teachers working in 796 public schools in nine districts of Istanbul in the academic year 2019-2020. Multi-stage sampling method was used to determine the sample. Since the dependent variable investigated in the study is teachers' life satisfaction, the quality of life indices of Istanbul districts as a result of Şeker's (2015) research were used as a criterion in determining the districts to be included in the study. In this context, 39 districts of Istanbul are ranked according to the lowest life index value from the highest life index value and the districts are divided into three groups as upper, middle and lower according to the life index. Later, three districts were selected randomly from each of these three groups. Among these districts included in the study, those in the upper quality of life group are Kadıköy, Fatih and Kartal; Those from the middle life quality group are Beylikdüzü, Pendik and Zeytinburnu; Those from the lower quality of life group are Avcılar, Bağcılar and Sultanbeyli. 40 schools aimed to be reached in the study were determined by proportional cluster sampling method, taking into account the number of public schools in the districts. The number of schools where the research was carried out according to the districts are as follows: Kadıköy = 5, Fatih = 5, Kartal = 4, Pendik = 7, Zeytinburnu = 3, Beylikdüzü = 3, Avcılar = 3, Bağcılar = 6, Sultanbeyli = 4. The scales used in the study were applied to the teachers in these schools. In this context, the study's sample size was calculated using the formula below, considering the total number of teachers working in the districts (Anderson, 1990, cited in Balcı, 2009).

$$n = \frac{N\ x\ \mathrm{t}^2\ \mathrm{x}\ \mathrm{p}\ \mathrm{x}\ \mathrm{q}}{d^2(N-1) + t^2\ \mathrm{x}\ \mathrm{p}\ \mathrm{x}\ \mathrm{q}}$$

"N" in the formula means the number of individuals in the population (number of teachers = 20086), "n", the number of individuals in the sample, "p", the probability of seeing the situation under study (0.5), "q" the probability of not seeing the situation under study (1-q), "t" the theoretical value (1.96) and "d" in the table of t are expressed as the desired + or - deviation corresponding to the probability of occurrence of the event (0.05). As a result of the calculation made according to the specified formula, it was determined that 377 teachers are competent to represent the population. However, to increase the sample size, 800 scale forms were randomly distributed to the teachers working in the districts within the scope of the study. Analyzes were performed with 767 scales after returning losses (28 scales), missing and incorrectly filled scales (5 scales) were removed. When the demographic characteristics of the teachers in the sample group were examined, it was seen that 557 of the teachers were female (73%) and 210 were male (27%). In addition, 75 of the teachers 0-5 years (10%), 155 6-10 years (20%), 151 11-15 years (20%), 143 16-20 years (18%) and 243 of them have professional seniority of 21

years or more (32%). It was observed that 25 of the teachers were at the associate degree (3%), 632 undergraduate (83%) and 110 graduate (14%). When the education levels in which teachers work was examined, it was seen that 251 of the teachers were working in primary schools (33%), 304 in secondary schools (40%) and 212 in high schools (27%).

Data Collection Tools

The study used the Work Engagement Scale, the Organizational Happiness Scale, the Life Satisfaction Scale, and Personal Information Form to collect data.

Work Engagement Scale

The Work Engagement Scale (UWES-9) was developed by Schaufeli, Bakker and Salanova (2006). The adaptation study of the scale into Turkish was conducted by Özkalp and Meydan (2015). The 7-item Likert scale, which consists of a total of nine items, has three sub-dimensions, each consisting of three items. The total variance explained by the three-dimensional structure is 73%. The sub-dimensions of the scale that are designed to measure the level of employee engagement are vitality, commitment and assimilation. The scale for engagement at work is classified as "never (1) - often (7)". The total score is obtained from the values of the scale. The increase in the scores obtained from the scale indicates that the participants' level of engagement to work increased, and the decrease in the scores indicates that their level of engagement to work decreased. As a result of the Confirmatory Factor Analysis, it was determined that the scale preserved its original three-factor structure. It was found that the fit values of the analysis were within acceptable limits. For the Cronbach's Alpha internal consistency coefficient total score of the scale .83, for the "vigor" sub-dimension .80, for the "devotion" sub-dimension .79, and for the "assimilation" sub-dimension .64. In present study, Cronbach's Alpha internal consistency coefficient total score of the scale .92, for the "vigor" sub-dimension .90, for the "devotion" sub-dimension .91, and for the "assimilation" sub-dimension .74.

Organizational Happiness Scale

Organizational Happiness Scale was developed by Demo and Paschoal (2013). The adaptation study of the scale into Turkish was conducted by Arslan and Polat (2017). The scale, which has a five-point Likert-type rating and a total of 29 items, has three sub-dimensions. The total variance explained by the three-dimensional structure is 63%. There are nine items in the positive emotions dimension, twelve in the negative emotions dimension, and eight in realising the potential in the organizational happiness scale. The scale is graded as "none (1) - completely (5)". Total scores can be obtained from the scores of the scale. The increase in the scores obtained from the scale indicates that the organizational happiness level of the participants increased, and the decrease in the scores indicates that the organizational happiness level decreased. As a result of the Confirmatory Factor Analysis, it was determined that the scale preserved its original three-factor structure. It was found that the fit values of the analysis were within acceptable limits. According to the CFA findings $\chi 2/df = 3.95$, RMSEA= .09, GFI= .77, CFI= .97 and NNFI= .97 values were obtained. For the Cronbach's Alpha internal consistency coefficient total score of the scale .96, for the "positive emotions" sub-dimension .94, for the "negative emotions" sub-dimension .95, and for the "realization of potential" sub-dimension .92. In present study, Cronbach's Alpha internal consistency coefficient total score of the scale .96, for the "positive emotions" sub-dimension .95, for the "negative emotions" sub-dimension .93, and for the "realization of potential" sub-dimension .91.

Life Satisfaction Scale

The Life Satisfaction Scale used in the study was developed by Diener, Emmons, Larsen and Griffin (1985). The adaptation study of the scale into Turkish was conducted by Dağlı and Baysal (2016). The scale, which is a five-point Likert-type scale with a total of 5 items, has a one-dimensional structure. The total variance explained by the one-dimensional structure is 68%. The scale is graded as "I do not agree at all (1) - I completely agree (5)". The increase in the scores obtained from the scale indicates that the life satisfaction levels of the participants increased. In contrast, the decrease in the scores indicates that the life satisfaction levels decreased. As a result of the Confirmatory Factor Analysis, it was determined that the scale preserved its original single-factor structure. It was found that the fit values of the analysis were within acceptable limits. According to the CFA findings $\chi 2/df = 1.17$, RMSEA= .08, GFI= .99, CFI= 1.00 ve NNFI= 1.00 values were obtained. The Cronbach's Alpha internal consistency coefficient is calculated as .88. In present study, Cronbach's Alpha internal consistency coefficient is calculated as .89.

Personal Information Form
In the personal information form prepared by the researcher, questions about the participants' gender, professional seniority, education level and educational levels they were working in were included.

Ethical Board Approval

Marmara University, Institute of Educational Sciences, Research and Publication Ethics Committee decided on 23/07/2020, with the approval number 2020-7-14 and protocol number 2020/55, that this study was ethically appropriate and declared its approval with the document numbered 2000223542.

Data Collection

During the data collection process, the permission of the Ethics Commission for the scales and the legal permission required for the implementation of the scales was obtained from the Istanbul Provincial Directorate of National Education. Then, the application process of the scales was planned by interviewing the administrators of the schools where the study would be conducted. The scales answered by the participants were examined one by one, and scales that were filled incompletely or incorrectly were not evaluated. In this context, 33 scales that were filled incompletely and wrongly were removed from the 800 scales distributed and analyzes were made with the data belonging to the remaining 767 scales.

Data Analysis

In the analysis of the data obtained within the scope of the research, descriptive statistics related to the variables were calculated and the relationships between variables were determined using the Pearson moments product correlation coefficient. Subsequently, mediation analysis was performed using the structural equation model and path analysis in line with the model proposed by Baron and Kenny (1986). In the research, the data were analyzed by making path analysis with the implicit and observed variables.

While performing the path analysis $\chi 2$, sd, $\chi 2/sd$, RMSEA, CFI, GFI and NFI values were taken as criteria for the suitability of the model. The opinions of Hu & Bentler (1999), Brown (2006), Çokluk, Şekercioğlu & Büyüköztürk (2016), Sümer (2000), Marcoulides & Schumacher (2001) and Tabachnick & Fidell (2001) were considered as base on the acceptance of the goodness of fit values of the model. Within the framework of these views, $\chi 2 / df \leq 5$; RMSEA $\leq .10$; CFI $\geq .90$; GFI $\geq .85$; NFI $\geq .90$ values were considered as acceptable limits for the suitability of the model. Bootstrapping is used to examine the significance of indirect effects. The fact that the confidence intervals calculated as a result of the bootstrapping process do not include zero, shows that the indirect effect is significant (Hayes, 2013). In this study, the bootstrapping coefficient and confidence intervals (CI) performed through 10,000 resampling were determined. SPSS 25 and AMOS 20 programs were used in the analysis of the data collected within the scope of the research. Before starting the analysis, it was examined whether the data showed one-way and multi-directional normality assumptions. For this purpose, the skewness and kurtosis values of the data and Q-Q charts were examined. Work Engagement (-1.01 with.93) organizational happiness (-.16 with -.63) and life satisfaction (-.39 with -.08) scales scores were found to be within the normal distribution limits. According to Kalaycı (2014, p. 8), the value of kurtosis-skewness between -2 and +2 indicates that the data has a normal distribution. In addition, when the Q-Q chart is examined, the fact that the data is in the form of an ellipse around the line with an angle of 45 degrees supports the normality assumption. Finally, the existence of the multiple connection problem was examined with correlation values (Charts 1 and 2). Correlation values between variables being lower than .85 is an indication that there is no multi-connection problem (Pallant, 2005). In the interpretation of arithmetic means in the study, the range of 1.00-1.79 is "very low", 1.80-2.59 interval is "low", 2.60-3.39 interval is "medium", 3.40-4.19 interval is "high" and 4.20-5.00 interval is "very high" in five-point Likert type scales. ; On the seventh Likert-type scale, the range 1.00-1.86 is "quite low", 1.86-2.72 range is "very low", 2.72-3.58 "low", 3.58-4.44 range is "medium", 4.44-5.30 range is "high", 5.30-6.16 range “Very high” and the range 6.16-7.00 is rated as “quite high”. In addition, in the interpretation of correlation analysis .00-.30 range is "low", .31-.70 range is "medium" and the range .71-1.00 has been accepted as a “high” level of relationship (Büyüköztürk, 2011). The first question of the study was investigated by arithmetic mean, the second question by Pearson moments product correlation analysis and the third question by structural equation modeling (SEM).

Findings

In the study, teachers' work engagement, organizational happiness and life satisfaction levels were examined. In addition, correlation analysis results between variables were given. Then the structural equation model for the

mediating role of organizational happiness in the relationship between work engagement and life satisfaction was tested.

Descriptive Statistics and Correlations

The correlation values between the latent variables of the study and the descriptive statistics for these variables are presented in Table 1.

Table 1. Correlation Values Between Latent Variables of the Study and Descriptive Statistics

	Skewness	Kurtosis	x̄	Sd	1	2	3
1. Work Engagement	-1.01	.93	5.59	1.04	1		
2. Organizational Happiness	-.16	-.63	3.72	.64	.72**	1	
3. Life Satisfaction	-.39	-.08	3.24	.83	.52**	.55**	1

*p< .05, **p< .01

When the descriptive statistics in Table 1 are examined, it is seen that teachers' work engagement levels are very high relative (x̄=5.59), organizational happiness levels are high relative (x̄=3.72) and life satisfaction levels are medium relative (x̄=3.24). In addition, when the skewness and kurtosis values of the variables discussed in the study are examined, it is seen that the distribution displays a normal distribution. Considering the correlation coefficients between the variables in Table 1, there is a positive, highly significant relationship between organizational happiness and work engagement (r =.72; p<.001). In addition, a positive, moderately significant relationship was found between organizational happiness and life satisfaction (r =.55; p<.001). Finally, it was determined that there is a positive and moderately significant relationship between work engagement and life satisfaction (r =.52; p<.001).

The correlation values between the observed variables of the study and the descriptive statistics for these variables are presented in Table 2.

Table 2. Correlation Values Between Observed Variables of the Study and Descriptive Statistics

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1. Vigor	1									
2. Devotion	.82**	1								
3. Assimilation	.63**	.64**	1							
4. Positive Emotions	.68**	.69**	.46**	1						
5. Negative Emotions	.57**	.58**	.34**	.68**	1					
6. Realization of Potential	.61**	.60**	.47**	.65**	.51**	1				
7. Life Satisfaction (item 1)	.51**	.53**	.36**	.52**	.41**	.46**	1			
8. Life Satisfaction (item 2)	.39**	.40**	.24**	.44**	.36**	.37**	.66**			
9. Life Satisfaction (item 3)	.47**	.48**	.31**	.49**	.41**	.39**	.66**	.70**		
10. Life Satisfaction (item 4)	.40**	.41**	.28**	.41**	.33**	.34**	.59**	.64**	.72**	
11. Life Satisfaction (item 5)	.37**	.40**	.28**	.40**	.31**	.29**	.54**	.55**	.63**	.66**

*p< .05, **p< .01

When the analysis results in Table 2 were examined, it was seen that all observed variables were significantly associated with each other. Before the analysis of the structural equality model, the measuring model showing the relationships between the latent variables obtained by formation of the observed variables was tested and presented in Figure 1. It was seen that the result of the analysis proved the measuring model and the values of fit were at the acceptable level ($\chi 2/df$= 4.21, p<.001, RMSEA=.065, SRMR= .039, GFI= .96, CFI= .98). The factor loadings ranging from .69 to .92 show that the observed variables significantly represent the latent variables.

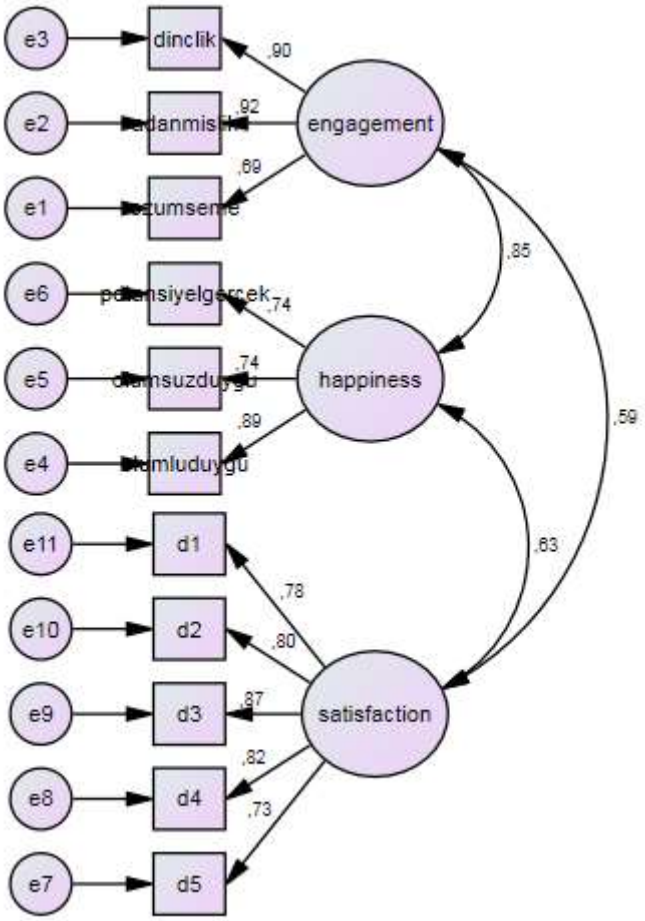

Figure 1. The Analysis Results Related to Measuring Model

The mediating effect of organizational happiness on the relationship between teachers' engagement in work and their life satisfaction was examined in line with the model proposed by Baron and Kenny (1986). According to this model, to test the mediator variable model, there should be a significant relationship between dependent, independent and mediator variables. When the findings in Table 1 and Table 2 were examined, it was seen that all variables had significant relationships among themselves. When there is a significant relationship between variables, if the variable for which the mediating effect is being examined is added to the model, this indicates the mediating effect. When the variable believed to play a mediating role is added to the model and the relationship between the dependent and independent variable is insignificant, this is considered "full mediation", while the significance of the relationship and the decrease in the level of influence is considered "partial mediation". This study examined whether organizational satisfaction plays a mediating role in the relationship between work engagement (independent variable) and life satisfaction (dependent variable).

Findings Regarding the Examination of the Effect of Work Engagement on Life Satisfaction Using Path Analysis

First of all, the relationship between predictor and predicted variables were examined and a significant relationship was found between variables. Then, the predictive effect of work engagement on organizational happiness was examined by path analysis. Analysis results are presented in Figure 2.

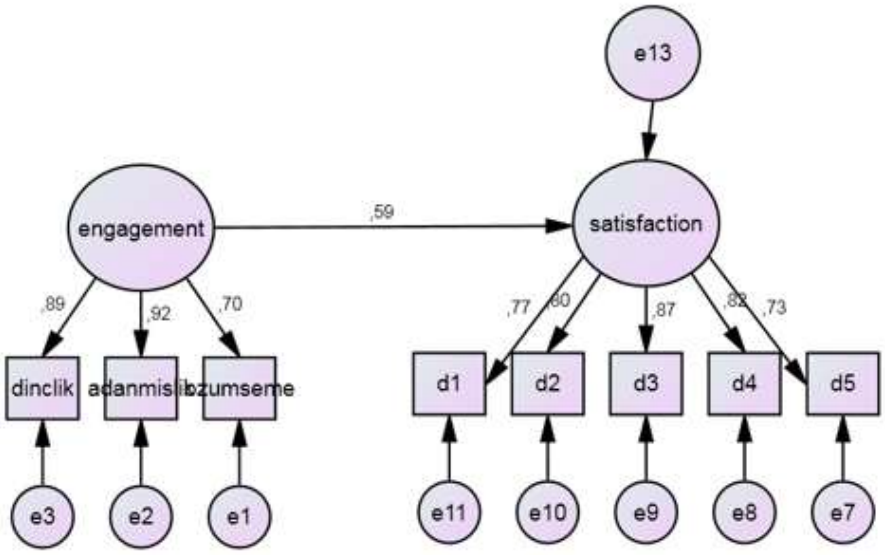

Figure 2. Path Analysis Diagram for Predicting Life Satisfaction

When the goodness of fit values of the model presented in Figure 2 are examined, it is seen that the model meets the required goodness of fit values [$\chi 2$ = 104.96, df = 19, $\chi 2$/df = 5.22, RMSEA = .08 (LO = .06, HI = .09), CFI = .98, GFI = .97, NFI = .97]. The path analysis coefficients related to the predictive effect of work engagement on life satisfaction are presented in Table 3.

The correlation values between the latent variables of the study and the descriptive statistics for these variables are presented in Table 3.

Table 3. Path Analysis Coefficients of Work Engagement as the Predictor of Life Satisfaction

Predictive (Exogenous)		Predicted (Endogenous)	B	Se	*t*	β	*p*
Work Engagement	→	Life Satisfaction	.62	.05	13.18	.59	.000

As seen in Table 3, work engagement (β =.59; p<.001) was found to be a predictor of life satisfaction. It explains 27% of the life satisfaction variance of work engagement (R^2=.27, p= .000)

Findings Regarding the Mediating Role of Organizational Happiness in the Relationship Between Work Engagement and Life Satisfaction

Relationships between work engagement, life satisfaction, and organizational happiness, which is considered as a mediating variable, were examined by path analysis. In addition, bootstrapping was used to investigate the statistical significance of indirect effects. The mediating effect of organizational happiness between work engagement and life satisfaction are shown in Figure 3 and Table 4.

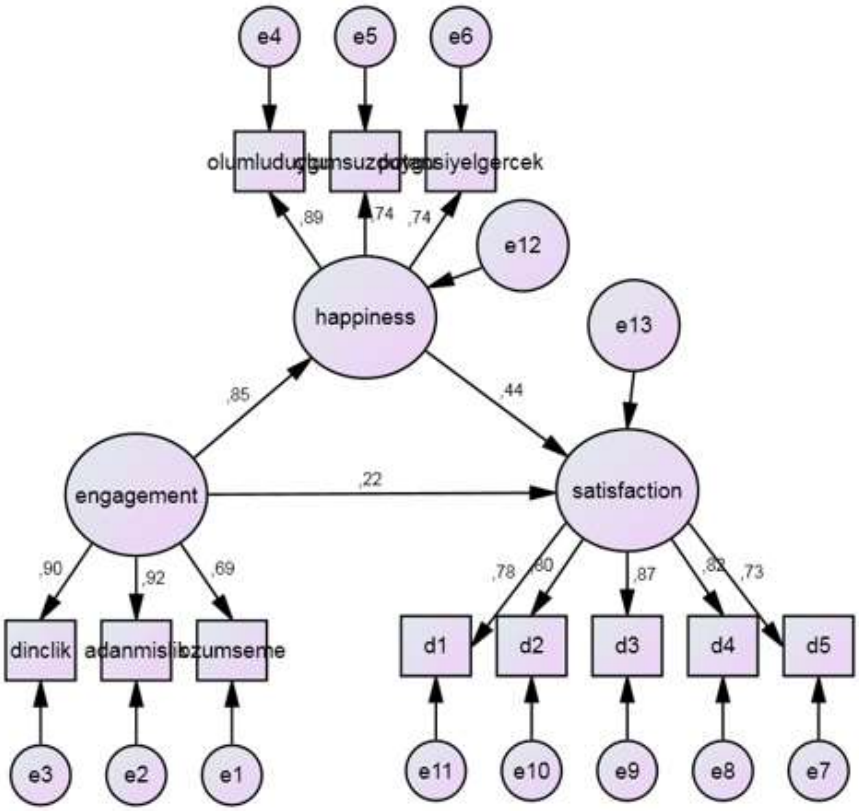

Figure 3. Path Analysis Diagram for Prediction of Life Satisfaction (Mediation Effect)

When the goodness of fit values of the model are examined, it can be said that it meets the required goodness of fit values [$\chi 2$ = 172.39, df= 41, $\chi 2$/df= 4.21, RMSEA= .07 (LO= .06, HI= .08), CFI= .98, GFI= .96, NFI= .97].

Table 4. Findings Concerning the Mediating Effect of Organizational Happiness in the Relationship Between Work Engagement and Life Satisfaction

Predictive (Exogenous)		Predicted (Endogenous)	B	Se	*t*	β	*p*
Work Engagement	→	Life Satisfaction	.23	.08	2.76	.22	.006
Organizational Happiness	→	Life Satisfaction	.43	.08	5.38	.44	.000
Work Engagement	→	Organizational Happiness	.92	.05	19.42	.85	.000

As shown in Table 4, work engagement positively predicts organizational happiness on a significant level (β =.85, t= 19.42, p<.001). In addition, organizational happiness positively predicts life satisfaction on a significant level (β=.44, t= 5.38, p<.001). Additionally, it was determined that work engagement positively predicted life satisfaction on a significant level (β=.22, t= 2.76, p<.01). It was found that work engagement and organizational happiness together predicted 33% of the variance of life satisfaction (R^2=.33, p= .000).

As it can be seen when Figure 2 and Figure 3 are compared, as a result of the path analysis made to determine the mediating role of organizational happiness, it is determined that when organizational happiness is included in the model (from .59 to .22) beta values of work engagement decreases. Although the beta value decreased, it was observed that the variable did not lose its predictability. When the analyzes are evaluated together, it can be said that engagement at work has a direct effect on life satisfaction, but also an indirect effect via satisfaction in the organization. In other words, it can be assumed that organizational satisfaction plays a partial mediating role between work engagement and life satisfaction. For this reason, bootstrapping was conducted to evaluate the significance of the indirect effect. According to the results of bootstrapping conducted by 10,000 replicates (coefficient of bootstrapping =.38, Se =.076, 95% CI =.235, .533), it was found that the indirect effect of job engagement was significant because the values of the confidence intervals did not include zero (Hayes, 2013). According to these findings, it can be said that organizational happiness has a partial mediating role in the relationship between work engagement and life satisfaction.

Direct, indirect and total effects were reviewed to examine the predictive effects of variables in the model, which examines the mediating role of organizational happiness in the relationship between work engagement and life satisfaction. Findings regarding direct, indirect and total effects are presented in Table 5.

Table 5. Direct, Indirect and Total Effects Regarding the Structural Model

Predicted	Predictive	Standardized Effects		
(Endogenous)	(Exogenous)	Direct	Indirect	Total
Life Satisfaction	Work Engagement	.22	.37	.59
Life Satisfaction	Organizational Happiness	.44		.44

According to the effect values in Table 5, work engagement (β =.22) and organizational happiness (β=.44) have been positively affecting life satisfaction. When the indirect effect on life satisfaction is examined, work engagement (β=.37) has been determined to have an indirect effect on organizational happiness. When the total effect of work engagement, which is the predictor variable, on life satisfaction, is calculated, work engagement (β=.59) and organizational happiness (β=.44) have been observed to have an effect superiority. Kline (2015) suggested critical values for the evaluation of standardized effect superiorities. These are as follows; low impact if less than .10, medium effect if around .30, high level of impact if .50 and above. Therefore, it can be said that in the last model in which organizational happiness takes place as the mediator variable, work engagement has a moderate effect on life satisfaction.

Results and Discussion

In this study, organizational happiness, work engagement and life satisfaction levels were examined in line with the opinions of 767 teachers working in 40 public schools in nine districts of Istanbul in the 2019-2020 academic year. In addition, the relationships between variables and the mediating role of organizational happiness in the relationship between work engagement and life satisfaction were examined.

Research findings have shown that teachers' perceptions of organizational happiness are on a relative high level. As a result of similar studies on educational organizations, it was found that teachers' perception of organizational happiness is high (Bulut, 2015; Tösten, Avcı & Şahin, 2017; Moçoşoğlu & Kaya, 2018; Uzun & Kesicioğlu, 2019; Özocak & Yılmaz, 2020). The high organizational happiness perceptions of teachers can be considered as a positive situation. Because education is of great importance in the development of a country and in raising the next generation. It is known that the success of an education system depends mainly on the success of the teachers who will implement and operate the system (Tahiroğlu & Meydan, 2019). Organizational happiness enables employees to cope with all problems that will negatively affect the functional activities, leading employees to the organization's goals and making them successful (Özen, 2018). Therefore, it is important that teachers, who play important and fundamental roles in educating the students, are happy in their schools in order to perform well (Bachtiar, Sudibjo & Bernarto, 2018). In a study conducted by Gavin and Mason (2004), it was shown that people's happiness and positive conditions at work contribute to increasing organizational success and engagement.

Another finding of the study is that the teachers' work engagement levels were found to be relative very high. Similar studies (Şanlı, Altun & Tan, 2018; Tösten, Arslantaş & Şahin, 2019; Şimşek & Gürler 2019) have also found that teachers have a high work engagement level. Work engagement is the main determinant of individual and organizational performance results. Moreover, it is beneficial not only for employees but also for organizations because engaged employees show superior job performance in their organizations (Demerouti & Cropanzano, 2010). Engaged employees are more creative, more productive, and more willing to go further (Bakker, Schaufeli, Leiter & Taris, 2008). Studies show that teachers' engagement in their jobs positively affects both themselves and their students' performance and increases their level of commitment to their jobs and institutions (Bakker & Demerouti, 2007). Also, teachers engaged in their jobs are more likely to apply active and reflective approaches to problem solving (Soini, Pyhältö & Pietarinen, 2010). Based on this information, teachers' high level of engagement in their jobs is important for their schools. Because teachers who are engaged in their jobs are more willing to undertake extra tasks, such as volunteering to support extracurricular activities that increase the school's performance (Runhaar, Sanders & Konermann, 2013).

The findings showed that the life satisfaction levels of the teachers were on a relative medium level. Life satisfaction refers to the one's cognitive-judgmental aspects of subjective well-being and has attracted the attention of many researchers (Kim & Kim, 2013). Because a good life satisfaction level is effective on individuals' good job performance (Ignat & Clipa, 2012). Looking at the studies that deal with teachers' life satisfaction, we find that teachers' life satisfaction is at a medium level in some studies (Şimşek & Aktaş, 2014; Demirel, 2014) and at

a high level in other studies (Ignat & Clipa, 2012; Hamama, Ronen, Shachar & Rosenbaum, 2013; Şirin & Şirin, 2015; Lee & Shin, 2017). There are many factors that influence individuals' life satisfaction positively or negatively (Tahiroğlu & Meydan, 2019). It is believed that many factors, from the gender of teachers to their branches, from the educational level of teachers to the settlement where their schools are located, may be effective behind the differences in study results regarding teachers' life satisfaction. For example, Demirel (2014) found that the job satisfaction of teachers working in public schools, preschool teachers and the life satisfaction of female teachers were higher.

Life satisfaction involves the comparison of the individual's self-imposed criteria and perception of life conditions and thus the evaluation of their own life (Pavot & Diener 1993). In other words, life satisfaction means that individuals' well-being and positive feelings are dominant against negative emotions (Yıldırım & Sönmez, 2017). It is stated that individuals who have achieved life satisfaction enjoy their daily activities and generally take an optimistic attitude towards life (Özer & Karabulut, 2003). Therefore, it is understood from the results of this study and other studies that teachers are satisfied with their lives.

Another finding of the study is that there are positive and meaningful relationships between organizational happiness, work engagement and life satisfaction. No research has been found in the literature in which all three variables were used together. However, Uzun and Kesicioğlu (2019) found in their study that there were positive and significant relationships between teachers' organizational happiness and job satisfaction and life satisfaction. Studies have revealed that work engagement can be seen as a concept related to happiness and that happiness leads to positive organizational results (Coetzee & Rothmarm, 2005; Rothmarm & Jordaan, 2006; Bakker, Albrecht & Leiter, 2011). Psychologist Martin Seligman, one of the leading experts in positive psychology, cited engagement as one of the main factors that can effectively achieve happiness (Juul, 2008). Studies have confirmed that work engagement contributes to many organizational variables such as job satisfaction and better performance (Alarcon & Edwards, 2011).

Life satisfaction as the main goal of many people's (Rask, Astedt- Kurki & Laippala, 2002) lives is influenced and changed by social and psychological factors that affect many aspects of one's life (Park et al., 2015). Therefore, it is frequently emphasized in the literature that the happiness of the individual in the workplace where he / she spends a large part of his / her daily life and the level of engagement in his / her job is very effective on life satisfaction (Robbins, 1996; Carver, 2003; Bhattacharjee & Bhattacharjee 2010; Field & Buitendach, 2011; Ignat & Clipa, 2012; Binder & Coad, 2013). On the other hand, one of the main reasons why employees with a high level of work engagement are better than those with a low work engagement level is that individuals engaged in work are generally happy, cheerful and enthusiastic in their jobs. As a matter of fact, happy individuals in the workplace are more sensitive to job opportunities; they are extroverted, helpful and optimistic towards others (Bakker & Demerouti, 2009).

Finally, the mediating effect of organizational happiness in the relationship between work engagement and life satisfaction was examined. The research findings showed that the effect of work engagement on teachers' life satisfaction happened partially due to organizational happiness. In other words, it was concluded that work engagement increases organizational happiness, and as a result, teachers' life satisfaction is positively affected. Therefore, it can be interpreted that keeping teachers engaged in their jobs at a high level can positively affect teachers' organizational happiness and increase their level of life satisfaction. In this context, steps can be taken to increase teachers' satisfaction with their lives by making their schools a happier organizational structure. In this respect, Piccolo, Judge, Takahashi, Watanabe and Locke (2005) and Streimikiene and Grundey (2009) drew attention to the relationship between life satisfaction and happiness in their research. Similarly, Schmitter (2003) showed being happy as one of the factors affecting life satisfaction. According to the research, it has been determined that the factors affecting organizational happiness also increase life satisfaction. Bakker and Demerouti (2009) stated that employees engaged in their jobs are happy at their jobs. Schaufeli, Taris, and Van Rehennen (2008) found that employees with higher level of work engagement experienced less psychosomatic disturbances. Based on this information, it can be said that employees who love their jobs and devote themselves to their jobs are happy and that organizational happiness levels are high in organizations consisting of such employees. In addition, there are many studies in the literature revealing that organizational happiness has a mediating role. For example; Asgarnezhad Nourı, Mır Mousavı and Ghaffarlou (2019) found that organizational happiness has a mediating effect on the relationship between employees' organizational commitment and job performance. Similarly, Bagherı, Jajarmızadeh, and Banafı (2017) found that organizational happiness plays a mediating role in the relationship between organizational spirituality and organizational commitment. Rego, Ribeiro, Cunha, and Jesuino (2011) revealed that happiness has a mediating role in the relationship between organizational virtue and emotional commitment.

Conclusion

In line with the findings obtained from the research, the following conclusions were reached: (i) teachers' level of work engagement and organizational happiness levels are on relative high level; (ii) life satisfaction levels of teachers are on relative medium level; (iii) there are positive, moderate and highly significant relationships between work engagement, organizational happiness, and life satisfaction; (iv) Organizational happiness plays a partial mediating role in the relationship between work engagement and life satisfaction.

Recommendations

In the light of the results obtained from the research, some recommendations can be made for researchers and practitioners. Many factors related to working life are effective on life satisfaction of individuals (Keser, 2005; Kanbur, 2018). Longitudinal and experimental studies can be conducted to determine the effects of these factors on life satisfaction of the individual. For example, The ultimate goal of teachers in professional sense is that their students are successful and valued individuals in the social structure. In this context, studies that consider students' success in the central exam as an indicator of teachers' success or their success in the higher education level as variables and examine the effects of this on teachers' life satisfaction can be conducted. The quantitative research method was used in the research. Qualitative or mixed research methods can also be used in similar studies to have more detailed information about the relationship of variables. In addition, some recommendations can be presented to the practitioners in line with the results obtained from the research. To make teachers engaged in their jobs and increase organizational happiness, training can be given to develop the leadership behaviors of school administrators. Professional support activities can be carried out for teachers to cope with the problems they face in their work-life, which cause psychological wear and reduce their life satisfaction. Social and cultural activities can be organized to strengthen the positive relationships between stakeholders, which have an important place in achieving organizational happiness.

Limitations

This investigation has some limitations. The study was conducted in the largest province of Turkey, Istanbul. Although the stratified sampling method was used to select teachers from districts with different levels of development for the sample group, it is believed that conducting similar studies covering different settlements (rural, urban, etc.) and different geographical regions might be beneficial in terms of generalizability of the results. Moreover, this study was conducted in public schools. A similar study can be conducted in private schools and the results can be compared. Thus, the similarities and differences that emerge from the research will provide guidance to managers and staff in the public and private sectors. Most of the participants of the research are female. Therefore, this situation should be taken into consideration when evaluating the findings. Data collection tools based on self-report were used to collect the research data. Therefore, the data obtained are limited with the responses of the participants to the measurement tools and the scope of the measurement tools. Considering this limitation in future studies, it is thought that it may be beneficial to use different methods such as observation and case study in addition to self-report-based measurement tools.

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A Quantitative Investigation of Final Year Preservice Science Teachers' Sources of Self-Efficacy Beliefs

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A Quantitative Investigation of Final Year Preservice Science Teachers' Sources of Self-Efficacy Beliefs*

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Abstract

The purpose of this study was to reveal final year pre-service science teachers' sources of science teaching self-efficacy beliefs. Research on the sources of pre-service teachers' self-efficacy beliefs is a promising field of research. However, the number of studies examining the sources of pre-service teachers' teaching self-efficacy in a special teaching domain is limited. Two hundred thirty-eight final-year pre-service science teachers constituted the sample of the current quantitative study. Data were gathered through two measures assessing final year pre-service science teachers' science teaching self-efficacy beliefs in classroom management, student engagement, and instructional strategies, and sources of these beliefs. Data were analyzed by using descriptive and inferential statistics. Means, standard deviations, and bivariate correlations were performed for descriptive statistics, and regression analyses were performed for inferential statistics. Regression analyses showed that mastery experiences were the primary source of self-efficacy for classroom management (β=.41), student engagement (β=.47), and instructional strategies (β=47), followed by verbal persuasions. While emotional states were the only negative predictor of prospective science teachers' self-efficacy beliefs related to classroom management (β=-.11), student engagement (β=-.14), and instructional strategies (β=-.14), vicarious experiences were not found to be a significant predictor of any dimension of self-efficacy beliefs. Teacher preparation programs are advised to pay more attention to teaching practice and micro-teaching courses and provide experienced mentor teacher models to pre-service science teachers. Findings are discussed.

Keywords: Preservice science teachers, Sources of self-efficacy, Teaching self-efficacy, Mastery experiences.

Introduction

Self-efficacy in social cognitive theory has been the focus of numerous research including finance (Farrell, Fry & Risse, 2016; Sizoo, Jozkowskia, Malhotra, & Shapero, 2008), sports (Lirgg, Feltz, & Merrie, 2016; Moritz, Feltz, Fahrbach, & Mack, 2000), nursing (Lee & Ko 2010; Peek & Park, 2013), engineering (Fantz, Siller & Demiranda, 2011; Ponton, Edmister, Ukeiley, & Seiner, 2001), educational psychology and education in general (Klassen & Usher, 2010; Schunk, 1995; Schunk & Pajares, 2009; Zimmerman, 1995). Self-efficacy takes place under the umbrella of social cognitive theory and is defined as one's beliefs in possessed capabilities to coordinate required actions to reach the desired end (Bandura, 1997). Self-efficacy studies in the area of education have concentrated mostly on students and their achievement-related outcomes. However, another crucial component of education is teachers, and self-efficacy research has extended its research region to teachers in a short while (Morris, Usher, & Chen, 2017). Teacher self-efficacy was defined as teachers' beliefs in their capabilities to make students learn the taught material (Tschannen-Moran & Woolfolk Hoy, 2001). Teacher self-efficacy stretches from student-related factors such as maintaining student motivation and teaching hard-to-learn concepts to keep an eye on student behavior and learning subject matter knowledge (Clark & Newberry, 2019). Research on teacher self-efficacy has revealed that teachers with high self-efficacy are more eager to use newly introduced teaching strategies, more sensitive to humanitarian classroom management, and have positive feelings toward the teaching profession (Woolfolk Hoy & Davis, 2006; Zee & Koomen 2016). Moreover, teacher self-efficacy influences the classroom learning atmosphere, student motivation, and academic achievement (Ross, 1992). In a comprehensive review of literature on teacher self-efficacy, Klassen, Tze, Betts, and Gordon (2011) have documented that research on sources of teachers' self-efficacy has been ignored while the number of teaching self-efficacy research

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has increased. Recent research has begun to question whether teacher self-efficacy was gained through teacher training programs and what sources contributed to pre-service teachers' self-efficacy. This study aimed to uncover the sources of teaching self-efficacy beliefs of final year pre-service science teachers in student engagement, instructional strategies, and classroom management dimensions.

Sources of Teaching Self-Efficacy for Pre-service Teachers

Bandura (1997) asserted that people develop self-efficacy beliefs by four main sources which are mastery experiences (personal or past accomplishments), vicarious experiences, verbal (social) persuasions, and emotional or physiological states (arousals). These four sources also work for pre-service teachers in constructing their teaching self-efficacy beliefs. Mastery experiences or past accomplishments refer to the activities completed successfully in the past. In teacher preparation programs, final year pre-service teachers have teaching practice courses in which they can teach in micro-teaching sessions and real classroom settings. Moreover, in teaching methods courses pre-service teachers develop lesson plans tapping to related teaching methods and perform teaching mini-sessions (as microteaching) as if they were teachers in a real classroom setting. In most studies conducted with pre-service teachers, mastery experiences have been the most powerful source of self-efficacy beliefs (e.g. Cantrell, Young, & Moore, 2003; Knoblauch & Woolfolk Hoy, 2008). A remarkable finding was reported by Bautista and Boone (2015) that performing a teaching practice had increased teaching efficacy beliefs of pre-service teachers even in a virtual classroom environment.

Vicarious experiences are the conclusions of observations derived by the observer from a model. In teacher preparation programs, pre-service teachers have various opportunities to observe teaching skills being modelled. Professors from the faculty of education, mentor teachers in the schools they visit during practicum courses, and their peers participating in teaching methods and other courses could all serve as role models to observe and inspire. Research on the effectiveness of vicarious experiences on pre-service teachers' self-efficacy beliefs is limited in number. However, these studies indicated that vicarious experiences are the second strongest predictor of pre-service teachers' self-efficacy beliefs (Bautista, 2011; Johnson, 2010; Palmer, 2006).

Verbal (social) persuasions are comments and praises received from others in a close environment. Verbal persuasions help pre-service teachers to enhance their self-efficacy beliefs when received as social support, encouragement, instructive mentoring, and constructive feedback (Clark & Newberry, 2019). In recent research, Arsal (2014) examined micro-teaching practices' contribution to pre-service teachers' self-efficacy by conducting an experimental study. Arsal (2014) concluded that constructive feedback provided to pre-service teachers just after watching their teaching performances could be counted as verbal persuasions, which may help improve their teaching self-efficacy. Another research by Moulding, Stewart, and Dunmeyer (2014) examined the association between perceived support from significant others (mentor teachers and university supervisors) during student teaching and pre-service teachers' self-efficacy. They found a significant correlation between perceived support (as verbal persuasion) and pre-service teachers' self-efficacy beliefs on a moderate level.

Lastly, emotional or physiological states (arousals) are bodily reactions (e.g. mood, stress, anxiety, stomachache, etc.) to the situation to which a person is exposed. Bandura (1997) asserted that these bodily reactions need to be processed since they may not be the determinants of self-efficacy alone. Additionally, people react differently to the signals emerging from emotions and received from their bodies (O'Neill & Stephenson & 2012). According to d'Alessio (2018), pre-service teachers generally feel nervous during their initial teaching practices in a real classroom environment. O'Neill and Stephenson (2012) reported that emotional states negatively predicted pre-service final year primary teachers' self-efficacy beliefs.

Previous researches have demonstrated that these four major sources influence pre-service teachers' self-efficacy as mastery experiences taking the leader role (Can, 2015; Clark & Newberry, 2019; O'Neill & Stephenson, 2012; Seung, Park, & Lee, 2019; Wang et al., 2017). However, slight differences were reported by studies conducted in different countries. For example, in an earlier research Poulou (2007) investigated one hundred ninety-eight fourth and last year pre-service primary teachers' teaching self-efficacy sources in three dimensions of the Teacher Sense of Efficacy Scale (TSES) in Greece. A commonly used scale to measure pre-service and in-service teachers' self-efficacy, the TSES, is able to assess sense of efficacy related to student engagement, instructional strategies, and classroom management with either a long (twenty-four items) or short (twelve items) version. Poulou (2007) developed a Teaching Efficacy Sources Inventory covering seven dimensions, including four main sources of self-efficacy beliefs. A series of multiple regression analyses showed that prospective elementary teachers' self-efficacy beliefs for student engagement, instructional strategies, and classroom management were positively predicted by mastery experiences combined with social (verbal) persuasions. Similar findings were reported by Oh (2011) who used the same instruments with fifty-seven prospective elementary teachers in the United States.

The research findings indicated that efficacy for classroom management was negatively predicted by mastery experiences combined with social (verbal) persuasions and emotional arousal, while efficacy for instructional strategies and student engagement were not predicted by any of the four sources.

Bandura asserted that the predictive capability of self-efficacy sources might vary as levels of self-efficacy in special domains of interest. Concerning science teaching, a limited number of studies yielded similar results. In very recent research, van Rooij, Fokkens-Bruinsma, and Goedhart (2019) investigated the sources of science teaching self-efficacy beliefs of sixty-nine science undergraduates. The researchers decided to measure emotional states with items measuring both positive and negative emotional states. Emotional states items are generally developed with negative meaning words and reversed when entering the data. Negative emotions might be "a more logical focus" compared to positive emotions because the consequences of negative emotions can end with leaving the teaching profession. However, Morris et al. (2017) pointed out that the lack of balance between negative and positive emotions is a general problem in measuring self-efficacy sources. However, there are recent efforts to include positive emotions as a source of teaching self-efficacy (see Lent, Ireland, Penn, Morris, & Sappington, 2017). van Rooij et al. (2019) created a new "positive emotional states" dimension in addition to negative "emotional states" items. Examples of positive states items are "Feeling enthusiastic during teaching". "Feeling cheerful from contact with students". Multiple regression analyses revealed that positive emotional states and mastery experiences were the two positive predictors of science undergraduates' science teaching self-efficacy, which explains more than half of the variance.

In Turkey, several studies have investigated how the four main sources of self-efficacy predicted pre-service teachers' self-efficacy beliefs (e.g. Aydın & Boz, 2010; Can, 2015; Çapa-Aydın, Uzuntiryaki-Kondakçı, Temli, & Tarkın, 2013; Uzuntiryaki, 2008). The samples in these studies ranged from prospective chemistry teachers (see Uzuntiryaki, 2008) to elementary science and mathematics teachers (see Aydın & Boz, 2010; Can, 2015; Gün, Acar-Şeşen, Akbulut, Çetin-Dindar, & Molu, 2021), computer education and information technology teachers, and elementary school teachers (Arslan & Çolakoğlu, 2019; Çapa-Aydın et al., 2013). Although educational psychology studies mainly were conducted using quantitative methods, Turkish researchers have shown examples of the mixed methods (see Aydin & Boz, 2010) and qualitative studies (see Can, 2015). These types of methodologies, known as flexible designs, can reveal additional self-efficacy sources related to the research area in question. In one of these recent studies, Can (2015) studied with five final year pre-service science teachers and examined their science teaching self-efficacy sources. The study was designed on qualitative methodology and data were gathered by semi-structured interviews. She found that all four main sources contributed to final year pre-service science teachers' teaching self-efficacy and science content knowledge, personality traits, and resource provision. Aydın and Boz (2010) examined whether grade level created a difference in pre-service science teachers' science teaching self-efficacy and sources. The famous STEBI (Science Teaching Efficacy Beliefs Instrument) was used as the quantitative measurement tool and semi structured-interviews provided qualitative data. The qualitative part of the study revealed the sources of pre-service science teachers' sources of science teaching self-efficacy. Results showed that pre-service science teachers mentioned mastery experiences, verbal persuasions, and vicarious experiences. While mastery and vicarious experiences were leading sources, pre-service science teachers had not mentioned emotional states as sources of their science teaching self-efficacy.

Previous studies have examined pre-service science teacher self-efficacy either with self-efficacy and outcome expectancy dimensions (mostly using STEBI) or by ignoring grade-level differences. Studies on the self-efficacy sources of pre-service teachers' addressing a single domain of teaching (science, math, social studies, etc.) are also limited in number. Moreover, final year pre-service teachers are the most experienced group at the end of their formal teacher education period. That group of pre-service teachers has almost completed basic mandatory courses to be able to graduate. Thus, the data obtained from such a group of pre-service teachers was considered the most suitable data for the study.

Morris et al. (2017) stated that although STEBI (Enochs & Riggs, 1990) is a content-specific measure concerning science teaching, it falls short to measure teaching self-efficacy from multiple perspectives. To the best of our knowledge, sources of pre-service science teachers' teaching self-efficacy have not been assessed from student engagement, instructional strategies, and classroom management perspectives with final year pre-service science teachers in Turkey. While the literature contains qualitative studies examining the sources of self-efficacy of pre-service science teachers in their final year of schooling with a small group of pre-service teachers, it lacks a quantitative study examining four sources of self-efficacy of pre-service teachers with a large sample. According to Morris et al. (2017), a single model covering all four sources could present a comprehensive notion to researchers regarding sources and their influences. Bandura (1977) proposed that self-efficacy is easily shapeable at the early stages of teacher preparation and these shaped beliefs may exert influence on pre-service teachers'

self-efficacy beliefs in their teaching careers. Teacher educators may benefit from the findings of the current research as it has the potential to reveal latent sources of self-efficacy beliefs in three critical dimensions of teaching. Assuming that sources of teaching self-efficacy may vary for these three dimensions, teacher educators will be able to decide which source to pay more attention to during pre-service teacher training. In addition, science teaching is characterised by the fact that different teaching strategies (e.g., inquiry-based learning, problem-based learning, project-based learning, etc.) can be used and laboratory sessions require special attention in terms of classroom management. Accordingly, it is believed that the current study adds depth to the knowledge base on pre-service science teacher self-efficacy with a large sample from Turkey. This study aims to reveal the sources of science teaching self-efficacy of final year pre-service science teachers in three teaching self-efficacy dimensions which are student engagement, instructional strategies, and classroom management. Accordingly, this study seeks answers to the research questions below:

- Which sources (mastery experience, vicarious experience, verbal persuasions, and emotional states) predict final year pre-service science teachers' self-efficacy in student engagement?
- Which sources (mastery experience, vicarious experience, verbal persuasions, and emotional states) predict final year pre-service science teachers' self-efficacy in instructional strategies?
- Which sources (mastery experience, vicarious experience, verbal persuasions, and emotional states) predict final year pre-service science teachers' self-efficacy in classroom management?

Method

This study uses a quantitative methodology in which data are obtained from participants' self-reports. Moreover, statistical analyses are conducted on the data to derive meaningful explanations. The study design could be stated as a correlational study. The purpose is to predict which sources of efficacy beliefs are related to pre-service teachers' science teaching efficacy beliefs.

Participants

The current study participants were 238 (185 women, 42 men, 11 gender missing) final year pre-service science teachers from five state universities of Turkey. The universities that the sample was drawn were located in the Central Anatolia Region and the number of participants from each university was roughly equal. The convenience sampling method was used for selecting participants. Age range of the participants varied between 20 and 29 (M = 22.34, SD = 1.15). Cumulative grade point average ranged from 1.81 to 3.95 (M = 2.90, SD = .31).

Instruments

Teachers' Sense of Efficacy Scale

Teachers' Sense of Efficacy Scale (TSES) was utilized to assess the self-efficacy beliefs of pre-service science teachers. TSES is a 9-point Likert type scale ("1 = nothing" to "9 = a great deal"). It was developed by Tschannen-Moran and Woolfolk-Hoy (2001) and Çapa, Cakiroglu, and Sarıkaya (2005) translated and adapted TSES into Turkish. TSES assesses three basic teacher capabilities, which are efficacy for student engagement (eight items), efficacy for instructional strategies (eight items), and efficacy for classroom management (eight items) with twenty-four items. TSES items were reworded to address science classes that comply with science teacher self-efficacy. For example, the efficacy for student engagement item "How much can you do to motivate students who show low interest in schoolwork?" was reworded to "How much can you do to motivate students who show low interest in science class?". Similarly, the instructional strategies item was "How well can you implement alternative teaching strategies in your science class?" and the classroom management item was "How much can you do to calm a student who is disruptive or noisy in science class?". The reliability coefficients (Cronbach's alpha) for the dimensions in the current study are α=.79 for student engagement, α=.82 for instructional strategies, and α=.84 for classroom management.

Sources of Self-Efficacy Inventory (SOSI)

Sources of Self-Efficacy Inventory (SOSI) was developed by Kieffer and Hanson (2000) to assess the four sources of teaching self-efficacy beliefs (mastery experiences, vicarious experiences, verbal persuasions, and emotional states). It is a seven-point Likert type scale ranging from "1 = definitely not true for me" to "7 definitely true for me". The Scale was translated into Turkish by Çapa-Aydın et al., (2013). The translated version included twenty-seven items. These items were distributed to sub-dimensions as eight items for mastery experiences, seven items for vicarious experiences, five for verbal persuasions, and seven for emotional states. Similar to TSES, items in

SOSI were reworded to address science class and tap to sources of science teacher self-efficacy. Example items for the dimensions are "I have had many positive opportunities to teach science" (mastery experiences), "When I see other teachers do poorly, I am able to learn how to teach science more effectively" (vicarious experiences), "When people I respect tell me I will be a good science teacher, I tend to believe them" (verbal persuasion), and "The idea of being in a classroom as a science teacher makes me nervous" emotional states. The reliability coefficients (Cronbach's alpha) for the dimensions in the current study are α=.77 for mastery experiences, α=.76 for vicarious experiences, α=.77 for verbal persuasion, and α=.70 for emotional or physiological arousal.

Teacher Preparation Context in Turkey

Teacher preparation programs last four years in Turkey and are provided by faculties of education under the rule of universities. Teacher candidates have theoretical courses in the first three years of their teacher preparation. In the final year, they visit public and private schools to experience a real classroom environment (early childhood and primary education teacher candidates begin visiting schools in their junior years) in teaching practice courses. In the first semester of the final year, pre-service teachers just observe the mentor teacher to increase their experience and teaching skills. In the second semester, they are required to teach at least two hours per week. Faculty supervisors attend pre-service teachers' teaching performances at least four hours during the semester to observe the development of teaching skills. Finally, pre-service teachers are graded on a consensus reached by the mentor teacher and faculty supervisor.

Procedure

The data were collected at the final weeks of the semester to ensure that final year pre-service science teachers have almost completed practice teaching courses in which they visit middle schools for twelve weeks, experience real classroom settings, and have the opportunity to teach science to middle schoolers. Since the aim of the study is to identify the potential sources of self-efficacy beliefs of trainee teachers, it is assumed that the experience gained by the teachers in teaching practice contributes greatly to the self-efficacy beliefs of the trainee teachers. The instruments were given to the participants by their instructors who were informed by the author. Participants were informed that completion of the questionnaires was voluntary and that they were free to opt out at any point during data collection.

Data Analyses

Data were analyzed by using descriptive statistics and inferential statistics analyses. Firstly, descriptive statistics such as means, standard deviations, and bivariate correlations were calculated. Then, inferential statistics were used to predict which source(s) tap into the dimensions of pre-service science teachers' teaching self-efficacy beliefs. Regression analyses were conducted to reveal the sources of teaching self-efficacy beliefs. The hypotheses below were proposed:

- H1: Bandura's four hypothesized sources (mastery experiences, vicarious experiences, verbal persuasions, and emotional states) predict final year pre-service science teachers' teaching self-efficacy for student engagement.
- H2: Bandura's four hypothesized sources (mastery experiences, vicarious experiences, verbal persuasions, and emotional states) predict final year pre-service science teachers' teaching self-efficacy for instructional strategies.
- H3: Bandura's four hypothesized sources (mastery experiences, vicarious experiences, verbal persuasions, and emotional states) predict final year pre-service science teachers' teaching self-efficacy for student engagement.

Results

Data cleaning, missing data analysis, and linearity and normality assumption controls were performed as an initial step. No violations were detected for the inferential statistics and analyses were conducted. For descriptive purposes, the means and standard deviations of study variables were presented in tables. Regression analyses, which revealed the answers to main research questions, followed.

Descriptive Statistics

Table 1 indicates the means and standard deviations of pre-service science teachers' self-efficacy beliefs in student engagement, instructional strategies, classroom management, and sources of efficacy beliefs.

Table 1. Descriptive statistics for variables included in the study

		M	*SD*	Scale
Preservice Teacher Self-efficacy	Student Engagement	6.86	1.00	1-9
	Instructional Strategies	7.03	1.02	
	Classroom Management	6.84	1.02	
Sources of Self-efficacy	Mastery Experiences	5.65	.69	1-7
	Vicarious Experiences	5.70	.71	
	Verbal Persuasions	5.78	.81	
	Emotional States	4.64	.97	

Final year preservice science teachers had the highest teaching "self- efficacy" beliefs in instructional strategies (M = 7.03, SD = 1.02), followed by student engagement (M = 6.86, SD = 1.00), and classroom management (M = 6.84, SD = 1.02) (see Table 1). For the sources of science teaching self-efficacy beliefs, verbal persuasions had the highest mean (M = 5.78, SD = .81), followed by vicarious experiences (M = 5.70, SD = .71), mastery experiences (M = 5.65, SD = .69), and emotional states (M = 4.64, SD = .97).

Pearson correlations of study variables are presented in the table below to depict intercorrelations among the variables.

Table 2. Pearson correlations of study variables

	1	2	3	4	5	6	7
1. Student Engagement		.73*	.68*	.58*	.49*	.43*	-.07
2. Instructional Strategies			.74*	.56*	.46*	.44*	-.08
3. Classroom Management				.48*	.37*	.44*	-.06
4. Mastery Experiences					.77*	.65*	.09
5. Vicarious Experiences						.71*	.15*
6. Verbal Persuasions							.14*
7. Emotional States							

* p <.05

All three efficacy dimensions correlated positively with sources except emotional arousal (see Table 2). Sources of efficacy beliefs correlated positively with each other. However, mastery experiences and emotional states had not a significant relationship (see Table 2).

Inferential Statistics

The regression analysis has the potential to reveal the predictive role of an independent variable on a dependent variable. In other words, regression analyses are run for making predictions or assessing the influence of one or more independent variables on a dependent variable. Thus, regression analyses have revealed to what degree Bandura's hypothesized sources of efficacy tap to final year pre-service science teachers' self-efficacy beliefs in student engagement, instructional strategies, and classroom management.

Table 3. Sources of teaching self-efficacy beliefs for student engagement

Predictors	***B***	**St. Error of *B***	**β**
Mastery experiences	.68	.12	.47*
Vicarious Experiences	.13	.13	.09
Verbal Persuasions	.10	.10	.08
Emotional States	-.14	.06	-.14*

R^2 = .36, * p < .05

Regression analysis indicated that the model explained a considerable variance in final year pre-service science teachers' teaching self-efficacy beliefs for student engagement (R^2 = .36). For predictors, pre-service science

teachers' mastery experiences (β = .47) predicted efficacy for student engagement positively and emotional states (β = -.14) predicted it negatively (see Table 3). Vicarious experiences and verbal persuasions were not significant predictors of final year pre-service science teachers' science teaching efficacy beliefs in student engagement.

Table 4. Sources of teaching self-efficacy beliefs for instructional strategies

Predictors	***B***	**St. Error of *B***	**β**
Mastery experiences	.70	.13	.47*
Vicarious Experiences	.00	.13	.00
Verbal Persuasions	.19	.10	.15
Emotional States	-.15	.06	-.14*

R^2 = .35; * p < .05

Table 4 shows that similar to efficacy for student engagement dimension of TSES, final year pre-service science teachers' self-efficacy for instructional strategies were significantly predicted by their mastery experiences and emotional states. While mastery experiences predicted it positively (β = .47), emotional states predicted it negatively (β =-.14). The regression model explained 35% of the variance in efficacy for instructional strategies. In efficacy for instructional strategies, vicarious experiences and verbal persuasions nor found as significant predictors.

Table 5. Sources of teaching self-efficacy beliefs for classroom management

Predictors	***B***	**St. Error of *B***	**β**
Mastery experiences	.60	.13	.41*
Vicarious Experiences	-.18	.14	-.13
Verbal Persuasions	.35	.10	.28*
Emotional States	-.12	.06	-.11*

R^2 = .28; * p < .05

For the last model, regression analysis revealed that in addition to mastery experiences (β = .41), verbal persuasions (β = .28) positively predicted final year pre-service science teachers' efficacy for classroom management. As in the previous analysis, emotional arousal (β = -.11) was found to be a negative significant predictor of efficacy beliefs for classroom management. The model explained 28% of the variance in self-efficacy beliefs for classroom management. Final year pre-service science teachers' vicarious experiences did not contribute to their efficacy beliefs for classroom management.

Discussion and Conclusions

This study examined the sources of final year pre-service science teachers' self-efficacy beliefs in three dimensions, namely, student engagement, instructional strategies, and classroom management, which are considered critical to science teaching. The sources of these self-efficacy beliefs examined were Bandura's four hypothesized sources. Concerning the sources of final year pre-service science teachers' teaching self-efficacy beliefs, regression analysis for predicting self-efficacy for student engagement indicated that pre-service science teachers' mastery experiences predicted it positively. In other words, as pre-service science teachers' mastery experiences increase, so their self-efficacy in student engagement. However, emotional states predicted it negatively. That means as pre-service science teachers experience bodily reactions such as worrying, sweating, or stomach-ache during teaching, their self-efficacy beliefs for student engagement tend to decrease. Neither vicarious experiences nor verbal persuasions were found as significant predictors of self-efficacy beliefs for student engagement. As the primary source of self-efficacy beliefs, pre-service science teachers' mastery experiences are mainly gained through their practicum courses. They visit public schools and have the opportunity to teach in real classroom settings. Such an experience helps to develop strong teaching self-efficacy beliefs through mastery experiences. Pre-service science teachers experience methods to motivate and engage students in their science classes. Previous studies have indicated consistent results for the leading predictive role of mastery experiences. For final year pre-service science teachers, mastery experiences are the strongest predictor of self-efficacy beliefs as it is for students and in-service teachers (Bandura, 1986; Bandura, 1997). Similar results were found in sources of efficacy beliefs for instructional strategies. Like self-efficacy for student engagement, while mastery experiences were found as the positive significant predictor, emotional states were found as the negative

predictor of self-efficacy for instructional strategies. Apart from these two teaching self-efficacy dimensions, verbal persuasions were found as the second positive predictor of self-efficacy for classroom management in addition to mastery experiences. Similar to the other two dimensions, emotional states were found again as the negative predictor of efficacy for the classroom management dimension of TSES.

Previous studies conducted both in national and international contexts reported mixed results. While mastery experiences were consistently found as the leading source of self-efficacy beliefs, the predictive role of other sources differed based on the domain of teaching, grade level of pre-service teachers, and cultural differences. For example, in a study conducted in the United States, Clark and Newberry (2019) reported that all sources except emotional states predicted pre-service primary teachers' efficacy beliefs measured by TSES, the same measure used in the current study. Clark and Newberry (2019) considered TSES as a composite measure and treated it as single-dimensional. Moreover, verbal persuasions were measured as received from mentor teachers and faculty supervisors. Similarly, O'Neill and Stephenson (2012) used TSES as a composite score and found that emotional arousal negatively predicted pre-service primary teachers' teaching self-efficacy beliefs. As mentioned in the above section, the current study found that emotional states were found as the negative predictor for all the three dimensions of TSES. As emotional states increase, efficacy beliefs in student engagement, instructional strategies, and classroom management decrease. This finding was expected since the items assessing emotional states mainly focus on negative feelings. Such a negative relationship could be explained in several ways. Firstly, pre-service science teachers could feel stress since their teaching practice performance in real classroom settings is mostly observed by their mentor teachers. Being observed by an experienced faculty member may cause stress for young teacher candidates. Second, because of the broad content of middle school science education (integrated science), which includes physics, chemistry, biology, earth science, environmental science, and astronomy, prospective science teachers may feel inadequately informed in the face of student questions. Such a broad array of topics may produce a huge number of student questions. This situation may make pre-service science teachers feel underconfident and preparing for a teaching practice performance could turn into a stressful issue. Finally, prospective science teachers know that they will be graded by their faculty supervisor and mentor after their performance is observed in teaching practice. Just being graded on a performance could lead to increased heartbeat, stomach pain, or depressed mood, which are typical forms of emotional states. This result is inversely confirmed by van Rooij et al. (2019). Emotional states predicted science students' self-efficacy beliefs, but positive emotions were positive significant predictors.

The predictive capability of sources shows differentiation across cultures. While mastery experiences consistently predict pre-service teachers' self-efficacy beliefs, other sources' predictive capability differed in countries. For instance, Pouluo (2007) measured Greek pre-service primary teachers' self-efficacy beliefs by TSES using its three domains. Pouluo (2007) combined mastery experiences with verbal persuasions in a single dimension and added vicarious experiences and emotional arousal as other sources of teaching self-efficacy beliefs. Separate analyses for efficacy domains indicated that mastery experiences in conjunction with verbal persuasions were the sole positive significant predictor of efficacy beliefs in student engagement, instructional strategies, and classroom management. Neither vicarious experiences nor emotional states were found as significant predictors of teaching self-efficacy domains for Greek pre-service primary teachers. Using the same instruments as Poulou (2007), Oh (2011) studied with pre-service teachers in the United States. Unlike Poulou (2007), mastery experiences in conjunction with verbal persuasions and emotional states were found as significant positive predictors of self-efficacy for the classroom management dimension.

A study conducted with science undergraduates in the Netherlands yielded similar results to the current study. Van Rooij et al. (2019) used TSES as a composite measure and assessed sources of teaching self-efficacy beliefs of science undergraduates with four hypothesized sources of efficacy. Similar to the current research findings, they reported that science undergraduates' science teaching self-efficacy beliefs were predicted positively by their mastery experiences and emotional (positive) states. The only difference was van Rooij et al. (2019) measured emotional states with positive and negative emotions. Only positive emotions predicted teaching self-efficacy beliefs positively. Negative emotions were not significant predictors.

In the current study, vicarious experiences have a divergent feature in final year pre-service science teachers' self-efficacy beliefs that these experiences were not found as significant predictors for any teaching efficacy dimension. Findings indicated that pre-service science teachers could not develop their teaching efficacy beliefs by observing or taking others as models in any teaching self-efficacy dimension. Mentor teachers, faculty supervisors, and peers could be pre-service science teachers' models as examples. However, in the current study Turkish pre-service science teachers could not benefit from significant others as their counterparts in various countries (see Clark & Newberry, 2019; Rogers-Haverback & Mee, 2015). To benefit more from mentor teachers, it is advisable to extend the duration of the teaching practicum and select experienced mentor teachers who have

worked with prospective teachers. It was found that vicarious experiences are not significant not only for prospective teachers but also for students' self-efficacy beliefs in Turkey. Kıran and Sungur (2012) found that science self-efficacy of eighth grade elementary students was not predicted by vicarious experiences. Observing others to gather information or experiences could be a cultural problem in Turkish society. Such a problem could be studied in a larger context in collaboration with a sociological perspective.

Recommendations

The current study revealed significant findings that may yield valuable recommendations for teacher education programs. Pre-service science teachers' primary source of teaching self-efficacy belief was found as mastery experiences. However, vicarious experiences were not found as a significant predictor in any teaching self-efficacy dimension. Moreover, emotional arousal has a negative influence on their efficacy beliefs. These findings imply that teacher education programs may pay more attention to micro-teaching courses in addition to teaching practice courses. Because emotional states negatively affect prospective science teachers' self-efficacy beliefs, increasing the number of lived teaching experiences could help them to moderate emotional reactions when they have to teach lessons. Pre-service teachers may develop teaching self-efficacy beliefs vicariously from their peers or mentor teachers, but the vicarious experience was not a significant predictor in the current study. This could mean that prospective science teachers do not consider their colleagues knowledgeable enough or that they do not consider their mentor teachers worthy of serving as role models and examples. To overcome such a problem, teacher education programs may pay more attention to selecting experienced mentor teachers for pre-service science teachers. Moreover, faculty supervisors may undertake leading roles for creating opportunities to organize science teaching activities to behave as a model for pre-service science teachers.

Limitations

Some limitations should be mentioned concerning the current study. Firstly, as stated in the literature section of this paper, a considerable number of qualitative studies on sources of self-efficacy beliefs of pre-service teachers have been conducted. These studies have brought about other sources of teaching self-efficacy beliefs belonging to pre-service teachers. The current research has focused only on the four hypothesized sources of self-efficacy. Future research may develop scale items based on the findings of qualitative studies to assess multiple sources other than those hypothesized four sources. Secondly, descriptive statistics results have indicated that the correlation between the sources of efficacy beliefs is high. Pallant (2007) recommends taking actions in these conditions such as combining highly correlated dimensions or omitting the variable. Moreover, Pallant (2007) also cautions that independent variables in a regression model should correlate to some degree with the dependent variable. These two conditions are present in the current research. Low or no correlation between independent and dependent variables but a significant predictor in the regression analysis may point suppression effect. According to Pandey and Elliot (2010) "The idea that a variable, which is unrelated to the dependent variable, should be retained not only for theoretical purposes but also to improve overall predictive power of the model is appealing" (p. 38). Additionally, suppressor variables contribute to eliminating the risk of rejecting a true hypothesis as if it was false (Rosenberg, 1973). Since the purpose of the regression analysis was to reveal the predictive role of sources, it was decided to continue regular regression analysis. Lastly, as multiple sources exist for pre-service teachers' self-efficacy beliefs, there possibly are self-efficacy dimensions in addition to student engagement, instructional strategies, and classroom management. For science education purposes, teaching science in laboratory self-efficacy, teaching science through argumentation self-efficacy, and nature of science self-efficacy could be investigated as self-efficacy dimensions particular to science education.

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The Relationships Between School Climate, School Belonging and School Burnout in Secondary School Students

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The Relationships Between School Climate, School Belonging, and School Burnout in Secondary School Students

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Abstract

This study examined the relationships between school climate, school belonging, and school burnout in secondary students. 667 middle school students from the Dörtyol district of Hatay, selected through a stratified sample, participated in the study. School Climate Scale, School Belonging Scale, and School Burnout Scale were used to collect data. Descriptive statistics, regression analysis, path analysis, and Sobel test were used to analyse the data. The study's findings show that secondary school students' perceptions of school climate and belonging are high, and their school burnout levels are medium. Additionally, the research findings show significant relationships between school climate, school belonging, and school burnout. School climate and school belonging are significant predictors of school burnout. School belonging has a mediating effect on the relationship between school climate and school burnout. School climate, which has a significant impact on the school burnout of secondary school students, has this effect directly and indirectly through school belonging.

Keywords: School climate, School belonging, School burnout

Introduction

Burnout is characterised by emotional exhaustion, cynical attitudes, and lack of personal accomplishment (Maslach, Jackson, & Leiter, 1996). To put it more clearly, burnout is an individual's reaction to themself, the job, and the work environment, depending on the feeling of difficulty and inability to fulfil their duties and responsibilities related to their job. Although burnout is seen as a problem experienced by employees regarding the factors in the work and work environment, it has recently emerged as a similar situation in students (Kwak, Ji, Baek, & Baek, 2020; Rajpurohit, Ankola, Hebbal, & Mehta, 2015; Sufia & Latif, 2016). This situation that students experience concerning the school is expressed specifically with the concept of school burnout (Almašiová, Kohútová, & Budniak, 2019; Kiuru, Aunola, Nurmi, Leskinen, & Salmela-Aro, 2008; Onuaoha, 2015; Salmela-Aro, Kiuru, Leskinen, & Nurmi, 2009; Tomaszek & Muchacka-Cymerma, 2019). Since students spend most of their daily lives at school, the school environment and the quality of the environment are important (Bakır-Ayğar & Kaya, 2017). Because, just like the effect of the working conditions on employee burnout (Demerouti, Bakker, Nachreiner, & Schaufeli, 2000), it has been revealed by research that school climate affects student burnout (Cırcır & Sargın, 2018; Durmuş, Aypay & Ayberk, 2017). The school climate seems to be linked to school characteristics that contribute to students' sense of school belonging. The research findings on this subject show that students' perceptions of school climate are positively associated with their school belonging (Bakır-Ayğar & Kaya, 2017; Huang, Xiao, & Huang, 2013). Students also need to feel belonging to the school to establish healthy relationships with their friends and teachers. It is highly probable that students who do not feel belonging to their environment, do not have positive relationships with the individuals at the school, cannot fulfil their duties and responsibilities related to the school, and cannot get the support of others in this regard, will experience burnout. Recent research findings in education also support this relationship (Aksoy, 2017; Xie & Xiao, 2018). Although the effect of school climate and school belonging on school burnout is known, it is not known whether this effect occurs directly or through school belonging, requires a study to reveal the link between school climate and school burnout. In this direction, it was aimed to reveal the mediating effect of school belonging on the relationship between school climate and school burnout by examining the relationships between school climate, school belonging, and school burnout in secondary school students. It is expected that revealing the relationships between school climate, school belonging, and school burnout will shed light on educators about

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what kind of studies should be done in which dimensions of school climate to reduce students' school burnout or strengthen their sense of school belonging.

School Climate

Since some individual factors (e.g., grade level, gender, etc.) cannot or are difficult to change, educational research focuses on school-related variables. Because while the factors that educators cannot easily change are less useful in eliminating the problems, the factors that can be changed in school systems (e.g., curriculum, teacher behaviour) can serve as the basis of reform for solving problems (Byrnes, 2003). In this context, the quality of the school environment can be changed in line with the intervention of educators. In addition to the physical characteristics of the school, the quality of the school environment is also determined by the quality of the relations between the individuals in the school (which is also expressed as the school climate and the learning-teaching process). In addition to the school's physical characteristics, the school environment's quality is also determined by the school climate, which is also expressed as the qualities of the relations between the individuals in the school and the learning-teaching process. School climate includes norms, values, and expectations that support individuals to feel socially, emotionally, and physically safe (The National School Climate Council, 2007). The school's climate can be considered as the all of internal characteristics that affect the behaviour of individuals and distinguish it from other schools (Baykal, 2007). School climate is a product of social interaction between teachers and students and is influenced by educational and social values. It can be stated that the school climate is also related to the social conditions within the school and classrooms as a whole (Koth, Bradshaw, & Leaf, 2008). School climate refers to teachers' collective perceptions of the formal and informal organisational structure, their colleagues, the principal's leadership, and how things are done in the organisation (Kılınç, 2013). For this reason, the school climate has a multidimensional structure and has been studied by researchers from different aspects. School climate has been examined in four dimensions by Cohen, McCabe, Michelli, and Pickeral (2009): (a) safety dimension refers to the physical and socio-emotional security of individuals; (b) teaching and learning dimension refers to teaching quality, socio-emotional and ethical behaviour in learning, professional development, and school leadership; (c) relationships dimension refers to respect for diversity, collaboration with the school community, morale, and connectedness; (d) the environmental-structural dimension refers to the physical condition of the school and curriculum and extracurricular issues. Çalık and Kurt (2010), on the other hand, developed a measurement tool that measures school climate with a structure consisting of three dimensions: Achievement Orientation, supportive teacher behaviours, safe learning environment, and positive peer interaction. Çalık and Kurt (2010) stated that in most of the previous scales, the school climate was determined by taking the opinions of teachers or school administrators, and there was a need for a scale to measure students' perceptions.

The school climate can have positive or negative characteristics, "Positive school climate is associated with well-managed classrooms and common areas, high and clearly stated expectations concerning individual responsibility, feeling safe at school, and teachers and staff that consistently acknowledge all students and fairly address their behaviour" (Osher, Spier, Kendziora, & Cai, 2009, p.1). While a supportive, guiding, and friendly school climate increases teachers' academic optimism (Kılınç, 2013), it is also closely related to student achievement (Uline & Tschannen-Moran, 2008). A positive school climate is necessary for the realisation of effective teaching activities, and it enables students to increase their academic achievement in an environment where they feel valuable (Dulay & Karadağ, 2017). Schools with a positive school climate have fewer behavioural problems, and an increase in academic achievement and school commitment is seen (Garcia, 2020). In a negative school climate, burnout and stress levels increase in all individuals within the system (Grayson & Alvarez, 2008). Previous research shows that as students' perceptions of school climate increase (as positive climate perception increases), students adopt human values more (Akgül, 2013), students' academic achievement in school (Konold, Cornell, Jia, & Malone, 2018; Maxwell, Reynolds, Lee, Subasic & Bromhead, 2017; Yıldırım, 2017), their engagement/attachment to school (Bilgin & Taş, 2018; Konold et al., 2018; Özgenel, Çalışkan- Yılmaz & Baydar, 2018) and belonging (Bakır- Ayğar, & Kaya, 2017) are higher. Whereas, as students' perceptions of school climate decrease (as negative climate perception increases), there are more bullying victimisation (Aldridge, McChesney, & Afari, 2018), students become more alienated from school (Sular, 2017), and level of school burnout are higher (Cırcır & Sargın, 2018).

School Belonging

School belonging is used to express students' feelings about how much they are personally accepted, respected, and supported by others in the social environment of the school (Goodenow, 1993; Goodenow & Grady,1993). "School belonging means students like their schools, like to be together with their teachers and classmates, and are proud to be members of the school" (Huang et al., 2013, p.26). Belonging is represented by the student's feelings that they are members of the school community, are accepted by other community members, are respected

in the community, and see themselves as a part of the school (Voelkl, 1996). In the literature, it is seen that researchers explain school belonging with different concepts. Willms (2003) explains school belonging with the concept of student engagement. School belonging is the psychological component of student engagement and is related to students' feelings of being accepted and valued by their peers and others in their school. Voelkl (1996) explains school belonging as the student sees themself as a part of the school and identify themself with the school. Students who do not identify with the school lack value and belonging to the school. Valuing school is the student's assessment of the importance of the school in general for the achievement and future of the education provided at school. Gray and Hackling (2009) explain school belonging with social connectedness. Students' sense of social connectedness to the learning environment or community of the school consists of the dimensions of support for studies and school belonging. Support for studies refers to students' support from their families, friends, and coordinators to remain at school and complete their schooling. On the other hand, school belonging refers to the participation of students in the school learning community and their enjoyment in participating in the community.

School belonging is important in many aspects of the educational environment. Findings obtained from studies on school belonging show that the sense of belonging is positively related to the student's motivation (Kiefer, Alley, & Ellerbrock, 2015; Walker & Greene, 2009) and academic achievement (Alvarez, 2003; Korpershoek, Canrinus, Fokkens-Bruinsma & de Boer, 2019; Moallem, 2013). In contrast, it is negatively related to depression (Parr, Shochet, Cockshaw, & Kelly, 2020), school absenteeism, and dropout (Korpershoek et al., 2019; O'Connor, 2017). There is also evidence that the student's sense of individual acceptance concerning school belonging also affects the quality of their relationships with others (Osterman, 2000). Students with a higher sense of belonging have better relationships with their teachers and peers, value education more, participates in activities more frequently, have higher self-esteem, and have a higher school attendance rate (Cemalciler, 2020). A student with high school belonging may want to perform well in all areas of the school. A sense of belonging can enhance academic performance and act as a buffer against burnout (Fearon, Barnard-Brak, Robinson & Harris, 2011).

In the literature, it is seen that many measurement tools have been developed under different names such as school belongingness, school engagement, psychological sense of school membership, social connectedness, and identification with the school to measure students' sense of school belonging (Arslan & Duru, 2017; Goodenow, 1993; Gray & Hackling 2009; Gunuc & Kuzu, 2015; Voelkl, 1996). In the present study, the "Psychological Sense of School Membership Scale", developed by Goodenow (1993) and used in many studies (Alkan, 2016; Alvarez, 2003; Farrell, 2008; Pittman & Richmond, 2007; Wagle et al., 2018), was used to measure students' sense of school belonging. The scale is used to determine the acceptance, respect, and support of students at school as a social environment. The scale items intend to reveal students' views on their relationships with their friends and teachers. Scale structures can differ culturally. For example, the Turkish adaptation of the scale by Sarı (2015) displays a two-dimensional structure different from the original scale. Positive items in the scale reflect the sense of school belonging, and the negative items reflect the feeling of rejection.

School Burnout

Since school life is seen as a business activity, it is thought that students can also experience burnout syndrome, and many studies have been conducted on this matter (Aypay & Eryılmaz, 2011a, b; Bibi, Wang, Ghaffari, Khalid, & Iqbal, 2019; Parker & Salmena-Aro, 2011; Salmela-Aro et al., 2009; Salmela-Aro, Kiuru, Pietikäinen, & Jokela, 2008). In these studies, the state of burnout experienced by the student was expressed as "school burnout" and defined by the researchers in various ways. School burnout is expressed as the emotional, cognitive, and physical wear or tiredness of the student due to the excessive demands of the school (Aypay & Eryılmaz 2011a). More broadly, school burnout is that the student feels exhausted due to the demands of the school, develops negative attitudes towards the school, has a cynical and detached attitude towards work, and feels inadequate as a student (Aypay & Eryılmaz, 2011a; Salmela-Aro et al., 2009; Schaufeli, Martinez, Pinto, Salanova, & Bakker, 2002). As can be seen from the definitions, school burnout has a similar structure to that theoretically put by Maslach et al. (1996). It consists of three dimensions: emotional exhaustion, cynicism, and reduced efficacy (Schaufeli et al., 2002).

Although there are many factors in the formation of school burnout, they can be classified as individual and environmental factors. Individual traits are characteristics that, in some cases, underpin burnout, increase or decrease the effect of burnout on the individual (Şener, 2018). Students' gender (Adhiambo, Odwar & Mildred, 2016; Çapulcuoğlu & Gündüz, 2013a; Ogbueghu et al., 2019; Onuoha, 2015), grade level (Demirel, 2018), exam anxiety (Andriyani, Himma, Alizar, Amin, & Mulawarman, 2017; Çapulcuoğlu & Gündüz, 2013b), self-efficacy perception (Charkhabi, Abarghuei & Hayati, 2013), coping with stress (Çapulcuoğlu & Gündüz, 2013b), and academic self-efficacy (Çapulcuoğlu & Gündüz, 2013b) are examples of individual characteristics. School,

family, and social support are the leading environmental factors that affect school burnout (Dündar, 2018; Jacobs & Dodd, 2003; Sarcheshmeh, Asgari, Chehrzad, & Leili, 2019; Yang, 2004). Students are obliged to fulfil many school-related duties and responsibilities. While social support provided to the student in overcoming these duties and responsibilities reduces school burnout, excessive pressure on this issue by the family and parent attitude that is not satisfied with the efforts of their children can improve school burnout (Durmuş et al., 2017; Kim, Jee, Lee, An, & Lee, 2017; Okkassov, 2018). School burnout is expressed in negative situations such as the student's chronic fatigue and stress due to excessive school work, feeling inadequate, and decreasing interest in many things related to school (Aypay, 2011). There is a negative relationship between school burnout and students' subjective well-being (Aypay & Eryılmaz, 2011b; Andriyani et al., 2017), engagement (Schaufeli et al., 2002), self-efficacy perception (Rahmati, 2015), academic motivation (Seçer, 2015a), and academic achievement (Yang, 2004). However, there is a positive relationship between school burnout and students' academic procrastination (Balkıs, 2013) and psychological disorders (Seçer, 2015b). In summary, school burnout is associated with psychological, behavioural, and academic problems.

In the literature, it is seen that burnout scales (Bresó, Salanova, & Schaufeli, 2007; Salmela-Aro et al., 2009; Schaufeli et al., 2002) developed to determine and measure the conceptual structure (emotional exhaustion, depersonalisation, low-personal accomplishment) of the burnout phenomenon concerning students school life are structured similar to the Maslach Burnout Inventory, which measures the theoretical structure proposed by Maslach and Jackson (1981). However, based on the idea that student burnout will differ according to education levels, Aypay (2011, 2012) developed different burnout scales for elementary and secondary school students. The present study used the "Elementary Students School Burnout Scale for Grades 6-8 (ESSBS)". The scale directly aims to reveal the burnout status of elementary school students and has a different structure compared to other scale types. Aypay (2011) conceptualises the burnout of elementary school students within the framework of school burnout and measures it with a structure consisting of four interrelated dimensions: burnout from school activities, burnout from family, loss of interest in school, and inadequacy in school.

The Relationships Between School Climate, School Belonging, and School Burnout

It can be said that students' negative feelings at school are a reflection of school burnout. School burnout is more likely to occur in an environment where there are no supportive teacher and peer relationships. Because school burnout occurs in schools without social support (Kim et al., 2017), in other words, a student's feeling of loneliness at school and lack of adequate support may cause school burnout. According to Cırcır and Sargın (2018), the strong relations between teachers and students, the school administrator's creation of a positive atmosphere, and the student's feeling safe at school reduce school burnout. According to Way, Reddy, and Rhodes (2007), students' emotional problems, especially depression symptoms, are closely related to their perceptions of school culture. As students' perceptions of teacher and peer support, autonomy, self-esteem, openness, and consistency in school rules decrease, the psychological and behavioural adjustment also decrease, and depressive symptoms and problem behaviours increase. According to Salmela-Aro and Upadyaya (2014), students' positive feedback from school increases their self-efficacy perceptions and school engagement. Meylan, Meylan, Rodriguez, Bonvin, & Tardif (2020) found that the negative emotions and burnout of high school students who were motivated by their teachers and supported in the face of academic or personal difficulties decreased.

Schools with supportive relationships, common goals, norms, and high participation increase the likelihood of student bonding to school (Payne, 2008). However, a safe school environment is one factor that will increase students' commitment to school and education (Bakır-Ayğar & Kaya, 2017). "In school settings, when students feel that their peers or classmates like and value them, they will have a higher sense of school belonging" (Huang et al., 2013, p.27). The fact that these school environment characteristics are seen in a positive school climate indicates that the school climate may affect the variables related to school belonging. There are positive relationships between school climate and school belonging (Bakır-Ayğar & Kaya, 2017; Huang et al., 2013), identification with school (Adomnik, 2012; Maxwell et al., 2017), student engagement (Konold et al., 2018), and student attachment (Özgenel et al., 2018). Özgenel et al. (2018) revealed that school climate is a predictor of student attachment. A study by Konold et al. (2018) revealed that a positive school climate leads to an increase in student engagement and academic performance. The study also found that school engagement had a mediating effect on the relationship between the characteristics of the school climate and academic achievement. Similarly, Maxwell et al. (2017) found that school identification had a mediating effect on the relationship between school climate and academic achievement. In summary, it can be said that school climate affects school belonging or other school-related variables through school belonging.

Establishing a relationship, bonding with other individuals, and wanting to continue this are basic needs that make people feel like they belong to their environment (Bowlby, 1980; cited in Şahan & Duy, 2017). Maslow (1962; as

cited in Jethwani-Keyser, 2008, p.19) asserted that belonging, love, and friendship are basic human needs that come soon after basic sustenance like food, water, and shelter. In this context, it can be said that school belonging meets one of the students' most basic needs. Although attachments to parents and positive relationships with friends are important in individuals' adjustment, those who do not have a sense of connection to a larger group or community will likely experience increased stress and emotional distress (Baumeister & Leary, 1995; cited in Pittman & Richmond, 2007). Burnout is associated with stress (Koçak & Seçer, 2017). Lack of close ties in students' school life, the stress they have in their private or school life, and their inability to cope with this stress can turn into burnout. Recent research results on the relationship between belonging and burnout in education also confirm this (Aksoy, 2017; Xie & Xiao, 2018). In the study conducted by Xie and Xiao (2018), a negative relationship was found between the school belonging and learning burnout levels of university students. Similarly, in a study conducted by Aksoy (2017), it was determined that high school students with high achievement scores had the lowest level of school burnout if their school belonging was high. Based on the results of these studies, it can be said that as the school belonging perceptions of the students increase, their school burnout levels decrease.

Rationale and Aim of the Study

Studies in the literature show that school climate and school belonging are environmental factors that affect school burnout and are closely related. The similar effects of school climate and school belonging on school burnout and the fact that these two variables are also related to each other raise the question of how these two variables together can affect school burnout. There is no study examining three variables together and revealing the relationship between three variables in the literature. The present study claims to reveal the possible predictors of school burnout in the context of school climate and school belonging variables. It is expected that revealing the variables affecting school burnout and the relationships between these variables will provide a significant contribution to the literature considering the behavioural, psychological, and academic effects of school burnout on the private and school life of the student. It can inform education administrators about what kind of school environment should be to reveal the relationships between school climate, school belonging, and school burnout, reduce students' school burnout, strengthen their sense of school belonging, and create a positive school climate. Depending on the study results, the findings to be obtained about the dimensions and level of burnout of the students may be useful in determining the source of burnout. Determining the source of burnout will enable more accurate studies to be carried out on this subject. The study results could benefit education administrators and policymakers in planning and conducting psychological counselling and guidance services to prevent school burnout. Therefore, this study aimed to reveal the mediating effect of school belonging on the relationship between school climate and school burnout by examining the relationships between school climate, school belonging, and school burnout in secondary school students. In line with these purposes, the problem sentence of the study was formed as follows: How and in what direction are there relationships between school climate, school belonging, and school burnout in secondary school students? Within the framework of the general purpose of the study, firstly, the answer to the following research question was sought, and then the listed hypotheses were tested:

RQ: What are the descriptive statistics of the variables of school climate, school belonging, and school burnout, and what is the level of correlation between the variables?
H1: School climate directly affects school burnout.
H2: School belonging directly affects school burnout.
H3: School climate directly affects school belonging.
H4: School belonging has a mediating effect on the relationship between school climate and school burnout.

Method

Research Model

The correlational research model was used in this study, which was conducted to reveal the relationships between school climate, school belonging, and school burnout. "Correlational research is conducted to determine the relationships between two or more variables" (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2010, p.14). In the model of the research, there are three variables, one of which is dependent (school burnout), one of which is independent (school climate), and one of which is the mediator variable (school belonging).
The estimated model of the study is shown in Figure 1 below.

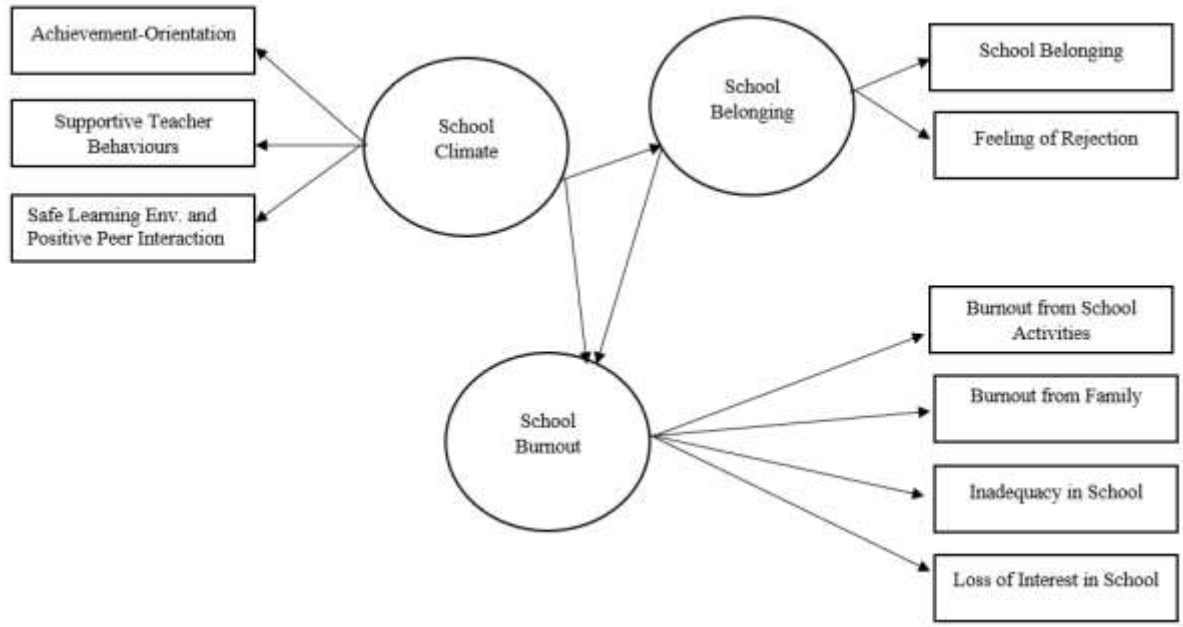

Figure 1. Estimated Model Expected in the Study

Data Collection Tools

The measurement tool, which has a structure of four parts, was used in the study. The first part of the measurement tool consists of demographic information (gender, grade level), the second part is the "School Climate Scale", the third part is the "School Belonging Scale", and the fourth part is the "School Burnout Scale". Within the scope of the research, the construct validity of the scales was determined through the confirmatory factor analysis (CFA), and their reliability was determined using the internal consistency coefficient. Information about the structure, validity, and reliability of the scales is presented below.

School Climate Scale: The "School Climate Scale" developed by Çalık and Kurt (2010) in a 5-point Likert type (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always) consists of 22 items. The scale has three sub-dimensions: achievement-orientation, supportive teacher behaviours, safe learning environment and positive peer interaction. The internal consistency coefficients (Cronbach's alpha) of the sub-dimensions of the scale were .77 for the achievement-orientation sub-dimension (4 items), .79 for the supportive teacher behaviours sub-dimension (8 items), .85 for the safe learning environment and positive peer interaction sub-dimension (10 items), and .81 for the overall scale. The total item correlations for each sub-dimension were between .33 and .67. The three-factor structure of the scale was tested by confirmatory factor analysis (CFA). As a result of CFA, fit indices were found to be χ^2 = 703.51, *df* = 203, $p < .001$, χ^2/df = 3.47, *RMSEA* = .07, *CFI* = .94, *GFI* = .88, and *AGFI* = .85.

CFA showed that the fit indices of the School Belonging Scale were χ^2 = 729.09, *df* = 206, $p < .05$, χ^2/df = 3.54, *RMSEA* = .06, *SRMR* = .07, *CFI* = .93, *NFI* = .96, *AGFI* = .89, *GFI* = .91 and *IFI* =.93. The internal consistency coefficients (Cronbach's alpha) for the sub-dimensions of achievement-orientation, supportive teacher behaviours, safe learning environment and positive peer interaction, and the overall scale of the school climate scale were calculated as .63, .79, .72, and .83, respectively.

School Belonging Scale: The "School Belonging Scale (The Psychological Sense of School Membership Scale)", developed by Goodenow (1993) in a 5-point Likert type (1 = Not at all true, 2 = Not true, 3 = Undecided, 4 = True, 5 = Completely true) and adapted to Turkish by Sarı (2015), consists of 18 items. The scale has sub-dimensions of school belonging and feeling of rejection. In the adaptation study of the scale, it was determined that it displayed a structure consisting of two dimensions, which explained 38.49% of the total variance. There are 13 positive items in the school belonging and five negative items in the feeling of rejection. Cronbach's alpha reliability coefficients of the subscales are .84 and .78, respectively. When the negative items were reversed and scored, the internal consistency coefficient of the total scale scores was found to be .84.

CFA showed that the fit indices of the School Belonging Scale were χ^2 = 413.02, *df* = 134, $p < .05$, χ^2/df = 3.08, *RMSEA* = .05, *SRMR* = .05, *CFI* = .97, *NFI* = .95 *AGFI* = .92, *GFI* = .92, and *IFI* =.97. The internal consistency

coefficients for the sub-dimensions of school belonging and feeling of rejection, and the overall scale was calculated as .65,.82, and .74, respectively.

School Burnout Scale: The "School Burnout Scale" developed by Aypay (2011) in a 4-point Likert type (1 = I strongly disagree, 2 = I disagree, 3 = I agree, 4 = I strongly agree) consists of 26 items. The scale has four sub-dimensions: burnout from school activities, burnout from family, inadequacy in school, and loss of interest in school. These four dimensions explain 59% of the total variance. Internal consistency coefficients of the sub-dimensions of the scale were .92 for burnout from school activities (12 items), .83 for burnout from family (5 items), .76 for inadequacy in school (4 items), and .81 for loss of interest in school (5 items). Total item factor load values for each dimension were between .41 and .81. The three-factor structure of the scale was tested through CFA. As a result of CFA, fit indices were found to be $\chi^2 = 787.6$, $df = 293$, $p < .01$, χ^2/df, = 2.06, *RMSEA* = .07, *CFI* = .91, *GFI* = .94, and *AGFI* = .91

CFA showed that the fit indices of the School Burnout Scale were $\chi^2 = 930.14$, $df = 295$, $p < .05$, $\chi^2/df = 3.15$, *RMSEA* =.05, *SRMR* =.05, *CFI* = .97, *NFI* = .96, *AGFI* = .88, *GFI* = .90, and *IFI* = .97. The internal consistency coefficients for the sub-dimensions of burnout from school activities, burnout from family, inadequacy in school, and loss of interest in school and the overall scale were calculated as 88, .74, .76, .76, and .91, respectively.

In evaluating the fit indices, the criteria given in Table 1 below were taken into consideration. According to these criteria, the construct validity of all scales used in the study is confirmed. However, when the Cronbach's alpha values obtained regarding the reliability of the scales are examined, it is seen that the sub-dimensions of achievement-orientation (.63) and school belonging (.65) have a value lower than .70. "Although it varies according to the measurement purpose, the recommended minimum value is .70 Cronbach's alpha. Cronbach's alpha value depends on the items in the scale. If the number of items in the scale is less than 10, Cronbach's alpha coefficient may be low" (Şeker & Gençdoğan, 2020, p.47). In cases where the number of questions is low, the cut-off value for the scale's reliability can be accepted as .60 and above (Durmuş, Yurtkoru, & Çinko, 2011). Since the number of items in the achievement-oriented and school belonging sub-dimensions was less than 10, the Cronbach's alpha limit value was accepted as .60, and the scales were decided to be reliable.

Table 1. Good and Acceptable Fit Indices

Good Fit Indices	Acceptable Fit Indices
$0 \leq \chi 2/df \leq 2$	$2 < \chi 2/df \leq 5$
$0 \leq SRMR \leq .05$	$.05 < SRMR \leq .10$
$.97 \leq CFI \leq 1.00$	$.95 \leq CFI < .97$
$.95 \leq NFI \leq 1.00$	$.90 \leq NFI < .95$
$.95 \leq GFI \leq 1.00$	$.90 \leq GFI < .95$
$.95 \leq IFI \leq 1.00$	$.90 \leq IFI < .95$

Source: Çokluk, Şekercioğlu, & Büyüköztürk (2012); Meydan & Şeşen (2011); Schermelleh-Engel, Moosbrugger, & Hans (2003).

Population and Sample

The study population consists of 9777 students studying in 19 public secondary schools in the Dörtyol district of Hatay in the 2020-2021 academic year. The stratified sampling method was used to determine the research sample. Gender and grade levels were used as a stratum in the sample of the study. The sample calculation formula given by Büyüköztürk et al. (2010) was used to determine how many schools and students from the population will be included in the sample. It was assumed that 370 students from 19 public secondary schools would represent the Dörtyol population at a significance level of .05.

Considering the problems that may be encountered during the data collection process, it was planned to apply the measurement tool to 1000 students who were selected to represent the stratified sample. It was predicted that if approximately 50 to 60 students from each school in the research population respond to the measurement tool, data belonging to 1000 students will be obtained. In this direction, this information was given primarily to school administrators. Later, school administrators were asked to identify a class representing each grade level and inform the classroom counsellors of the determined classes about the research. The determined classroom counsellors were contacted before the application. Since the representation ratios of the strata in the population should be considered, the classroom counsellors were asked to identify an equal number of female and male students (at least 7) and contact the parents of these students. The classroom counsellors also shared the measurement tool in parent communication groups (e.g. WhatsApp, e-mail, etc.). As a result of the data collection process, the students'

feedback on 738 measurement tools was provided. However, after data analysis, 667 middle school students were included in the study. Demographic information about the participants in the population of the research is given in Table 2 below.

Table 2. Demographic Information Regarding the Population and Sample of the Study

Variable			*N*	*%*	*n*	*%*
Gender	Female		4881	49.92	330	49.48
	Male		4896	50.08	337	50.52
		Total	9777	100	667	100
Class	5th grade		2414	24.69	164	24.59
	6th grade		2193	22.43	152	22.79
	7th grade		2264	23.16	155	23.24
	8th grade		2906	29.72	196	29.39
		Total	9777	100	667	100

Source: Antakya Directorate of National Education R & D Unit

When Table 2 above is examined, it can be said that the characteristics and number of the participants in the sample are representative of the population.

Ethical Procedures

The following process was followed to obtain the necessary permissions before applying the measurement tool for data collection. First, the researchers who developed the scales in the measurement tool were reached by e-mail, and permission was obtained from the researchers to use the scales. Secondly, legal permission was obtained from the Hatay Provincial Directorate of National Education, to which the schools to be implemented are affiliated. Thirdly, in line with the Higher Education Institutions Scientific Research and Publication Ethics Directive, the ethics committee approval certificate dated 07.08.2020 and numbered 8/12 was obtained from Hatay Mustafa Kemal University Social and Human Sciences Scientific Research and Publication Ethics Committee. Finally, since the participants are under 18, permission was obtained from their legal representatives to apply the measurement tool.

Data Analysis

IBM SPSS Statistics 22 and LISREL 8.7 programs were used in the preparation and analysis of the data. Descriptive statistics (arithmetic mean and standard deviation) were used to determine the participants' perceptions of variables. Pearson's correlation coefficient was used to determine the relationships between variables, and regression, path analysis, and Sobel test were used to examine the predictive relationships.

Within the scope of the research, before the data were analysed, noisy data were checked and corrected. First, erroneous data in the data set was checked, and the data entered incorrectly were corrected. Second, missing data (forms of participants who did not fill in one or more of the research scales) were identified, and 48 forms with missing data were removed from the data set. Missing values (forms of participants who did not fill in one or more of the items of the research scales) are assigned according to mean values. Third, the control of the outlier data was performed according to the univariate outlier (Z scores) and multivariate outlier (Mahalonabis distance) analysis. The extreme values were controlled based on the +3 to -3 range of the Z scores and the .001 value cut-off at the Mahalanobis distance. As a result of the control, it was determined that the data of 23 participants were outliers. The forms of these participants were discarded from the data set. Finally, univariate normality (kurtosis and skewness coefficients) and multivariate normality (relative multivariate kurtosis coefficient) analysis of the remaining 667 data were performed. In the study, the values obtained by dividing the skewness and kurtosis coefficients by their standard errors are within the limits of -1.96 and +1.96 accepted for normal distribution (Can, 2013) and the relative multivariate kurtosis value (1.095) < 2 (Kline, 1998 as cited in Aşkar & Mazman, 2013) indicate that distribution is normal.

Correlation coefficients, tolerance values (TV), and variance increase factors (VIF) for independent variables were calculated to determine the multicollinearity problem between research variables. Binary correlations between variables greater than .90 signify the multiple connection problem (Çokluk et al., 2012). If the tolerance value is above .10 and the VIF value is less than or equal to 10, it indicates that there is a multiple linear connection problem (Pallant, 2020). As a result of the analysis, it was seen that the correlation values between the sub-dimensions of the research variables were less than .90 (See Table 4 below). The collinearity diagnostics statistics

(TV and VIF values) obtained from the multiple regression analysis are given in Table 3 below. As the tolerance values were greater than .10 and VIF values were less than 10, it was concluded that there was no multicollinearity problem between variables.

Table 3. The Collinearity Diagnostics Statistics

Dependent Variable	Independent Variable: School Climate	TV	VIF
School Climate	Achievement-Orientation	.620	1.614
School Burnout	Supportive Teacher Behaviours	.611	1.636
	Safe Learning Environment, and Positive Peer Interaction	.854	1.172
	Independent Variable: School Belonging		
School Burnout	(Feeling of) School Belonging	.754	1.327
	Feeling of Rejection	.754	1.327

Findings

Descriptive Statistics and Correlations Among Variables

The arithmetic means and standard deviation values were calculated to determine the school climate perceptions, belonging, and burnout levels of secondary school students. Pearson's correlation coefficient analysis was conducted to determine the correlations between sub-dimensions of school climate, school belonging, and school burnout. Findings are given in Table 4 below(see page 68).

As Table 4 shows, it is observed that secondary school students responded to the items related to school climate ($\bar{x}$ = 3.45; *SD* = .59), school belonging ($\bar{x}$ = 3.65; *SD* = .67), and school burnout ($\bar{x}$ = 2.84; *SD* = .59) at the level of I agree. When these findings are analysed based on the assessment range of arithmetic means according to the Likert type (Kaplanoğlu, 2014), it can be said that secondary school students' perceptions of school climate and school belonging are at a high level. In contrast, their levels of school burnout are moderate. According to the perceptions of secondary school students, there is an achievement-oriented climate ($\bar{x}$ = 3.75) at schools, students' school belonging ($\bar{x}$ = 3.62) are higher than their feelings of rejection ($\bar{x}$ = 2.32), and they mostly experience burnout from family matters ($\bar{x}$ = 2.37). There is a moderate, positive, and significant relationship between school climate and school belonging (r = .59; p <.01). There is a moderate, negative, and significant relationship between school belonging and school burnout (r = -. 54; p <.01). Similarly, there is a moderate, negative, and significant relationship between school climate and school burnout (r = -.53; p <.01).

Direct and Indirect Effects between Variables

Simple regression analysis was conducted to determine the effects of the study's independent variables on the dependent variables, in other words, to determine whether the independent variables are a significant predictor of the dependent variables. On the other hand, it was examined by path analysis and Sobel test whether school belonging had a mediating effect on the relationship between school climate and school burnout. Findings are given in Table 5 below.

Table 5. Regression Analysis, Path Analysis, and Sobel Test Results

Effects	Independent Variable	Structural Path	Dependent Variables	β	*t*	*p*
Direct	School Climate	⟶	School Burnout	-.67	-19.76	.000
	School Climate	⟶	School Belonging	.88	25.04	.000
	School Belonging	⟶	School Burnout	-.33	-18.34	.000
Indirect	School Climate	⟶	School Burnout	-.41	-3.56	.000

In a relationship where School Belonging is the mediator	Total Effect	Direct Effect	Indirect Effect	Bootstrap Confidence Interval	Mediating Effect
School Climate ⟶ School Burnout	-.5293	-.3246	-.2047	-.2606 and - .1381	Partial

VAF = % 36.64

Table 4. Descriptive Statistics and the Correlation Coefficients (n = 667)

	Variable	$\bar{x}$	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1	AO	3.75	.76												
2	STB	3.31	.80	.60**											
3	SLEPPI	3.35	.71	.33**	.35**										
4	SB	3.62	.69	.48**	.60**	.46**									
5	FR	2.32	.87	-.24**	-.25**	-47**	-50**								
6	BSA	2.24	.69	-.38**	-.40**	-.32**	-41**	.32**							
7	BFF	2.37	.79	-.22**	-.28**	-.33**	-34**	.30**	.49**						
8	IIS	2.35	.82	-.24**	-.30**	-.32**	-38**	.34**	.51**	.50**					
9	LIS	2.18	.75	-.37**	-.38**	-.41**	-46**	.40**	.61**	.38**	.45**				
10	OSC	3.45	.59	.83**	.84**	.69**	.65**	-.40**	-.47**	-.35**	-.36**	.-.49**			
11	OSB	3.65	.67	.40**	.46**	.54**	.83**	-.89**	-.42**	-.36**	-.42**	-.49**	.59**		
12	OSBO	2.84	.59	-.38**	-.43**	-.44**	-.50**	.43**	.82**	.76**	.79**	.77**	-.53**	-.54**	

*p < .05; **p < .001

Note. AO: Achievement-Orientation, STB: Supportive Teacher Behaviours, SLEPPI: Safe Learning Environment, and Positive Peer Interaction, SB: (Feeling of) School Belonging, FR: Feeling of Rejection, BSA: Burnout from School Activities, BFF: Burnout from Family, IIS: Inadequacy in School, LIS: Loss of Interest in School, OSC: Overall School Climate, OSB: Overall School Belonging, OSBO: Overall School Burnout

According to the regression analysis results in Table 5, school climate is a significant predictor of school burnout (t = -19.76; p < .001) and school belonging (t = 25.04; p < .001). School belonging is also a significant predictor of school burnout (t = -18.34; p < .001). Based on the regression analysis results in Table 5, it can be said that the H1, H2, and H3 hypotheses of the study were confirmed.

According to the direct effect model in Table 5, while the standardised regression coefficient value between school climate and school burnout is β = -.67, this coefficient value is β = .-41 in the indirect effect model in which the mediating effect of school belonging is tested. The regression coefficient between the two variables in the direct effect model is lower when the mediating variable is included in the model is interpreted as the relationship between the dependent and independent variables occurs when the variable is partially mediated (Holmbeck, 1997; as cited in Arastaman & Özdemir, 2019).

According to the results of the Sobel test in Table 5, the Bootstrap confidence interval does not contain a zero value. Secondary school students' perceptions of school climate have an indirect (-.2047) and a direct effect (-.3246) on their perceptions of school burnout. The fact that the VAF value is between 20% and 80% indicates partial mediation (Hair, Hult, Ringle, & Sarstedt, 2017, as cited in Ramayah Cheah, Chuah, Ting, & Memon, 2018). In other words, school belonging acts as a partial mediator variable in the relationship between school climate and school burnout. Based on the path analysis and the Sobel test results in Table 5, it can be said that the H4 hypothesis of the research is confirmed.

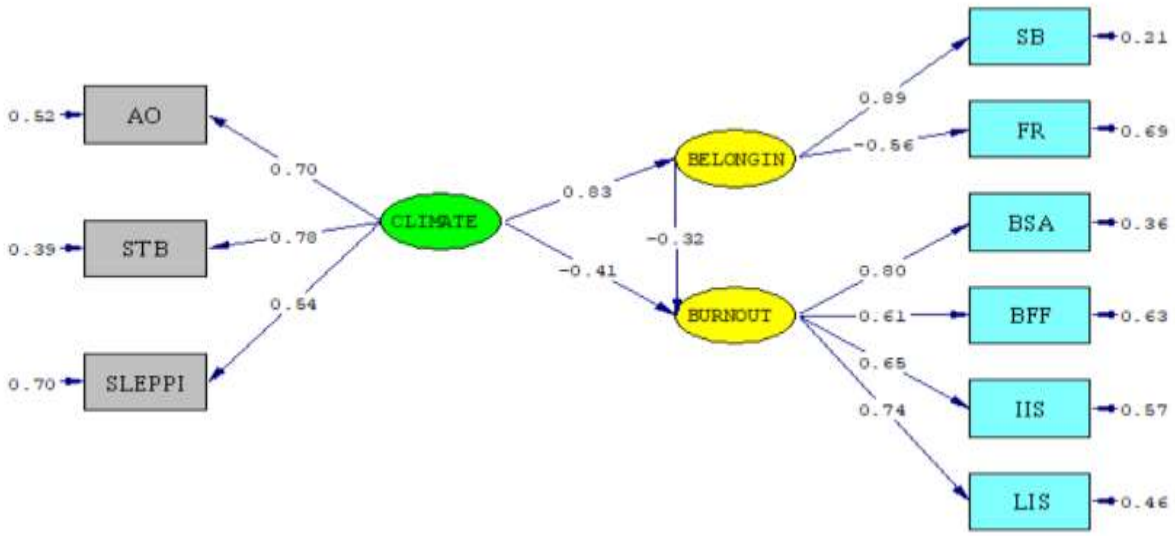

Figure 2. Path Analysis Results

As shown in Figure 2, the effect of school climate on school burnout occurs both directly and indirectly through school belonging. The goodness of fit values calculated for the indirect effect model are as follows: $\chi 2$ = 224.67, df = 24, $\chi 2/df$ = 9.36, p < .05, $SRMR$ = .07, GFI = .92, IFI = .95, CFI = .95, NFI = .94. It is seen from the fit indices that only the χ2 / df ratio exceeds the critical value. "In confirmatory factor analysis, the sample size is sensitive to 200" (Şekercioğlu, 2009, p.172). Floyd and Widaman (1995, as cited in Çokluk et al., 2012) state that it would be more useful to analyse the sample by dividing it into subsections rather than testing the model in large samples, and at the same time, it is important to repeat the analysis and obtain additional evidence. Accordingly, the model was retested on 383 randomly selected data, representing the population at .05 significance level, and the fit indexes of the model were obtained as follows: $\chi 2$ = 88.65, df = 24, $\chi 2/df$ = 3.69, p < .05, $SRMR$ = .05, GFI = .95, IFI = .97, CFI = .97, NFI =. 96. When these indices are evaluated according to the criteria of fit indices and cut-off points for acceptance (see Table 1), it is seen that the model shows an acceptable fit.

Discussion, Conclusion, and Suggestions

In the study, descriptive statistics of the variables of school belonging and school burnout and the level of correlation between the variables were examined first. The descriptive statistics show that the perceptions of the participants regarding the school climate are high. Findings of the study regarding school climate show similarities with the findings of Akkanat (2019), Booren, Handy, and Power (2011), Özgenel et al. (2018), Terzi and Uyangör (2017), and Yavrutürk (2019), while they differ with the findings of Adomnik (2012), Akgül (2013), Gündoğan and Koçak (2017), Şenel and Buluç (2016), and Uzun (2018). In the studies conducted by Akgül (2013),

Gündoğan and Koçak (2017), Şenel and Buluç (2016), and Uzun (2018), students' perceptions of school climate were found to be at a moderate level. This difference in the findings may have resulted from the size of the schools included in the research sample. The results of studies on school climate reveal that students' perception of school climate differs according to school size (Bahçetepe, 2013; Cotton, 1996). Relationships between individuals in small schools are more positive (Bates, 1993; Cotton, 1996; Fowler & Walberg, 1991; Gregory & Smith, 1983). As a result of a study conducted by Bahçetepe (2013), it was revealed that the perceptions of students in large schools regarding supportive teacher behaviours, safe learning environment, and positive peer interaction dimensions of the school climate are lower than the perceptions of students in both small and medium-sized schools. Considering that this study was carried out in public secondary schools in a district, it can be said that it has participants who study in relatively smaller schools compared to studies conducted in provincial centres. For this reason, students' perception of school climate may have been high in the study. In addition, the high level of school climate observed in the study shows that the school has a supportive environment, students feel valued, develop positive relationships, and focus on academic achievement.

In the study, it was found that the perceptions of the participants about school belonging were high. The findings of the study regarding school belonging are similar to those of Altınsoy and Karakaya-Özer, (2018), Gencer (2019), Jethwani-Keyser (2008), Lee (2011), O'Farrell (2004), Özkök and Sarı (2016), and Özkan (2015), while they differ with the findings of Arıkan (2019), Goodenow and Grady (1993), Kılıçoğlu (2014), and Yıldız (2019). In the studies conducted by Arıkan (2019), Goodenow and Grady (1993), Kılıçoğlu (2014), and Yıldız (2019), it was found that students' perceptions of school belonging were moderate. The difference in the findings may have resulted from the structure of the schools included in the research sample. In this study, the school belonging level of secondary school students was determined. This difference in the findings may be the positive attitudes of students studying at schools in the sample group in the study and their trust in their friends and teachers. According to the research results (Birch & Ladd, 1997; Demanet & Van Houtte, 2012; Roeser, Midgley, & Urdan, 1996), the relationship between teacher and student affects students' sense of belonging to the school. According to Birch and Ladd (1997), teachers' closeness with students affects students' academic performance and attitudes towards school. According to Demanet and Van Houtte (2012), students' high sense of belonging ensures lower negative behaviours. In addition, it is seen as an indicator of students' belonging to the school, peer relations, and respect among students (Faircloth & Hamm, 2005; Osterman, 2000). Thus, the high level of school belonging of the students in the study may indicate that the students have a high level of trust in teachers and that students establish positive relationships with each other.

In the study, it was revealed that participants' perceptions of school burnout were moderate. The findings of the study regarding school burnout are similar to the findings of Acar and Çakır (2015), Bikar, Marziyeh, and Pourghaz (2018), while they differ from the findings of Demirel (2018) and Polat (2018). In the studies conducted by Demirel (2018) and Polat (2018), students' perceptions of school burnout were found below. These studies, like the present study, were carried out on samples of secondary school students. In this context, it is useful to look at different variables from the school type to determine the reason for the difference between the research findings. The results of studies on school burnout show that the level of student burnout is also associated with exam anxiety (Demir, 2015; Dündar, 2018), stress (Akpınar, 2016; Çam, Deniz, & Kurnaz, 2014), perfectionism (Aboalshamat et al., 2017; Çam et al., 2014), subjective well-being (Akpınar, 2016; Aypay & Eryılmaz, 2011b), self-esteem (Gündüz, 2016; Kapkıran, Yaşar, & Kapkıran, 2016), humour styles (Şener, 2018), psychological resilience (Güneş, 2016), psychological disorder (Seçer, 2015b), self-regulation (Kapkıran et al., 2016), and problem-solving skills (Güneş, 2016). Besides, student burnout is also associated with parental attitude (Dündar, 2018; Gündüz, 2016) and social support perception (Çam et al., 2014; Okkassov, 2018). In this context, the difference in the findings may be due to the student's personal characteristics, parental attitude, or social support perception. The difference in the findings may also be due to the different characteristics of the participants. The results of studies on school burnout reveal that students' perceptions differ according to gender, school type, and grade level (Çapulcuoğlu & Gündüz, 2013a; Seçer & Gençdoğan, 2012; Sunay, 2018). Considering that students have different individual characteristics and study at different school types or grade levels, this difference in research results can be considered natural. Considering that each student has different individual characteristics, socio-economic structure, family income, etc., this difference in research results can be accepted as natural. High school burnout affects students' achievements and academic goals (Madigan & Curran 2020; Salmela-Aro, Savolainen, & Holopainen, 2009). Students' effectiveness and social participation in academic activities at school help reduce school burnout and increase school engagement (Salmela-Aro & Upadyaya, 2020). Çam et al. (2014), the appreciation of students' achievements, giving feedback, and being supported by their teachers prevent them from experiencing burnout. Therefore, in this study, it can be stated that students' commitment to school and academic achievement, their efforts to reach academic goals, being appreciated and supported by their teachers are not sufficient.

Secondly, the study examined the relationships between school climate, school belonging, and school burnout according to secondary school students' opinions. The research findings show that there is a positive, moderate and significant relationship between school climate and school belonging. And there is a negative, moderate, and significant relationship between school belonging and school burnout; and a negative, moderate, and significant relationship between school climate and school burnout. The finding regarding the significant relationship between school climate and school burnout is similar to the results of studies of Cırcır and Sargın (2018) and Durmuş et al. (2017). "The quality of students' relationships with teachers and peers is a fundamental sub-strate for the development of academic engagement and achievement" (Furrer, Skinner, & Pitzer, 2014, p.101). In a study by Williams (1987), it was found that students who dropped out of school lacked a peer support network; on the other hand, it was revealed that graduating students had both peer affiliation and were supported by the social acceptance system. Accordingly, it can be said that the social support provided to the student and the positive relationships between individuals bring academic achievement together. It is known that academic achievement is negatively related to school burnout (Atik, Özer, & Karadağ, 2018; Balkıs, Duru, Buluş & Duru, 2011; May, Bauer & Fincham, 2015). According to Salmela-Aro, Kiuru, Pietikäinen, and Jokela (2008), supportive behaviours towards students at school lead to a decrease in negative school climate and school burnout. Therefore, it can be stated that the support provided by the school and the teachers will reduce the burnout syndrome of the students. Burnout syndrome may not be experienced in a positive learning environment where students focus on academic success, are supported by their teachers, and interact with their peers based on mutual respect.

The findings regarding a significant relationship between school climate and belonging show similarities with the results of studies of Adomnik (2012), Bakır-Ayğar and Kaya (2017), and Huang et al. (2013). School belonging also includes respect for school, the safety of students, teacher support, and positive peer relationships that are the qualities that a positive school climate should have. Negative attitudes towards these elements, a negative school climate harms the student's sense of school belonging. School climate and school belonging can mutually affect each other (Huang et al., 2013). As students' sense of belonging to the school increases, their positive interaction with peers and their trust in school also increases (Özdemir, Sezgin, Şirin, Karip, & Erkan, 2010). According to Cemalcilar (2010), students with a high sense of belonging to the school have intrinsic motivation rather than extrinsic motivation, exhibit more successful, more autonomous, and social behaviours in the classroom, and feel less lonely and anxiety. The fact that students develop positive feelings towards the school climate as a result of their relationships with their teachers and the school's administrative staff plays an important role in their belonging to the school (Kılıçoğlu, 2014). According to Ma (2003), a school climate that makes students feel properly cared for, safe, and treated fairly helps develop a positive sense of belonging. Therefore, in a positive school climate where students feel safe, valued by teachers and administrators, and interact positively with their peers, students are more likely to be connected to the school.

The findings regarding the significant relationship between school belonging and school burnout show similarities with the results of Aksoy (2017) and Xie and Xiao (2018). On the other hand, in the study conducted by Doğan (2016), a positive and significant relationship was found between theology students' belonging and burnout levels. The difference between the research results may be due to the characteristics of the sample. The limited number of studies examining the relationship between school belonging and school burnout in the literature (Aksoy, 2017; Doğan, 2016; Xie & Xiao, 2018) makes it difficult to determine the reason for this difference. It is seen that lack of school belonging is associated with other negative outcomes besides burnout. Students' lack of sense of belonging to school causes some negative consequences such as low academic achievement (Arslan, 2016; Ma, 2003), depression (Booker, 2006), feeling of loneliness (Osterman, 2000), dropping out of school (Kılıçoğlu, 2014), and low self-esteem (Ma, 2003). In addition, students' low perception of school belonging can lead to negative social events such as school violence (Ma, 2003). According to Virtanen, Lerkkanen, Poikkeus, and Kuorelahti (2016), as students' engagement in school increases, their level of burnout decreases. It is necessary to provide an environment that attracts their attention to increase students' attachment to the school; thus, burnout can be reduced (Altuntaş & Sezer, 2017). Therefore, students' social and emotional support at school and their commitment to the school, having a good academic performance, and motivation for achievement can make them more resistant to difficulties and cause a decrease in the sense of burnout.

Thirdly, the study examined whether the independent variables affected the dependent variables, in other words, whether the independent variables were a significant predictor of the dependent variables. Research findings reveal that independent variables are significant predictors of dependent variables. In other words, the school climate is a significant predictor of both school belonging and school burnout; school belonging is also a significant predictor of school burnout. The finding that school climate is a predictor of school burnout is similar to the results of studies of Cırcır and Sargın (2018) and Durmuş et al. (2017). The finding that school climate is a predictor of school belonging is similar to the results of studies of Bakır-Ayğar and Kaya (2017), Günalan (2018),

and Huang et al. (2013). According to Günalan (2018), the dimensions of the school climate, which are expressed as supportive teacher behaviours and safe learning environments, significantly predict the sense of school belonging. According to Bakır-Ayğar and Kaya (2017), the sense of school belonging predicts dimensions of school climate expressed as supportive teacher behaviours, achievement-orientation, safe learning environment and positive peer interaction. In the studies revealing the relationship between school belonging and school burnout (Aksoy, 2017; Doğan, 2016; Xie & Xiao, 2018), the findings could not be compared because there was no or limited finding related to the predictive relationship. On the other hand, confirming the hypotheses of the predictive relationships between dependent and independent variables is consistent with the findings in the literature.

Finally, the study examined whether school belonging had a mediating effect on the relationship between school climate and school burnout. The study's findings show that school belonging partially mediates the relationship between school climate and school burnout. In other words, students' perceptions of school climate have an indirect and direct effect on school burnout levels, and school climate exerts its indirect effect through partial mediation of school belonging. In this context, it can be stated that in an achievement-oriented school environment where teachers behave in a supportive manner, where there are safe learning and positive peer interaction, students will feel like they belong to the school. As a result, their burnout will decrease. In the study conducted by Bakır-Ayğar and Kaya (2017), it was determined that the school climate has a mediating role in the relationship between the sense of school belonging and school-based loneliness. Considering that the lack of a study in the literature revealing the mediation effect between these variables is one of the reasons for conducting the study, this study's findings could not be compared with the previous study findings.

This study has some limitations in some respects. In the study, gender and grade level were considered as strata. However, the lack of information about gender distribution by grade level in the research population did not make it possible to provide this distribution in the sampling. The lack of results or limited findings on predictive relationships in studies that revealed the relationship between school belonging and school burnout caused the research results not to be compared. Similarly, the absence of a study demonstrating the mediation effect between variables caused the research results not to be compared. During the epidemic period, the collection of research data may have affected students' perceptions of school climate, school belonging, and school burnout. 5th-grade students who received more online education during the epidemic may have limited their perception of school climate and school belonging. Conducting online education with a different structure and functioning than normal education may have impacted the burnout experienced by students. Not knowing the effect of these factors on research results can be considered a limitation. Despite these limitations, the results of the research make important contributions to the literature. This study determined that the relationship between school climate and school burnout is directly and indirectly through school belonging. This result gives important clues about which variables can be used to prevent and reduce school burnout. According to the results of the study, students mostly experience burnout due to the family. Students' perceptions of school climate are at the lowest supportive teacher behaviour dimension. In this direction, positive relationships should be established between families, students, and teachers to prevent school burnout. For this, the school administration and guidance service can increase the school belonging of the students, realising positive peer interaction with their peers, and improving the quality of social support in the teacher-student relationship.

Considering that the level of school burnout of the students participating in the study is at a moderate level, it can be said that the increase in the sense of burnout in the students towards the school will lead to some mental problems such as depression and loneliness and a decrease in academic achievement. Families should act in a supportive way and cooperate with the school to make the student's school life enjoyable and easier in the face of such problems. School administrators need to do some planning to develop a learning-oriented school culture and a positive school climate. In particular, students with low academic achievement and a sense of burnout should be encouraged to participate in activities such as music and art outside of their curriculum. In this way, students increase positive feelings towards the school, and social interaction between students is provided. Teachers' should act with an understanding of classroom management that improves intrinsic motivation to prevent the feeling of burnout in students. They should behave in supporting and improving their social and emotional skills. Especially by ensuring early detection of students at risk of burnout at school, programs can be prepared by the guidance services for these students.

Since this study was conducted quantitatively, limited information was obtained on the relationships between variables. However, future studies in qualitative design may provide more detailed information on the relationships between variables. Conducting new studies that will reveal the predictive relationship between school belonging, the mediator variable, and school burnout are important in comparing the research results. Considering that environmental and individual factors affect school burnout, different individual (psychological

personality traits: self-efficacy, self-esteem, self-regulation, etc.) and environmental factors (school-related variables: school size, structure, region, etc.) can be investigated. Structural equation models can be used to test the relationships between variables based on the relationships between academic achievement, school climate, school belonging, and school burnout.

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The Effect of Using Cryptology on Understanding of Function Concept

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The Effect of Using Cryptology on Understanding of Function Concept*

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Abstract

The aim of the study is to teach the concept of function using cryptology and to investigate whether it provides support to students who have difficulty integrating this topic into everyday life. The study's research group consisted of 50 elementary school teachers in the department of mathematics education at a public college in Ankara. Since the study aimed to show the advantages and disadvantages of using cryptology in teaching the basic function concept, qualitative data were collected and analyzed. The data collection instrument of the study is a performance test which consists of 10 questions prepared by an observer, a practicing researcher and an evaluation expert. This performance test was used as both pretest and posttest. For the functions, only function definition, inverse function, one-to-one function, set of values, set of definition, set of images, and cryptography were used where functions can be used in daily life. As a result of the study, it was found that the prospective teachers' awareness of functions has increased and it is beneficial and possible to use cryptology to relate functions to daily life.

Keywords: Function, Cryptology, Encryption, Mathematics teachers' candidates

Introduction

While mathematics has been used in the historical process to satisfy the basic needs of societies and to facilitate certain aspects of life, the rapid development of science and technology in contemporary life has affected social life and increased the importance of teaching and learning mathematics in daily life (Umay, 2007). We can say that we use mathematics in daily life even if we are aware of it or not. The concept of function, which occupies an important position in mathematics, is also very important in terms of how it is perceived by teacher candidates. The sufficiency and quality of the information in the teachers affect the quality of teaching the information. For these reasons, it has been deemed necessary to reveal all aspects of the conceptual knowledge of a teacher trainee and to reveal how much knowledge they have about the concept of function in the minds of teacher candidates (Süzer, 2011).

Functions are one of the fundamental topics of mathematics, unifying in mathematics (NCTM, 1989) and related to many topics of modern mathematics (Malik, 1980; Dreyfus & Eisenberg, 1982; Eisenberg, 1991; Ferrini-Mundy & Graham, 1991; Bowman, 1997 ; Mishelsen, 2006). Therefore, it can be said that functions are one of the most important concepts in mathematics. In the study of Akkoç (2006), the meaning of the concept of function according to NCTM (1989) is explained as follows:

According to NCTM 1989; *The concept of function is an important unifying concept in mathematics. The function is a special match between the two sets and is spread over the whole curriculum. Functions in arithmetic are the process that equate number pairs to a single number (such as the sum of the numbers in the number pairs); Functions in algebra: are the relations between variables, representer and counted; Functions in geometry: maps the point sets to figures with movements such as shift and rotation; Functions in probability: match events to the probability of occurrence.*
NCTM (2000) emphasizes the need to provide opportunities for all students to understand patterns, relations and functions, from pre-school to secondary education.

* This study is part of master thesis entitled "The Effect of Using Cryptography on Understanding the Concept of Function" by first author conducted in supervisor of second author.

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It is known that the subject of function has an important place in school mathematics. In this context, when the concept of function is examined in general, it provides opportunities for students to understand the relationships between variables, explain coefficient changes, analyze and interpret the graphs. (Clement, 2001). Moreover, as in NCTM (2000) and Common Core State for Mathematics (2011), the concept of function is also included in the secondary mathematics curriculum in Turkey (2018) (i.e. 10th, 11th and 12th grades). According to Ural (2006), functions completely affect the mathematics curriculum. However, it has been included in the college curriculum because it is an integrative and organizing concept.The concept of function is very important for students, mathematics educators, mathematics teachers and preservice mathematics teachers. Students in secondary education face 22 gains in total for 160 lessons during 3 years (MEB, 2018). Therefore, functions can be said to have an effective place in secondary education. In this context, examining teacher candidates' knowledge about the concept of function can give an idea and help them in the subsequent learning and teaching experiences (Süzer, 2011).

Functions do not fall under the name of functions in primary and secondary school mathematics, but mathematics subjects include topics that are the basis of the concept of function under numbers and algebra. For this reason, pre-service teachers must mastered concepts of function (Polat & Şahiner, 2007).

In the studies, it was found that students perceived variables such as x and y found in algebraic expressions and equations as functions. Such trends do not consider the function's definition, but take into account the concept images found in the minds of students (Özmantar, Bingölbali & Akkoç, 2010; Ural, 2006).Despite research on how to learn mathematical concepts, it is still not known how people will learn. Learning indeed occurs, but it is not known exactly which mechanism it is formed (Eisenberg, 1991). The concept of function is difficult to learn. Because, according to Sajka (2003), functions are seen as confusing. The reason for this is that the concept of function has a two-way characteristic.

In other words, students link between different representations indicating the same function and have difficulty in switching between these connections (Sierpinska, 1992). For example, students have difficulty in determining whether an algebraic expression is a function. As an example of this situation, university students have expressed (x2 + y2 = 1), a circle equation, as a function (Tall & Bakar, 1992). However, some students only know the functions as algebraic equations and they think that the graph is completely different from function (Tall & Bakar, 1991; Vinner 1983; Vinner & Dreyfus, 1989).

According to Ural (2006), students stated that they had some structural difficulties and misconceptions while learning the concept of function. The teacher plays an important role in eliminating these misconceptions and structural difficulties. Şandır (2006) stated that the subject of function should be learned at the conceptual level and more time could be spent for this. Function topics in Turkey are often taught with a memorization approach. The conceptual dimension of this is not mentioned much, but it can be said that there is a teaching method for information processing (Polat & Şahiner, 2007). It is important that the persistence of mathematical knowledge and the fact that conceptual knowledge and knowledge processing support each other in a balanced manner. When the conceptual knowledge is learned, the information processing will gain a meaningful dimension (Hiebert & Lefevre, 1986). However, it is seen that the functions are learned in the level of knowledge processing and not fully integrated into daily life (Ural, 2006; Ural, 2007; Polat & Şahiner, 2007).

Establishing the connection between mathematics and students' daily lives is one of mathematics teaching goals (NCTM, 2000). In this context, in many studies conducted, it is seen that encryption activities are in the teaching of mathematics (Bachman, Ezra & Norton, 2010; Chua, 2006; Chua, 2008; Evered & Gningue, 2001; Özdemir & Erdoğan, 2011; Özdemir & Yıldız, 2012; Özgeldi & Osmanoğlu, 2017; Göktepe Yıldız & Özdemir 2015; Özdemir & Geçim, 2014; Özdemir & Erbay, 2015; Hall, 2003; Hamilton & Yankosky, 2004; Kaur, 2008).

It can be said that the concept of function has an important place in the current mathematics curriculum. In this context, it may be appropriate to learn the structural side of the concept of a function and to adapt it with different mathematical models in daily life. This kind of mathematical modelling is an example of cryptology consisting of mathematical algorithms.

Conceptual Frameworks

The word “Cryptology” is composed of the words "kryptos" and and "logos” in ancient Greek. Cryptology today is a mathematical science that uses many disciplines such as electronics, optics and computer science (Saygı & Umay, 2010).

According to Çimen, Akleylek & Akyıldız (2011), cryptology is the branch of mathematics that includes both cryptography (cryptograph) and password analysis (cryptanalysis). The purpose of password science is to ensure the security of the message sent, and the purpose of password analysis is to solve the existing passwords.
In cryptology, there are encryption and decryption applications. Encryption is the ability to perform information by using several mathematical operations or by making the information to be displaced according to a particular algorithm. Deciphering is to make the complex message meaningful using some mathematical algorithms (Saygı & Umay, 2010; Çimen, Akleylek & Akyıldız, 2011). According to Menezes (2001), 2000 years ago, the Roman Emperor Julius Caesar used a simple replacement code, known as Caesar Cryptography, a classic example of symmetric key cryptography.

Since cryptology in general is a mathematical science based on number theory, the algorithms of cryptology consist entirely of mathematical functions. For this reason, cryptology is also used to encrypt one-to-one functions and encode the messages and decode the reverse functions (Saygı & Umay, 2010).As can be seen from the related literature, functions can be a difficult subject to learn (Tall & Bakar, 1991; Vinner 1983; Vinner & Dreyfus, 1989; Sajka, 2003; Ural, 2006; Ural, 2007; Polat & Şahiner, 2007). In this context, cryptology can be an important tool to be used to teach basic function concepts. Cryptology is thought to be an interesting way to gain the concept of function and an interesting and popular science. In this study, it is aimed to teach preservice teachers basic functions using cryptology.

Purpose and Importance of Research

The aim of this study is to teach basic functional concepts using cryptology and to help students who have difficulty integrating this subject into their daily lives. It also seeks to answer the question of which of the sub-concepts of function is effective in the classroom.

Research Problem and Its Sub-Problems

Within the scope of this research: “How is the learning process of mathematics teacher candidates studying in the 1st grade of the university develop in an application where basic function concepts are taught using cryptology?"
The sub-problems for the problem as mentioned above sentence are as follows:
1. Is there a statistically significant difference between the pre-test and post-test scores in the achievement test that measures basic function concepts of mathematics preservice teachers studying at the university?
2. How did the preservice mathematics teacher in the 1st grade describe the concept of function throughout the application?
3. How did the first-grade mathematics teacher candidates define the concept of inverse function?
4. How is the development of the function's usefulness in daily life in terms of preservice mathematics teachers studying at the university 1 st class?

Method

This study is an empirical investigation aimed at showing the advantages and disadvantages of using cryptology in teaching the concept of function to the first grade mathematics students in a public university in Ankara. In the study, the same test was administered twice at different times to the same group. In other words, since the effect of the study is investigated on a single group, the research design is a single group, pre-test and post-test, which is a weak experimental study. Weak experimental studies have no selectivity (Fraenkel and Wallen, 2009; Büyüköztürk 2012). The experimental study was supported by collecting qualitative data to investigate the conceptual development of using cryptology in teaching basic functional subjects and the conceptual development of mathematics teachers in the university.

Group	**Pre-test**	**Process**	**Post -test**
G	**O_1**	**X**	**O_2**

Figure 1. Single group, pre-test, and post-test pattern according to Fraenkel and Wallen

Data Collection Tools

Three instruments were used to collect data. A performance test, working papers, and records.
The achievement test was developed by the researcher and observer in the presence of an assessment expert. The test consists of 10 questions. This achievement test was used with the participants as both a pre-test and a final test. The working papers contain 4 different activities prepared by the researcher and the practitioner. The working

papers are explanations in envelopes within each activity. The purpose of these activities is to teach basic functional concepts using cryptology. The audio recordings were recorded by the researcher during the four week course.

Data Collection Process

The implementation process took a total of four weeks. In each week of the implementation process, the concept of basic function and the concept of cryptology were explained by the practice researcher. The organization of the applications, recording of the audio, and the necessary explanations during the activities were done by the observer. The data collection instruments such as performance test, worksheets and voice recordings were used as follows. The achievement test was administered for two weeks, the first week and the last week. The pre-test was administered before the first week and the post-test was administered after the end of the last week. The speech recordings were recorded every week during the course. And the speech recordings were recorded during the group discussion.

After these recordings were transcribed by the researcher, the opinions of the prospective teachers on the topic of function were analyzed. The answer sheets that were part of the activities were put into the envelopes that were distributed to the groups for 4 weeks to explain them. It is planned that the activities will be carried out in practice before and each week by an observer and a practicing researcher. In addition, the lecturer worked for four weeks. The observer was involved in the organization and implementation of the activities. In this study, the pretest and posttest responses of the prospective teachers were analyzed. The following is a detailed description of each application.

The first week of the study was conducted in three course sessions. The achievement test, which was developed by the observer and the researcher in the presence of an expert in measurement and assessment, was used as a pretest for the pre-service teachers before the first week of the course. The knowledge of the pre-service teachers about the basic functional topics was measured by this achievement test (pretest). The achievement test was developed by the observer and the researcher from the field with reference to the relevant literature. The achievement test consists of 10 questions. The validity and reliability of the test was ensured by expert opinions of 3 mathematics educators.

In the second week, pre-service teachers were asked to write cryptic text as a function and find the definition and value sets of the function in which the cryptic text is written. The activity, lecture and group discussions were conducted in three lessons.

In the first lesson, the concepts of cryptology, password, key and the history of cryptography were explained. In the second lesson, a new activity was introduced to the topic by recalling the concepts from a week ago.
In the third week, the course started with the question-answer technique on the topic of functions without going into the first lesson. A brief reminder of the previous two lessons was included. The last two lessons were on surjective functions and one-to-one functions.

This week, one of the basic function concepts: one-to-one and surjective functions were set as the topic for a lecture. In the fourth week, one-to-one function (1-1), surjective function, and inverse function with closed texts were distributed to pre-service teachers when the last week of teaching basic function concepts using cryptology had come.

Data Analysis

The responses of pre-service teachers to the functional test were qualitatively transferred into the computer. Responses that were close were collated and converted into a table. The aim is to determine the frequency of responses that are close to each other. The closeness of the responses to each other was determined by observing the responses of the pre-service teachers to the basic concepts of function by the observer and the researching practitioner. In this way, the pretest and posttest responses were examined and the pre-service teachers' development of their definition of basic concepts of function was explored. For questions (1, 2, 3, 6, 7, 8, 9, and 10) that measure conceptual information found in the pretest and posttest, "1" represents correct responses and "0" represents incorrect responses. In addition, question 2 also measures operational information. Questions 4 and 5 test information about function and cryptology. SPSS 22 software was used to analyze the scores obtained. Since this is the only group in the study, t-test was used to see if there was a significant difference between the means of the pre-test and post-test scores. The statistical significance of the difference (p) was tested at the 0.05 level.

In addition to statistical analysis, qualitative content analysis was also used in this study. Büyüköztürk(2012: 236) defines the purpose of qualitative research as "trying to understand the participants from their point of view". In other words, such studies focus on the discourses of different participants on a topic (Büyüköztürk, 2012). By analyzing the collected data, descriptive facts were revealed by revealing the themes and patterns related to the situation under study (Yıldırım & Şimşek, 2016; Creswell, 2013).
According to Fraenkel and Wallen (2009), the internal validity of a study means that the relationship or effect between two or more variables that one is trying to observe exists only between these variables without the effect of any other variable. (2012) According to Büyüköztürk, planning, conducting research, collecting data, analyzing given data and all similar stages are suitable for experts' opinions.

Findings

First Sub-Problem Findings and Comments

The first sub-problem of the inquiry is as follows: "Is there a statistically significant difference between pre-test and post-test scores on the achievement test that measures the basic functioning concepts of first grade mathematics teachers? In the study, before explaining the basic function concept using cryptology, participants were asked questions with the same content after applying the basic function concept using cryptology to measure students' function knowledge. The T-test was used to determine if there was a significant difference between the means of the students' scores before and after the test. The Kolmogrov Smirnov p-value of the difference between the pre-test and post-test total scores is 0.079 and it shows that the score differences are suitable for normal distribution. The calculated value of n2 is .81. Accordingly, it can be said that 81% of the variance in post-test scores after application was caused by cryptology. This effect size reflects a broad effect.

Table 2. *T-test results of pre-service teacher*

Evaluation	**N**	$\bar{X}$	**S**	**Sd**	**t**	**p**
Post test scores	50	9.46	1.528	49	14.676	0.00
Pre test scores	50	5.46	1.717			

Examining Table 2, it is clear that the points of a study that teaches the concept of function through cryptology are given to pre-service teachers. After the study, there was a statistically significant increase in the total score of pre-service teachers, t (49) = 14.676; p <.01. The mean score of pre-service teachers was 5.46 and increased to 9.46 after explaining the function of cryptology. This result shows that the concept of basic function of cryptology has a significant impact on the success of prospective teachers (Büyüköztürk, 2012).

Results and comments on the second sub-problem.

The second sub-problem of the study was posed as "How did first grade mathematics teachers define the concept of function during application?". For this reason, the questions of the achievement test were examined before and after the test 1. Also, the incorrect answers and then the frequency of correct answers are presented in the tables. Pre-test and post-test question 1: What is the function? Please describe it. Give an example of a function. The first question of the pretest and posttest was examined in two parts. First part: what is the function? Please describe it. The second part is: Give an example of a function.

Table 3. *Pre-Test 1. Question, First Part Findings and Comments*

Pre-service Teachers' Answers	**The Number of pre-service Teachers' (f)**
This is function in definition with expressions like f(x).	17
I don't know, I can't explain.	15
This is the Equation System.	13
Those who make the right definition.	5

In the pretest, 45 pre-service teachers answered the first part of Question 1 incorrectly, while five pre-service teachers answered correctly. In the study of Table 3, pre-service teachers are expected to answer the question "What is the function?" with Erbaş (2013: 45), namely, "Function: is a special mapping between the two sets, and x and y are called a function corresponding to a single element of y, where each element of x corresponds to two clusters." However, in pretest 1. it was found that pre-service teachers could not give a clear answer on the definition of function.

Pre-service teachers: In a process defined in the set of values from the definition set of E, the empty element must not be left in the set and each element I select from the definition set must correspond to only one element in the set of values and this process is called a function. Teacher E's answer was correctly accepted. One of the other answers is that the expression "f (x) = mx + n" is called a function. In this answer, pre-service teacher R thought that the expression "f (x)" could be a function.
In the pretest part 1, it can be seen that most of the pre-service teachers cannot define the function.

Table 4. *Post Test 1. Question First Part's Answers Findings and Comments*

pre-service Teachers' Answers	**The Number of pre-serviceTeachers' (f)**
Those who make the wrong definition.	6
This is a custom mapping with the Definition Set and the Value Set.	18
Those who use the question of "from where and to" in the definition.	14
Those who use "two non-empty sets…" in the definition.	12

In the first part of the pre-test, 44 of the 50 teacher candidates responded correctly. When Table 4 is examined, it can be said that teacher candidates have positively defined the concept of function. According to the information given in Table 3, the teacher candidates did not answer *"I do not know, do not remember"* in the last test. It is a desirable development that preservice teachers use two sets of non-empty statements in their definitions. The teacher candidate B's answer is: "*A non-null set of A from a non-null set of A will have no unmapped elements in the set A, and each element in A will match a single element from B, for example: f: IN → IN f (x) = 2x."*

Table 5. *Pre-test 1. Question, second part finding and comments*

Pre-service Teachers' Answers	**The Number of pre-service Teachers (n)**
No examples.	30
Ones that do not specify definitions and sets of values (as indicated by f (x)).	8
Ones that give true answers like (f:R→R f(x)=ax+b)	7
Figure drawing by responding correctly. (with Venn diagram)	5

Pre-test 1. question In the second part of the test, 12 of 50 preservice teachers were accepted as correct. When Table 5 is examined, preservice teachers were asked to specify sets of definitions and values when asked "give an example of a function". So (f:R→R and a, b ϵ R = f(x)=ax+b) in the form of mathematical symbols and expressions were expected them to give these as examples. Accordingly, it was observed that only 7 preservice teachers gave their examples as desired. *"Example: f: R→R f(x)=2x+1"* is the answer of the teacher candidate D, who gave one of the correct examples. What is highlighted in Table 5 is that the majority of teacher candidates cannot give an example.

Table 6. *Post Test 1. Question, Second Part Answers Findings and Comments*

Pre-service Teachers' Answers	**The Number of pre-service Teachers (f)**
No examples.	7
Ones that do not specify definitions and sets of values (as indicated by f (x)).	5
Ones that give true answers like (f:R→R f(x)=ax+b)	26
Figure drawing by responding correctly. (with Venn diagram)	12

In the second part of the post-test 1. The answer of 38 people in the second part was considered correct. When Table 6 is examined, preservice teachers' sample of mathematical symbols and expressions showed a positive development according to Table 5 (f = 7). In addition, the number of teacher candidates who do not give any examples in Table 5 is 30 and this number has decreased to 7 in the post-test.

Findings and Comments Related to the Third Sub-Problem

The third sub-problem of the study was defined as *"How did the first-grade mathematics teacher candidates define the concept of inverse function?"*. The findings of this sub-problem were reached by analyzing the 3rd and 10th questions of the achievement test. Pre-test and post-test 3. question: find the inverse of the function given by this rule (3 f: Z → Z, f (x) = 3x - 2).

Table 7. *Pre-Test 3. Question Findings and Comments*

pre-service Teachers' Answers	The Number of pre-service Teachers (f)
$f^{-1}(x)= (x+2)/3$	49
He wrote this ((y+2)/3) statement and the result was missing.	1

Looking at the above table, we find that no one can give the correct answer to the 3rd question in the achievement test, which we have described as the question that measures the conceptual knowledge of teacher candidates. In this question, it was found that the prospective teachers did not consider the definition and value sets in this function. It can be said that what Özyıldırım (2015) defined as mechanical knowledge was solved by Hiebert and Levefre (1986) with operational information. The correct answer to the 3rd question is: ($f: Z \rightarrow Z$, $f(x) = 3x - 2$) the inverse of the function is undefined in the set Z.

Table 8. *Post-Test 3. Question Findings and Comments*

Pre-service Teachers' Answers	The Number of pre-service Teachers (f)
$f^{-1}(x)=(x+2)/3$	5
Those who wrote that the function f is not defined in this ($f:Z\rightarrow Z$) range.	18
Those who, by giving value to "x", wrote that the function is not defined in Z.	18
Those who wrote that "Because "f (x) is not one-on-one and a surjective, it does not have a its reverse".	9

When Table 8 is examined, it was observed that only 5 people gave the wrong answer and 45 of the teacher candidates gave correct answers. According to Table 7, preservice teachers paid attention to whether the function was defined in the definition range. Teacher's answer M: *"I cannot find the inverse of the function given by this rule and I can't say that "f: Z → Z f1 (x) = (x + 2) / 3" and "f (2) = 4/3" but not "4/3" integer. But if I change its whereabouts, I can find the opposite. For example, if f: R → R, I have a range."*

The other question analyzed to identify the inverse of the function is the 10. question of pre-test and post-test: Is there an inverse of each function? Please explain.
In the analysis, it was observed that 23 teacher candidates gave the desired answer and explanation in the last question of the pre-test. However, only 15 people who wrote the *"no"* answer did not comment. In the last test, it was observed that all preservice teachers gave the correct answer and made an explanation. It was observed that teacher candidates' answers have conditions of one-to-one and surjective in the explanation.

Findings and Comments Related to the Fourth Sub-Problem

The fourth subproblem of the study: how do first grade mathematics teacher candidates develop their knowledge of the utility of function in daily life. The results of this sub-problem were determined using the 4th and 5th questions of the pretest and the posttest.
Question 4 of the pretest and posttest: How do you explain the meaning of the function to another person or to a student who has never seen the function before?

Table 9. Pre-test 4. Question's answers, findings and comments

Pre-service Teachers' Answers	The Number of pre-service Teachers (f)
I don't know, I don't remember, I have no idea	16
I explain with the subject of equations.	7
I explain it through the function examples.	5
I illustrate these with clusters.	11
I give examples from daily life (machine example, factory sample, mother-child relationship, puzzle)	11

In this question, the answer of 22 people who gave the following answer (*I give examples from daily life and draw a figure and explain it with clusters)* was accepted as correct. It is seen that 28 preservice teachers *"do not know"* the function as they are understood. According to Table 9, it can be said that preservice teachers are incomplete in explaining the function. The response of teacher candidate Y, who was one of the 11 people who gave examples from everyday life: I described this using visuals, gave examples from daily life and explained the definition under the mother's name and the value under the child's name with examples. I would say that there are no 2 elements

in the set of values in the value set. For the 4th question in the pre-test, it can be said that pre-service teachers prefer to explain functions through shapes.

Table 10. *Post Test 4. Question, Findings and Comments*

Pre-service Teachers' Answers	The Number of pre-service Teachers (n)
I describe it as a conversion process.	4
I draw a figure.	4
I explain it with the sets and matching.	19
I give examples of everyday life.	14
With encryption by using the alphabet.	9

It was observed that preservice teachers preferred to explain the subject of function with the subject of clusters and pairing. The answer of 42 people in this question can be considered right, according to Erbaş (2013). The answer *"I do not know, cannot tell"* in Table 9 is not given here. Considering cryptology-based activities, those who prefer to tell by encryption are limited to 9 people have shown that this answer is not preferred. For example the teacher candidate *O*'s answer: *"We have an element and we do this by doing various operations on another element. It refers to the function as a conversion process."*

Another question related to the fourth sub-problem was reached by examining the pre-test and post-test question 5. Question 5 of the pre-test and post -test: Give an example of where the function can be used in everyday life.

Table 11. *Pre-Test 5. Findings and Comments Related to the Question*

Pre-service Teachers' Answers	The Number of pre-service Teachers (n)
I do not know.	25
Used in problem examples.	8
Those who say that it is used in integral, derivative, civil engineering, architecture.	3
Those who say that it is used in calculator, electronic tools, Excel and computer programs.	10
Those who say that it is used in encrypted doors and encryption methods.	4

A remarkable point, if we examine Table 11: In the 5th question of the pretest, students predict that the function can be used in daily life for encryption methods. Another notable case is that the answer of 36 students is considered wrong. One of the teacher candidates gave the following example: For example, we can use this in the relation between salaryand rent, f (x) = 3x + 700, f (x) = salary and x = rent of the house. He also explained that the algebraic expression given in the function can be used in everyday life.
In the fifth question of the last test, 38 teacher candidates about the use of function in daily life say that functions can be used in cryptology. On the other hand, 10 students repeated in both the pretest and the last test that these functions are used in calculators, Excel and computer programs.

When the answers of pre-service teachers to questions 1, 3 and 10 were examined in the pretest, it was found that these answers were based on memorization. However, it can be said that they have difficulty in defining the concept of function and giving examples. It was observed that algebraic expressions were defined as function or even expressions of f (x) as direct function. When examining the answer sheets, it can be seen that 45 participants are unable to define the function in question 1 and therefore the information provided by these participants is incomplete. However, when examining the answers to question 1 in the last test, it was found that 6 people could not define a function. Therefore, it can be said that the activities carried out in the last period have reduced this lack of knowledge. In particular, question 3 shows that pre-service teachers do not pay attention to the definition domain of the function and that the inverse function and the function are learned by the method of memorization according to Polat & Şahiner (2007). In the results on the fourth subproblem, the results of the pretest showed that the teacher candidates could not integrate the concept of function into daily life. As a result, it can be said that the pretest answers generally do not contain information about the topic of functions and the operational information is based on the memorization method. The results of the pretest on teacher candidates' ideas about where the function is used in daily life are incomplete and inaccurate. However, this situation changes when the posttest responses are examined.

Discussion

This study aims to examine the changes in the learning of the basic function concepts of primary school mathematics preservice teachers using cryptology. For this purpose, 50 teacher candidates were compared with the pre-test and last -test results of the development of basic function concepts (definition of function, one-to-one function, inverse function, set of values, set of definitions) by implementing cryptology activities. In the findings obtained from the study, it was observed that the preservice teachers did not remember the concept of function according to the pre-test results and the majority of the class remained incomplete. In this context, as Hitt (1998) states, the definition of function associated with various concepts is preferred by preservice teachers.

One of the biggest problems in terms of function is that the number of representations of this concept is very high (Eisenberg, 1991). When the teacher candidates were asked to give an example of a function, it was concluded that they did not give the correct example, and the examples given were incomplete. In this seemingly simple question (the question asked for the function example), there were troubles. According to a study by Akkoç (2005), mathematics teacher candidates preferred to define the function verbally. However, they tried to give an example by using a cluster matching diagram.

In the first week of the application, teacher candidates solved the encrypted texts in the activities, but it was found that they could not reconcile this with the concept of a function. Many authors, such as Sierpinska (1992), Carlson (1998) and Clement (2001), found that students who succeeded in algebra courses at the university could define a function with a simple algebraic formula (Dubinsky, 2013). Towards the end of the implementation process, it was observed that the teacher candidates were able to make the function definition at the desired level in the activities and the final test results. In addition, it was seen that preservice teachers had written a function example in a correct and meaningful way.

As Hitt, (1998) stated in his study, preservice teachers prefer to create a matching rule or a sequential binary when defining the function. However, it was seen in this study of the basic function concepts based on cryptology, the teacher candidates mentioned that they had a mapping rule in defining the one-to-one function. The functions in cryptology applications are exact but they have not made any explanations. Moreover, as a result of the application, as in the pretest, they defined the one-to-one function from the definition set to the value set as a set matching graph. It can be concluded that the applications of cryptology activities that represent the concept of one-to-one function, the basic concept of function, do not produce changes in the development of pre-service teachers. Hiebert & Levefre (1986), Özyıldırım (2015) defined operational information, mathematical symbols and representations as follows: mechanical knowledge capable of defining formulas and performing process steps appropriately. In this context, pre-service teachers defined the inverse function from the basic function concepts and stated that there is no inverse function for any function. However, they also stated that there is no inversion of one-to-one and non-surjective functions. However, in pretest question 3, it was observed that they tried to take the answer to the question without considering this information. In this case, it was observed that the teachers presented a memorised solution. Calrson (1998) in his study found that university students have difficulty in producing functions that correspond to real life. When examining the results of the pretest on the use of the concept of function in daily life, it is found that most of them have no knowledge of this topic. Nevertheless, 4 teacher candidates stated that they used encoding methods in the pretest. According to the results of the posttest and the answers about the activities, it can be said that the teacher candidates know the concept of function in daily life.

Recommendations

It can be said that the study is a new application in the literature. It was found that cryptology has entered the new educational research. In this sense, other mathematical topics can be integrated with cryptology in education. The study is a descriptive study with a pre-test load test in a group, which is one of the weak experimental designs. The design of the study can be changed to a quasi-experimental design and a new study can be conducted by forming control and experimental groups.

The study can be conducted not only for the first year mathematics teacher candidates but also for the secondary, high school and elementary students. The research is based on teaching the basic functions of cryptology activities. In addition, a research on cryptology and matrices can be developed. However, it is also possible to offer various researches on patterns that can form the basis of functions for primary and secondary school students. In addition to these subjects, the subject of equations can also be taught to primary and secondary school students with the help of cryptology.

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Validity and Reliability Study of the Situational Interest Scale in Turkish

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Abstract

Interest has a key role in the learning and teaching processes. However, interest could be categorized as individual, situational, and topic interest. Situational interest that educators could design, develop, and organize with instructional design is the most significant. The structure of situational interest consists of triggered situational interest, maintained situational interest feeling, and maintained situational interest value. The current study aimed to determine the conceptual structure of the situational interest scale by adapting it into Turkish. For this purpose, the study also aimed to determine the validity and reliability of the Turkish language adaptation of situational interest scale developed by Linnenbrink-Garcia et al. in 2010. Turkish language adaptation of the situational interest scale has a good fit in all parameters for first-order CFA analysis ($\chi 2$ /df = 2.349, RMSEA = 0.078, SRMR = 0.025, CFI = 0.976, TLI = 0.969) without modification. The Cronbach Alpha internal consistency coefficient was calculated for each factor: .901 for the triggered situational interest, .949 for the maintained situational interest feeling, .945 for the maintained situational interest value, and .963 for the whole scale. In the study, it was recommended that future studies determine the validity and reliability of the situational interest scale with subjects at various education levels.

Key words: Situational interest, Situational interest scale, Computer Course.

Introduction

Interest is a psychological state that is effective in the acquisition of a certain attitude, emotion and behavior of individuals. Here, interest is vital in guiding individuals to a particular situation (Ainley, 2006). Also, studies on interest show that interest was an important factor in attention, goal setting, motivation, and learning (Hidi & Renninger, 2006). This importance of the interest in the learning can be explained as a high level of interest allows for a feeling relatively effortless of focusing attention and cognitive activities (Krapp, 2005; Schraw & Lehman, 2001; Schiefele, 2009). Interest could contribute to learning and transfer of learning, and conversely, learning could contribute to developing the individual's interest in individualizing the individual (Flowerday & Shell, 2015; Magner et al., 2014; Rotgans & Schmidt, 2014; Schraw & Lehman, 2001). Thus, it should be emphasized that interest is an important psychological variable in learning and teaching.

The interest as a motivational factor has contributed to engage student during the learning process (Dewey, 1913). In educational research, interest uses as situational, individual and topic interest. Situational interest could trigger through the organization of the learning environment, such as supporting the student by teachers, parents, and peers, planning learning-teaching activities such as group work, and developing new instructional methods (Han et al., 2020; Renninger et al., 2019). Thus, educators could develop an instructional approach that could trigger learner's interest. As Rotgans and Schmidt (2011) stated, the focus should be on what teachers should do and what they should avoid to triggered situational interest. The studies on situational interest have focused on determining the characteristics of a rich and problem-based environment that could trigger and maintain student interest (Renninger et al., 2019). Therefore, it is important to address the situational interest could trigger by organizing the environment. Also, the situational interest shaped by the environment is predictive of the variables related to academic success (Rotgans & Schmidt, 2011), but there is a need for a reliable and valid measurement tool to measure the situational interest. The present study aims to introduce a valid and reliable situational interest scale to the Turkish literature to measure situational interest.

Theoretical Framework

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Interest

Although there are studies that aim to establish a theoretical framework, the literature lacks a clear definition of interest. However, the interest could be defined as an emotional state that includes the feelings of stimulation, awareness, attention, and concentration and is a key factor of learning motivation (Ainley, 2006). Although there are various descriptions of interest in the literature, this section includes a first association between interest and learning and then the studies that aimed to establish the theoretical framework for interest.

The interest is conceptualized in two dimensions: situational and individual interest. It was assumed that there was a distinction between situational and individual interest (Hidi & Renninger, 2006). Situational interest has had an important role in the learning and teaching process. According to Rotgans and Schmidt (2014), if the students have little interest in a course s/he learns less it, vice versa. Therefore, the educational research on interest shows that situational interest positively affects learning (Schiefele et al., 1992). Situational interest also motivates learners to engage with new information (Rotgans & Schmidt 2011; Schraw & Lehman, 2001) and plays an important role as a motivational variable that triggers feelings of enjoyment and increased attention (Fandakova & Gruber, 2021; Hidi & Renninger, 2006).
Since this study examines the measurement of interest in the context of its theoretical structure, it is necessary to examine the development of interest. According to Krapp et al. (1992), interest was accepted as a psychological variable and explained with a three-tier structure: 1- individual interest: interest as a personal trait, 2-situational interest: interest that originates in the learning environment, and 3- interest as a psychological state (Kaya, 2016; Krapp et al., 1992). Thus, interest is primarily associated with personal traits. It could be suggested that the interest could be improved by designing interesting learning environments to retain situational interest and its transformation into a psychological state. This development of interest is explained based on a four-phase model of interest development. In this model, interest was associated with individual and situational factors (Hidi & Renninger, 2006; Renninger & Hidi, 2011). The model emphasized the situational interest dimension that was mostly affected by environmental factors (Knogler et al., 2015; Schraw et al., 2001). According to the four-phase model of interest development, interest is primarily triggered by a situation that attracts the individual's attention, and then situational interest emerges when the initial interest is sustained by the environment.Situational attention leads to individual interest, which becomes advanced individual interest. Instructional environments and learner's traits such as emotions, autonomy, character identification, technology, groupwork, practical activities, educational lectures, innovations, ownership, and personal consistency transform the triggered situational interest into maintained situational interest (Renninger et al., 2019). Therefore, situational interest should be first triggered to achieve individual interest. In other words, situational interest is a prerequisite for developing individual interest (Yaman, 2005). Thus, it could be suggested that a focus on situational interest plays an important role in developing an individual's interest in a particular situation.

Situational interest occurs during an individual's interaction with a situation such as a topic, event, or idea (Knogler et al., 2015). Studies on the triggering/initiation of situational interest emphasized the significance of environmental properties, such as the design of the tasks and activities conducted with others with whom the individual interacts (Renninger et al., 2019; Rotgans & Schmidt, 2011). For example, in a study conducted by Pasco et al. (2017), it was reported that mobile cycling games had a positive effect on situational interest. In other words, situational interest occurs in a specific environment where environmental properties are effective. Although there are different types of interest, such as topic interest and individual interest in the literature (Hidi, 2000), the current study focused on situational interest, the instructional design contributes to the development of individual interest.

Measurement of Situational Interest

Studies on the measurement of interest have accompanied those that aimed to determine the theoretical framework of interest. In these studies, data collection instruments such as scales, questionnaires and interview forms were generally employed to measure interest, behavioral measures and neuroscientific methods were also preferred (Renninger & Hidi, 2011). However, among these methods, it was observed that the scales were the most preferred quantitative data collection instruments.

In studies on interest, the content of interest has been determined based on emotions and values (Renninger & Hidi, 2011). Linnenbrink-Garcia et al. (2010) developed a situational interest scale that could be applied in various academic levels such as middle school, secondary school, and university students. The scale was based on the theoretical framework presented in Figure 1.

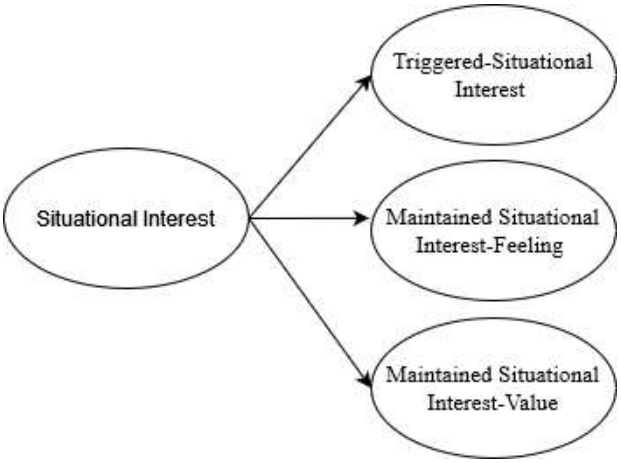

Figure 1. The theoretical framework of situational interest

As seen in Figure 1, *situational interest (SI)* includes three components: *triggered-situational interest (ST), maintained-SI-feeling (SMF), and maintained-SI-value (SMV)*. Triggered situational interest could initiate the process of interest development by drawing the students' attention to the course material; however, this experience needs to be transformed into individual interest (Linnenbrink-Garcia et al., 2010). Maintained situational interest is involved in the process of the transformation of the triggered-situational interest into individual interest. Thus, when environmental factors do not support triggered-situational interest, it could be withdrawn (Linnenbrink-Garcia et al., 2010), and it should be supported by the environment and transformed into a form of maintained situational interest. Maintained situational interest develops through two mechanisms that are based on feeling and value. Maintained-SI-feeling is associated with positive emotions such as fun and excitement that instructional content triggers. In contrast, maintained-SI-value is associated with the belief that the instructional content is meaningful and important (Schiefele, 1991). In other words, it could be suggested that positive emotions could be effective on maintained-SI-feeling; however, triggered situational interest and maintained-SI-value could be independent of the emotional state (Bhandari et al., 2019). Here, situational interest is discussed based on three components: triggered-situational interest, maintained-SI-feeling, and maintained-SI-value.

The studies on interest are quite limited in Turkey. Among these studies, Deniz et al. (2014) investigated students' vocational interests attending two public universities. The study discussed interest based on vocational interest. In a study by Akın et al. (2015), who analyzed interest in the course, the interest in the Course Scale, developed by Mazer (2013), and includes the cognitive and affective factors, was adapted into Turkish language. Although environmental factors play an important role in triggering interest (Krapp et al., 1992), there were limited studies on situational interest. Thus, the present study would fill a gap in the literature by addressing situational interest that could be organized with instructional design and induced by environmental factors and adopting a scale that could be employed to measure situational interest in the Turkish language. It is expected that introducing a validity and reliability situational interest scale to the Turkish literature with the current adaptation would provide an infrastructure for future situational interest studies.

Method

Research design

A cross-sectional survey model was used to measure the Turkish literature's situational interest scale's validity and reliability. The method (Fraenkel et al., 2012) allows the collection of data about a case from a specific sample in a certain time interval. Thus, data for the adaptation of the scale to Turkish language were collected between 16.04.2018 and 30.04.2018.

Participants

In educational research, populations are large, diverse, and widely distributed, and collecting data from all members can be time-consuming and expensive (Fraenkel et al., 2012). For this reason, it is necessary to select a

sample for the study. In order to achieve the aim of this study, which is to introduce a scale to measure situational interest in Turkish, situational interest needs to be investigated based on a course and the students enrolled in that course. Therefore, the current study was conducted with a random sample consisting of a group of individuals available for the study (Fraenkel et al., 2012). The study was conducted with students enrolled in the Computer II course at a state university of education who volunteered to participate in the study during the spring semester of the 2017-2018 academic year. The distribution of participating students in the scale adjustment phase of the study is shown in Table 1 by gender and department.

Table 1. Distribution of the students who participated in the adaptation phase of the study based on gender and department

	Gender (n)		Total
	Female	Male	
Department	27	1	28 (12.6%)
Elementary Science Education	31	15	46 (20.6%)
Elementary Mathematics Education	50	4	54 (24.2%)
Preschool Education	35	18	53 (23.8%)
Preschool Education (Evening Education)	30	12	42 (18.8%)
Primary School Education			
Total	173	50	223 (100%)

As seen in Table 1, the scale was adapted with 223 undergraduate students attending Science Education, Mathematics Education, Preschool Education, Preschool Education (Evening Education) and Primary School Education programs. Among the participants, 75.6% (n = 173) were female, and most students attended the Preschool Education (Regular and Evening Education) department.

Data Collection Instrument and Process

The study used the situational interest scale developed by Linnenbrink-Garcia et al. (2010) as the data collection instrument. The scale includes 12 items, four of which aim to measure triggered situational interest (ST), four aim to measure maintained-SI-feeling (SMF), and four aim to measure maintained-SI-value (SMV). The adaptation was conducted to introduce the Situational Interest Scale to Turkish. The following steps were included in the adaptation:

- **1st Phase:** Permission of the situational interest scale developers was obtained by e-mail.
- **Phase 2:** Six experts, who can speak and write fluently in both languages, translated the English items into Turkish.
- **3rd Phase:** The author prepared the items in the Turkish version based on the advice of the experts.
- **4th Phase:** One expert made Turkish to English back-translating.
- **5th Phase:** The comprehensibility of the scale items was examined with nine students representing the sample group.
- **6th Phase:** The adopted scale, as shown in Appendix-1, was finalized.

The scale originally developed for the mathematics course was adapted to Turkish by replacing the phrase mathematics course with computer course. The scale was adapted as a five-point Likert scale, with ratings varying from "strongly disagree" to "strongly agree." To avoid data loss during the survey, data were collected online using Google Forms. In addition, participants' demographic data, such as gender and department, were recorded on the same form.

Data analysis

The collected data were analyzed with confirmatory factor analysis (CFA) to determine the construct validity of the adapted scale, and the item responses were analyzed. Confirmatory factor analysis was conducted to determine the goodness of fit of the Turkish language structure with the original.

The data in the current study was collected via Google Forms to prevent missing data. The data was exported as an XLS file and then imported into SPSS 25. According to data set, the participants completed the survey with no missing data. CFA assumptions were tested, such as normality and univariate and multivariate outliers (Tabachnick & Fidell, 2013). The sample size for CFA was sufficient. The scale items were transformed to the standard z-score for testing univariate outliers, and no one data the ±4 z score range (George & Mallery, 2010;

Mertler & Vannatta, 2016; Tabachnick & Fidell, 2013). The upper value of skewness and kurtosis scores were -1.491 and 2.740, respectively. Mahalanobis distance was used to detect multivariate outliers, and then 10 outlier data, removed from the data set. Tolerance values were expected upper than .1 (Menard, 1995); this value for the scale was upper than .165 (item-12). When the VIF values are less than 10, there probably is not a multicollinearity cause for concern (Field, 2013). VIF value for the scale is less than 6.057 (item-12). According to these results showed assumptions were met for the CFA. During the adaptation of the scale, CFA was conducted with the MPlus 8.5 software to determine the goodness of fit.

In the study, Cronbach Alpha coefficient was employed to determine internal consistency on SPSS 25 software. It was suggested that a coefficient of .70 or higher would indicate reliability in psychological tests (Büyüköztürk, 2007). A coefficient above .90 is interpreted as completely reliable, a coefficient between .80 and .90 is interpreted as very reliable, a coefficient between .70 and .80 is interpreted as reliable, a coefficient between .60 and .70 is interpreted as moderately reliable, a coefficient between .50 and .60 is interpreted as somewhat reliable, and a coefficient below .50 is interpreted as unreliable (Özdamar, 2017). In addition, the reliability of the indicator and its convergent validity were analyzed with the average variance extracted (AVE) and the composite reliability (CR).

Findings

This section presents the validity and reliability analyses conducted on the Turkish version of the situational interest scale.

Situational Interest Scale Construct Validity

In this section, construct validity findings for the situational interest scale are presented. However, the data collected for the adaptation of the scale were primarily subjected to descriptive analysis. Descriptive analysis findings are presented in Table 2.

Table 2. Descriptive analysis results of Situational Interest Scale

	n	Lowest	Highest	$\bar{x}$	SD	Skewness	Kurtosis
ST	223	1.00	5.00	3.84	0.79	-0.95	1.34
SMF	223	1.00	5.00	3.81	0.89	-1.01	1.34
SMV	223	1.00	5.00	4.19	0.80	-1.54	3.21
Total Scale	223	1.00	5.00	3.95	0.77	-1.30	2.35

Table 2 shows that the mean scores for the situational interest dimension were quite high. It could be assumed that the skewness and kurtosis were at an acceptable level (George & Mallery, 2010). Based on these data, a confirmatory factor analysis was conducted for the adaptation of the scale to the Turkish language. The MPlus diagram of the model is shown in Figure 2.

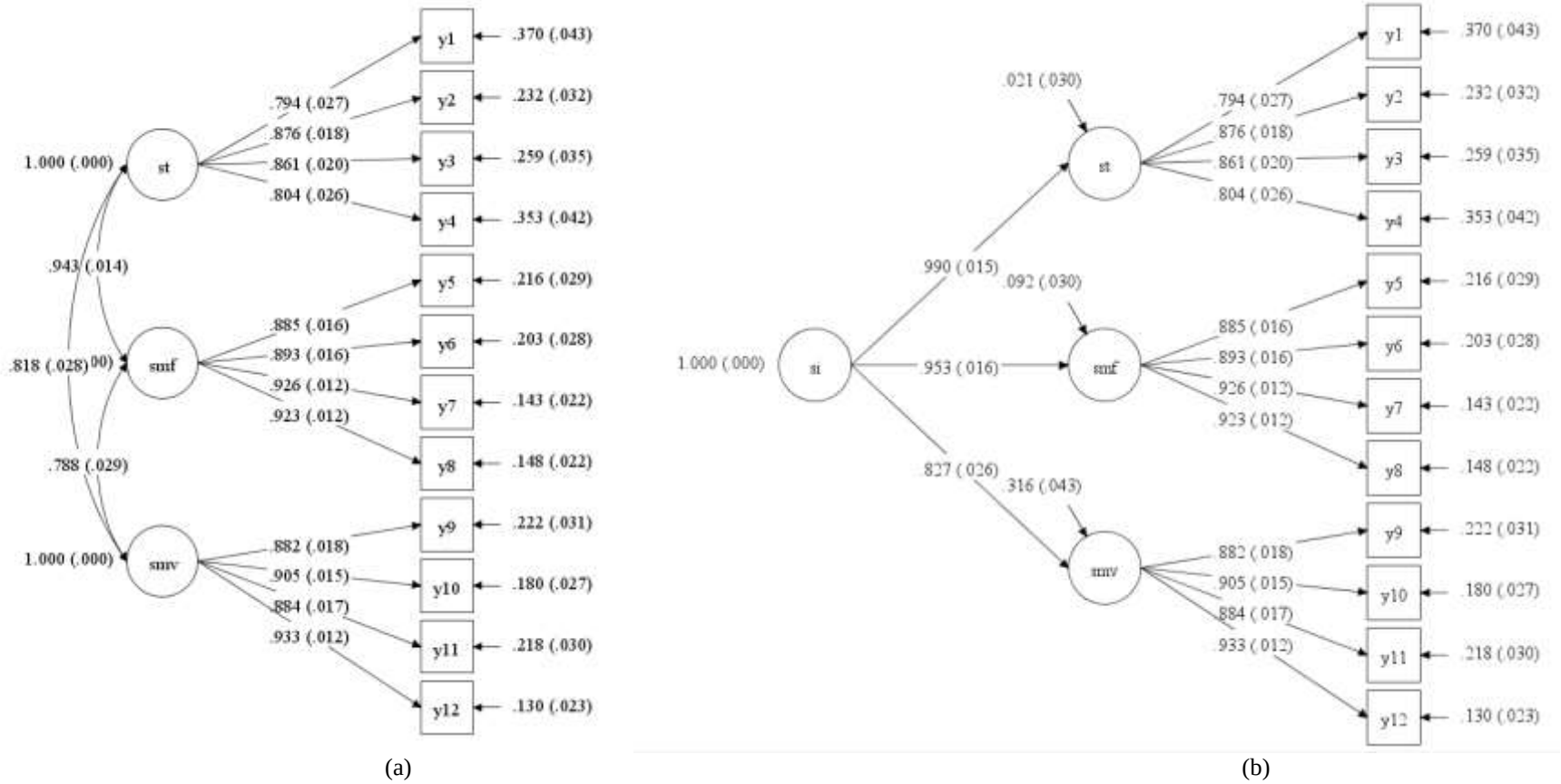

Figure 2. Standardized First Order (a) and Second Order (b) CFA Findings

To determine the construct validity of the scale, a confirmatory factor analysis was conducted using MPlus. To determine the construct validity of the scale, model fit indices such as the ratio of chi-square value to degree of freedom ($\chi 2$/df), Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Residual (SRMR), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI) were calculated (Hu & Bentler, 1999; Kline, 2011; Sümer, 2000; Tabachnick & Fidell, 2013). The values and ranges of scale fit are presented in Table 3 based on the previous studies in the literature.

Table 3. Results of Confirmatory Factor Analysis

Fitness Criterion	Good Fit	First Order	Reference
$\chi 2$	$0 \leq \chi 2 \leq 2.5$df	119.848<127.5	(Kline, 2011)
$\chi 2$ /df	$0 \leq \chi 2$ /df ≤ 2.5	2.349	(Kline, 2011; Sümer, 2000)
RMSEA	$0 \leq$ RMSEA ≤ 0.08	0.078	(Hu & Bentler, 1999; Sümer, 2000)
SRMR	$0 \leq$ SRMR ≤ 0.08	0.025	(Hu & Bentler, 1999; Sümer, 2000)
CFI	$0.90 \leq$ CFI ≤ 1.00	0.976	(Hu & Bentler, 1999; Sümer, 2000; Tabachnick & Fidell, 2013)
TLI	$0.90 \leq$ CFI ≤ 1.00	0.969	(Hu & Bentler, 1999)

As seen in Table 3, the model exhibited a good fit based on all criteria ($\chi 2$ /df, RMSEA, SRMR, CFI, TLI) without modification (Hu & Bentler, 1999; Kline, 2011; Sümer, 2000; Tabachnick & Fidell, 2013). NFI, GFI and AGFI were not reported in the study conducted by Hu and Bentler (1998), since these were not recommended. Based on these findings, it could be suggested that the three-factor structure of the scale in the model was confirmed. Standardized factor loads between first order and second-order variables and explained variance (R^2) in the model are presented in Table 4.

Table 4. Second-Order CFA standardized factor loads and explained variance

Second Order Variable	First Order Variable	λ	R^2
Situational interest	ST	0.990	0.979
	SMF	0.953	0.908
	SMV	0.827	0.684

As seen in Figure 2b and Table 4, situational interest was primarily explained by SI and SMF and the least by SMV.

Situational Interest Scale Reliability Analysis

To determine the reliability of the scale, Cronbach's alpha internal consistency and correlation between factors were examined. First, the internal consistency coefficient Cronbach Alpha was determined as part of the analysis conducted using SPSS 25 software. The internal consistency coefficient Cronbach Alpha calculated for each factor was as follows: .901 for the ST, .949 for the SMF, .945 for the SMV, and .963 for the scale. Since the coefficients for the internal consistency of the subfactors and the total scale were above .80, it can be assumed that the scale is very reliable. In addition, the total scale was completely reliable as the internal consistency coefficient was above .90 (Özdamar, 2017).

Table 5. Descriptive statistics, Cronbach's coefficient, AVE, CR and inter-factor correlations

Factor	$\bar{x}$	SD	α	AVE	CR	ST	SMF	SMV	Scale
ST	3.84	0.79	.901	0.696	0.902	-	.867**	.752**	.941**
SMF	3.81	0.89	.949	0.823	0.949		-	.743**	.944**
SMV	4.19	0.80	.945	0.812	0.945			-	.894**
Scale	3.95	0.77	.963	0.777	0.977				-

**: Correlation is significant at the 0.01 level (2-tailed).
α : Cronbach's Alpha coefficient.

To determine reliability, inter-factor correlation coefficients were also calculated. The analysis findings revealed a perfect positive correlation between ST and SMF (r = .867, p <.001), and a positive high correlation between ST and SMV (r =.752, p <.001) between SMF and SMV (r =.743, p <.001). Furthermore, it was observed that there was a perfect positive relationship between the scale sub-factors and the overall scale.

The average variance extracted (AVE) was investigated to determine the convergent validity of the model at the structural level, and AVE is expected to be equal to or above 0.5 (Hair et al., 2017). Furthermore, the construct reliability (CR) should be equal or above 0.7 (Fornell & Larcker, 1981). As seen in Table 5, AVE was above 0.5, and the CR was above 0.7. Thus, it could be suggested that the model exhibited both convergent validity and construct reliability.

To determine the reliability of the scale using item analysis, the differences between the mean item scores of the bottom 27% (n = 60) and top 27% (n = 60) percentiles obtained with the total item scores were analyzed using the independent samples t-test. The results presented in Table 6 show that there is a significant difference between the scores of the bottom 27% and the top 27% for all factors in the sub-dimensions of the scale (p <.001). To determine the internal consistency of the scale, the correlation coefficients of the corrected total items were calculated. It was found that the coefficients ranged from .753 to .875. Since the corrected total correlation coefficients of the items were above 0.30 and the items discriminated the individuals well (Büyüköztürk, 2007), it can be assumed that the scale items discriminated well and thus the internal consistency of the scale was high. Thus, all validity and reliability analyzes showed that the scale had satisfactory psychometrics.

Table 6. Item Total Correlations Based on the Dimensions and the Scale

Factor	Items	Group	n	$\bar{x}$	SD	t	df	*p*	Total item corrected correlation
ST	M1	Lower	60	3.27	0.989	-9.608	88.797	<.001	0.767
		Upper	60	4.65	0.515				
	M2	Lower	60	2.95	0.891	-13.504	88.595	<.001	0.839
		Upper	60	4.70	0.462				
	M3	Lower	60	2.90	0.951	-13.657	85.624	<.001	0.815
		Upper	60	4.77	0.465				
	M4	Lower	60	2.55	0.723	-14.781	118	<.001	0.753
		Upper	60	4.35	0.606				
SMF	M5	Lower	60	2.70	0.962	-15.400	80.268	<.001	0.831
		Upper	60	4.78	0.415				
	M6	Lower	60	2.67	0.816	-15.914	99.533	<.001	0.832
		Upper	60	4.65	0.515				
	M7	Lower	60	2.92	1.013	-13.554	76.121	<.001	0.875
		Upper	60	4.82	0.390				
	M8	Lower	60	2.70	0.962	-15.594	79.125	<.001	0.872
		Upper	60	4.80	0.403				
SMV	M9	Lower	60	3.33	1.052	-10.732	71.383	<.001	0.793
		Upper	60	4.87	0.343				
	M10	Lower	60	3.35	0.899	-11.795	79.024	<.001	0.796
		Upper	60	4.83	0.376				
	M11	Lower	60	3.38	1.043	-10.639	70.263	<.001	0.765
		Upper	60	4.88	0.324				
	M12	Lower	60	3.30	0.944	-12.500	70.988	<.001	0.827
		Upper	60	4.90	0.303				

Discussion and Conclusion

The study contributed a scale that was determined to be valid and reliable to the Turkish literature. The scale was determined to be acceptable in the Turkish sample for the measurement of situational interest. Thus, it was observed that the measurement instrument exhibited good fit in all criteria ($\chi 2$ /df = 2.349, RMSEA = 0.078, SRMR = 0.025, CFI = 0.976, TLI = 0.969) without modification (Hu & Bentler, 1999; Kline, 2011; Sümer, 2000; Tabachnick & Fidell, 2013). It could be assumed that the three-factor structure of the Situational Interest Scale, which includes the factors SI, SMF, and SMV, has been confirmed. It was noted that previous studies in the literature focused on measuring professional interest (Deniz et al., 2014; Hoff et al., 2020), thematic interest, and content interest (Schraw & Lehman, 2001). However, the present study contributed to the measurement of students' general perceptions and reactions during classroom activities, as suggested by Linnenbrink-Garcia et al. (2010). Thus, the confirmatory factor analysis findings were consistent with the conceptual structure of the scale,

namely the triggered-situational interest, maintained-SI-feeling, and maintained-SI-value structures reported in the literature (Hidi & Renninger, 2006; Renninger et al., 2019; Rotgans & Schmidt, 2017). It could be suggested that the theoretical structure proposed in the literature was confirmed in the Turkish language.

It could be argued that the scale could be employed for reliable measurements since Cronbach Alpha internal consistency coefficient was high ($\alpha >$ .80) for both the sub-factors and in the overall scale (Büyüköztürk, 2007; Özdamar, 2017). The high and positive correlation between the scale sub-factors was important for determining the reliability of the measurement instrument. In another reliability analysis, it was determined that the items discriminated the individuals well since the total item corrected correlation coefficient was higher than .30 (Büyüköztürk, 2007). Based on these findings, it could be suggested that the reliability of the scale was high.

Limitations and Recommendations

Linnenbrink-Garcia et al. (2010) recommended that the scale be used to reflect students' general experiences in the classroom rather than a specific time period. Another limitation of the present study was related to the sample. It is recommended that the reliability and validity of the situational interest scale be determined in future studies with larger samples, different age groups, and random samples.

It is recommended that the survey be conducted with paper and pencil in the event that study participants engage in cyberfaking behavior (Grieve & Elliott, 2013), as the data in the current study was collected online via Google Forms.

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Appendix

Appendix-1: Factors and items of the Situational Interest Scale in Turkish language

Factor	Item Number	Items
ST	1	Bilgisayar öğretmenim beni derse heveslendirir.
	2	Bilgisayar dersinde öğretmenim dikkatimi çeken etkinlikler yapar.
	3	Bu yıl bilgisayar dersim genellikle eğlenceli geçiyor.
	4	Bilgisayar dersi o kadar heyecan verici ki derse dikkatimi kolayca verebiliyorum.
SMF	5	Bu yıl bilgisayar dersinde öğrendiklerimiz bende büyük ilgi uyandırıyor.
	6	Bu yıl bilgisayar dersinde öğrendiklerimiz beni heyecanlandırıyor.
	7	Bu yıl bilgisayar dersinde öğrendiklerimiz hoşuma gidiyor.
	8	Bu yıl bilgisayar dersinde yaptıklarımızı ilgi çekici buluyorum.
SMV	9	Bilgisayar dersinde öğrendiklerimizi bilmek benim için yararlıdır.
	10	Bu yıl bilgisayar dersinde yaptıklarımız benim için önemlidir.
	11	Bu yıl bilgisayar dersinde öğrendiklerimiz gerçek yaşama uygulanabilir.
	12	Bu yıl bilgisayar dersinde değerli bilgiler öğreniyoruz.

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A Model of Well-Being to Protect Mental Health during COVID-19 Pandemic Process

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Abstract

This study aimed to examine the mediating role of hope in the relationship between psychological resilience and the psychological wellbeing of teachers at the beginning of the COVID-19 epidemic. A total of 1059 teachers serving in Turkey, 729 female (%68.8) and 330 male (%31.2), whose ages vary between 21 and 62 ($\bar{X}$=35.83; SD=9.17), participated voluntarily in this study. The brief resilience scale, dispositional hope scale, and psychological wellbeing scale were used for data collection. In this study, a structural model for the psychological wellbeing of teachers at the beginning of the COVID-19 epidemic was constructed. Testing the hypothetically determined model was carried out with the Structural Equation Modelling technique, and the significance of its indirect effects was assessed by bootstrapping analysis. As a result, a structural wellbeing model has been obtained for teachers to protect their mental health. It was proved that hope has a fully mediating role in the relationship between psychological resilience and wellbeing.

Keywords: COVID-19 pandemic, resilience, hope, psychological wellbeing, teacher

Introduction

The new type of disease, called COVID-19 by the World Health Organisation, spread worldwide in 2020. It has been accepted as a pandemic and acute respiratory syndrome with serious consequences (WHO, 2020). A large part of the world's population had to comply with the house restriction to prevent the spread of the virus. The unexpected spread of the virus has brought universal psychological consequences such as sensitivity, anxiety, and stress, according to the World Health Organisation (WHO, 2020). Previous studies on pandemics have shown that mental wellbeing can be heavily affected during a major international pandemic (Sim & Chua, 2004; Wu et al., 2009). However, research shows that after the pandemic process is over, the negative psychosocial effects of the pandemic may continue in the long term (Shigemura et al., 2020).

Studies examining the psychological effects of quarantine on individuals show that hysteria, anxiety, and stress may increase in society due to the loss of control (Rubin & Wessely, 2020). In addition, in the first phase of the pandemic process, parents' separation from each other due to uncertainty in the development of the disease, insufficient access to basic needs, financial losses, and the increased risk perception due to information pollution from media or wrong sources may cause these psychological symptoms to increase even more (Maunder et al., 2020; Brooks et al., 2020). Past epidemic outbreaks have shown that the quarantine process has sudden effects such as irritability, fear of getting infected or spreading viruses to family members, anger, confusion, frustration, loneliness, denial, anxiety, depression, and insomnia, and destructive effects such as suicide (Hawryluck et al. 2004). It has been observed that the suspicion of being infected with the virus and quarantined cases about their own health status increases; they may have recurrent obsessive symptoms, and they show signs of post-traumatic stress disorder due to prolonged quarantine periods (Brooks et al., 2020). As can be understood from all these effects, the pandemic process is a versatile and difficult chaos process to control.

Turkey also experienced great chaos, has begun to take quarantine measures, and people have tried to establish a new order in this chaos. At the beginning of this process, education, health, work, and social life conditions were rearranged, and a struggle to adapt to the new order began. Education, one of the most affected areas by the COVID-19 pandemic, has become an important issue in which one of the biggest chaos is experienced and needs to be resolved quickly. The Ministry of National Education quickly established a new order and started the distance education process on 16 March 2020. Students, parents, and teachers trying to adapt to the distance

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education process while keeping up with quarantine and social isolation faced various disadvantages in this process. On the one hand, teachers having responsibilities such as online lectures and sharing course content, have struggled with new experiences and have become vulnerable to the negative psychosocial risks of the pandemic (Kırmızıgül, 2020).

In recent studies, it has been emphasised that it is necessary to develop protective activities immediately by identifying the psychosocial risks of COVID-19 and support individuals by identifying the protective factors for mental health for different sample groups (Dubey et al., 2020; Sood, 2020; Seçer & Ulaş, 2020; Rajkumar, 2020). The current research was carried out with certain sample groups such as students, healthcare professionals, and patients diagnosed with COVID-19. It was found that anxiety and stress were high in these groups (Lai et al., 2020; Wang et al., 2020; Seçer & Ulaş, 2020). In addition, students continuing their education at home with the closure of schools have difficulties following their online lessons, keeping up with technology, and getting enough support from their parents in dealing with the stress caused by the pandemic (Dubey et al., 2020). On the other hand, it was challenging for teachers to balance their personal and professional lives. For instance, some of the teachers have other responsibilities like monitoring and supporting online learning activities of their children or dealing with the negative emotions related to family members or friends (MacIntyre, Gregersen & Mercer, 2020). It can be said that teachers have a great role in healthily managing this process.

Sharma and Chopra (2020) emphasise in their study the role of teachers in the COVID-19 process and certain life skills they should acquire during the pandemic and afterwards that there is a need for more research on teachers. They also argue that teachers should be supported with training on leadership, emotional intelligence, creative thinking, adaptation to change, and technological skills (Sharma & Chopra, 2020). Many studies related to teachers in the Covid-19 pandemic focused on the effects of the Covid-19 conversion to online teaching (MacIntyre et al., 2020; Talidong & Toquero, 2020; Zhou & Yao, 2020; Matiz et al., 2020). Substantial levels of stress were reported by teachers in the study, examining correlations with stress, wellbeing, and negative emotions of teachers dealing with online teaching in the pandemic (MacIntyre et al., 2020).

In addition to the fact that teachers should have certain life skills, it is thought that there is a need to examine the factors threatening their psychological health. Protective strategies providing wellbeing should be developed since the pandemic may cause long-term permanent undesirable behaviours. The chaos created by the pandemic may affect education and teachers for a long time. In this respect, this research aims to examine hope as a mediator in the relationship between teachers' psychological resilience and wellbeing during the COVID-19 pandemic. In this context, this study suggests a model of wellbeing for teachers in Turkey to protect their mental health during the COVID-19 pandemic.

Theoretical Framework

Psychological Resilience and Psychological Well-Being

Psychological resilience is one of the prominent concepts of positive psychology, and it has entered the literature with a wide variety of definitions. Psychological resilience is often defined as the ability of individuals to maintain a stable balance when they encounter traumatic or stressful events (Bonanno, 2004). According to the definition made by the American Psychologists Association (APA, 2010), psychological resilience is a *"good adaptation process to important stressors such as negativity, trauma, tragedy, threats, family and relationship problems, serious health problems, workplace and financial stressors"*. As can be understood from the definitions, to observe psychological resilience, the triggering factor creating a negative condition, trauma, or stress must occur (Wright et al., 2013). In the literature, risk factors revealing psychological resilience are examined as individual, familial, and environmental factors. It is stated that the situations frequently seen in environmental factors are traumatic situations in all societies, such as social violence, war, natural disasters, diseases, and nuclear disasters (Masten & Reed, 2002). From this perspective, it is seen that the COVID-19 pandemic is an important environmental factor affecting psychological resilience.

Experts emphasise that the COVID-19 epidemic has psychosocial effects worldwide. Symptoms like anxiety and panic that seriously threaten mental health may occur, and fear and panic will bring more than the damage caused by the COVID-19 virus in the long term (Zhou et al., 2020). Therefore, there is a need to support individuals to sustain their psychological wellbeing in this process and cope with the psychological problems experienced during and after the pandemic.

Studies on mental health are based on the medical model, which has focused on symptoms and treatments for problems over the years (Seligman and Csikszentmihalyi, 2000). But in recent years, the missing part of the traditional medical model focused on psychopathology has been completed with the effect of postmodernism, and the positive mental health dimension has taken its place in the definitions of mental health. This view, the basis

of positive psychology, explains mental health with positive functionality called wellbeing rather than explaining it with any illness or disorder (Keyes et al., 2002). The World Health Organisation (2001) also adopted a positive mental health perspective in the definition of mental health. They defined it as a state of wellbeing in which individuals can be aware of their abilities and capacities, cope with stressful situations they encounter, and work efficiently and contribute to society.

In the COVID-19 process, sustaining and improving psychological wellbeing has an important place in the mental health of individuals. Psychological wellbeing is a six-dimensional wellbeing model developed by Ryff (1989) based on the potentials and functionality of human nature (Ryan & Deci, 2001). These dimensions provide a comprehensive roadmap to develop individuals' potentials, including self-acceptance, autonomy, individual development, life purpose, positive relationships, and environmental domination (Ryff, 1989; Keyes et al., 2002). Studies on psychological wellbeing suggest that psychological wellbeing is closely related to various variables. Psychological wellbeing has been widely explained by associating with concepts such as happiness (Bradburn, 1969), spiritual power (Lawton, 1983), depression (Waterman, 1993), optimism (Souri & Hasanirad, 2011), psychological resilience (Nath & Pradhan, 2012), life satisfaction (Ozpolat et al., 2012), personality traits (Garcia, 2011), positive and negative affect (Garcia & Moradi, 2013), and self-esteem (Rosenberg, 1965).
There are some studies in the literature examining the relationship between psychological resilience and wellbeing. Some researchers state that individuals being psychologically well experience less psychological stress in stressful or traumatic situations, they can recover themselves easily and quickly, and their psychological wellbeing is also at a good level (He et al., 2013; Ryff & Singer, 2003; Sagone & Caroli, 2014). Similarly, many of the studies conducted show that psychological resilience has an effect of increasing psychological wellbeing and there is a positive, meaningful relationship between the two concepts (Allen, 2016; Altıntaş, 2019; Malkoç & Yalçın, 2015; Conversano et al., 2010; Ghadami & Khalatbari 2015; Karacaoğlu & Köktaş, 2016; McDermott et al., 2010; Pidgeon & Keye, 2014; Sagone & Caroli, 2014; Souri & Hasanirad 2011; Yağmur & Türkmen, 2017). Based on this, it can be said that psychological resilience has an important place in ensuring individuals' psychological wellbeing.

Hope as a Mediator

The concept of hope was first explained as the individual's focus on goals and the power the individual perceives towards achieving these goals. In this context, Snyder (2002), who argued that the basis of human behaviour is goal-oriented, first developed the theory of hope and defined the concept of hope as the perceptions individuals have towards achieving their goals. Scioli (2007) formulated the concept of hope as a complex emotion with cognitive, social, and spiritual dimensions by the theory of hope he developed. According to this theory, hope is an emotional network that includes biological, psychological, and social resources. It is also a holistic concept including attachment, domination, struggle, and spirituality, which facilitates the evaluation of wellbeing.

Individuals are expected to have some strong features as a mental health indicator with a positive psychology trend. From this perspective, wellbeing can be sustained by developing strong psychological aspects such as hope and psychological resilience in individuals (Seligman, 2002). It is thought that being hopeful is closely related to a positive mood, acts as a protective shield against compelling mental illnesses such as depression, and can activate psychological resilience while in a troubled state (Chang, 2003; King et al., 2006; Peterson et al., 2007). According to Park, Peterson, and Seligman (2004), positive personality traits such as hope, curiosity, gratitude, and love have a strong relationship with life satisfaction.

In addition, many studies in the literature claim that the concept of hope is a strong predictor of wellbeing (Charles, 2013; Toner et al., 2012). For example, Charles (2013) concluded that hope has a positive, meaningful relationship with wellbeing and psychological resilience in his study investigating the relationship between hope, psychological resilience, and wellbeing. In addition, some research has revealed that hope is an important resistance factor in maintaining psychological wellbeing (Lloyd & Hastings, 2009; Shorey et al., 2007). Rustoen, Cooper, and Miaskowski (2010) stated that patients' hope has an intermediary role in the relationship between psychological distress and life satisfaction in their research with cancer. Satıcı (2016) concluded that hope has a mediating role in the relationship between psychological vulnerability, psychological resilience, and subjective wellbeing in his research. Similarly, in a study examining the relationship between psychological resilience, hope, wellbeing, and burnout, it was found that those who did not show burnout symptoms had higher levels of psychological resilience, hope, and wellbeing (Vetter et al., 2018). Therefore, hope is thought to have an intermediary effect between psychological resilience and psychological wellbeing.

Purpose of the Present Study

This research provided a conceptual framework grounded in positive psychology concepts, multidimensional hope theory, psychological wellbeing and resilience, and introduced these concepts and their relationship. In light of the information above, a structural model was designed for the psychological wellbeing of teachers during the beginning of COVID-19 (during the lockdown in Turkey) and to examine hope as a mediator in the relationship between psychological resilience and psychological wellbeing. Accordingly, the research questions are:

(H1) Does psychological resilience positively predict hope?
(H2) Does hope positively predict psychological wellbeing?
(H3) Does psychological resilience positively predict psychological wellbeing?
(H4) Does hope to have a mediating effect on the relationship between psychological resilience and psychological wellbeing?

Research conducted on mental health and related concepts before and during the pandemic was examined. A model based on the relationship between teachers' psychological resilience and wellbeing levels and the mediating role of hope has not been found in the literature. In this respect, it is thought that this research will make an important contribution to future preventive and remedial activities. For this purpose, the hypothetical model created within the framework of the related literature is presented in Figure 1 below.

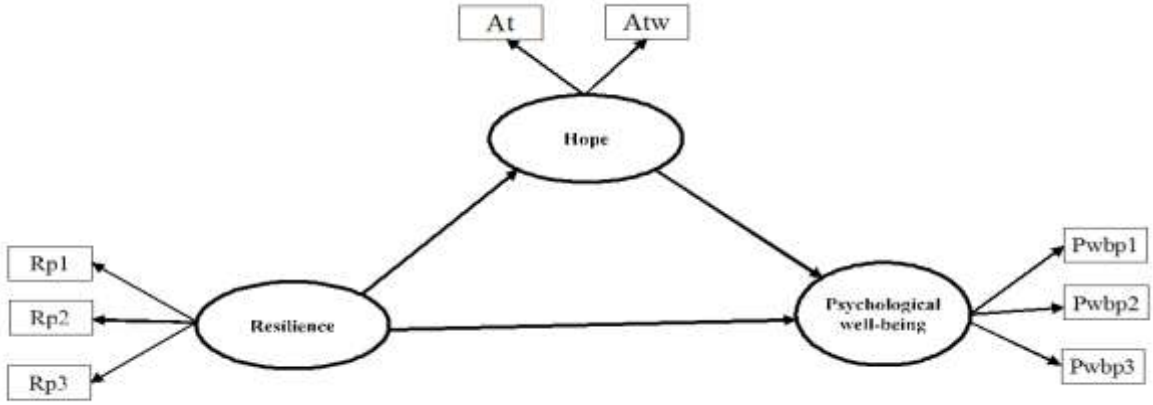

Figure 1. Hypothetical model

Method

Participants and Procedure

The survey was administered via Google Docs between 8 - 18 May 2020. The participants were reached via social media platforms and personal email contacts. The snowball sampling method was used to collect the data. Participants were required to respond to informed consent to take part in the study. At the end of the 10-day data collection, the survey was responded to by 1059 participants. They were not allowed to miss a value while filling out the survey questionnaires by using a feature of the Google Docs system. Through an online survey, a total of 1059 teachers serving in Turkey, 729 female (%68.8) and 330 male (%31.2), whose ages vary between 21 and 62 (X=35.83; SD=9.17), participated voluntarily in this study.

Data Collection Instruments

The Brief Resilience Scale, Dispositional Hope Scale, and Psychological Well-Being Scale were used in the data collection process.

Brief Resilience Scale (BRS): In this study, the Brief Resilience Scale (BRS) developed by Smith et al. (2008) and adapted to Turkish by Doğan (2015) was used. Its validity and reliability analyses were carried out. BRS consists of 6 items, and it is a one-dimensional 5-point Likert type measurement tool. BRS's score calculation is as follows: high scores after reverse scoring that individuals have high psychological resilience. The construct validity was made by Doğan (2015) with exploratory and confirmatory factor analysis. As the exploratory factor analysis results, a single factor measurement tool explaining 54% of the total variance was obtained. Factor loadings ranged from .63 to .79. As the results of the confirmatory factor analysis, goodness of fit values were found as $\chi 2$ / sd

(12.86 / 7) = 1.83, NNFI = 0.99; AGFI = 0.96; IFI = 0.99; GFI = 0.99; NFI = 0.99; CFI = 0.99, and RMSEA = 0.05. In the reliability analysis results, the internal consistency coefficient of (BRS) was found to be .83 (Doğan, 2015). The internal consistency coefficient obtained within the scope of this study is 0.84.

Dispositional Hope Scale (DHS): In this study, Dispositional Hope Scale (DHS) developed by Snyder et al. (1991), adapted to Turkish by Tarhan and Bacanlı (2015), was used. Its validity and reliability analyses were carried out. DHS is a two-dimensional 8 point Likert type measurement tool. These dimensions are alternative ways of thinking and actuating thinking. The DHS's score calculation is as follows: high scores indicate that hope levels have increased. Construct validity was examined by exploratory and confirmatory factor analysis. A two-factor structure that explains 61% of the total variance was obtained in the exploratory factor analysis. As a result of confirmatory factor analysis, goodness of fit values were revealed as NNFI = .94; AGFI = .92, GFI = .96; RFI = .90, CFI = .96, and RMSEA = .077. The internal consistency reliability analysis findings showed that the DHS's internal consistency coefficient was 0.84 (Tarhan & Bacanlı, 2015). The internal consistency coefficient obtained within the scope of this study is 0.91.

Psychological Well-Being Scale (PWBS):
In this study, the Psychological Well-Being Scale (PWBS) developed by Diener et al. (2009), adapted to Turkish by Telef (2013), whose validity and reliability analyses were performed, was used. PWBS has 8 items and is a one-dimensional 7-point Likert type measurement tool. In the calculation of the PWBS score, high scores mean that individuals have high psychological wellbeing. Construct validity was evaluated by Telef (2013) with exploratory and confirmatory factor analysis. As a result of the exploratory factor analysis, a single factor structure that explains 41.94% of the total variance was obtained. As a result of confirmatory factor analysis, goodness of fit values were found as $\chi 2$/sd (92,90/20= 4.64); NFI= 0.94; CFI= 0.95; RFI= 0.92; IFI= 0.95, and RMSEA= 0.08. In the reliability analysis findings, the Cronbach alpha coefficient was 0.80 (Telef, 2013). The internal consistency coefficient obtained within the scope of this study is 0.89.

Validity and Reliability Analysis of Measures within the Current Study

In the study, the reliability analysis of the measurements was examined with an internal consistency coefficient. In addition, to ensure the study's validity, the construct validity of the scales used in the measurements were taken into consideration. At this point, construct validity was evaluated by the confirmatory factor analysis technique. Table 1 below shows the internal consistency coefficients regarding the reliability and fit indices for confirmatory factor analysis.

Table 1. Results for validity and reliability analysis of measures

Parameter	BRS	DHS	PWBS
x^2/sd	4.01	3.40	4.81
RMSEA	.05	.04	.06
GFI	.99	.98	.98
CFI	.99	.99	.98
AGFI	.97	.97	.96
TLI	.98	.98	.97
Cronbach's Alpha	.84	.91	.89

Note. BRS: Brief Resilience Scale; DHS: Dispositional Hope Scale; PWBS: Psychological Well-Being Scale

Data Analysis

Preliminary analyses such as normality, homoscedasticity, and multicollinearity were performed before data analysis. After preliminary analysis, the data were analysed by two-step structural equation modelling (Kline, 2015). The measurement model was tested first; then, the structural model was tested. The maximum likelihood estimation technique was used. In addition, chi-square ($\chi 2$), $\chi 2$/sd ratio, CFI, TLI, GFI, NFI, and RMSEA fit index values were used in this study. $\chi 2$/sd ≤ 5; CFI, TLI, GFI and NFI $\geq .95$; RMSEA $\leq .60$ was determined as a reference point (Hu & Bentler, 1999).

Since psychological resilience and wellbeing scales consist of a single dimension, the parcelling method created virtual factors in structural equation modelling. The parcelling method assigns the scale items to the parcels based on the item-total correlation values within the framework of the determined parcel number. With this method, three parcels were produced for the implicit variables: psychological resilience and psychological wellbeing.

Thus, the reliability of the measurements is increased by decreasing the number of variables observed with the parcelling method, and it helps the data to show normal distribution. (Alhija & Wisenbaker, 2006).

A mediation test was carried out, taking into account the assumptions of Baron and Kenny (1989). Finally, the significance of its indirect effects was evaluated by bootstrapping analysis (Shrout & Bolger, 2002). At this point, bootstrap coefficient, lower and upper limit confidence intervals were obtained by creating 10000 resampling with bootstrapping analysis. As a result of the bootstrapping analysis, when the lower and upper limits in the confidence interval do not cover zero, their indirect effects are significant (Hayes, 2017).

Results and Findings

Preliminary Analysis

In the preliminary analysis section, the normality, homoscedasticity, and multicollinearity assumptions were evaluated. In addition, descriptive statistics and bivariate correlations analysis were carried out. In this context, for the normality assumption, kurtosis and skewness coefficients were first examined. It was found that the kurtosis and skewness coefficients of the seven variables in the study were below +/- 1.5, but the kurtosis coefficient of the Pwbp2 variable was 2.59. These conditions confirmed the normality assumption of distribution (Tabachnick & Fidell, 2007). In addition, the Levene test was used to assume the covariance of the data. In the Levene test results, it was found that the level of significance was higher than p> .05 in all variables except Awt. In this case, the covariance assumption of the data has been proved. Finally, the assumption of multicollinearity was examined. Accordingly, bivariate correlation coefficients, VIF (variance inflation factor), and tolerance values were examined. The bivariate correlation coefficients are suggested to be lower than .90, tolerance values to be higher than .10, and VIF values to be lower than 10 to meet this assumption (Kline, 2015). In the current data set, the bivariate correlations ranged between .27 and .72, tolerance values ranged between .41 and .52, and VIF values ranged between 1.89 and 2.39. Thus, all the bivariate correlations, tolerance, and VIF values satisfied the suggested criteria and showed that the multicollinearity assumption was met. Table 2 below presents the means, standard deviations, skewness, kurtosis, and bivariate correlations values.

Table 2. Means, standard deviations, skewness, kurtosis and bivariate correlations

Variable	1	2	3	4	5	6	7	8
(1) Rp1	1							
(2) Rp2	.69	1						
(3) Rp3	.57	.64	1					
(4) Awt	.39	.43	.48	1				
(5) At	.30	.36	.43	.67	1			
(6) Pwbp1	.37	.38	.47	.55	.61	1		
(7) Pwbp2	.29	.29	.40	.57	.59	.71	1	
(8) Pwbp3	.27	.27	.36	.51	.51	.71	.72	1
M	6.91	7.07	7.00	25.75	24.72	16.05	17.32	11.19
SD	1.97	1.83	1.73	4.50	4.48	3.45	2.70	2.13
Skewness	-.19	-.28	-.11	-.79	-.74	-.78	-.1.14	-.91
Kurtosis	-.59	-.20	-.36	.81	.77	.68	2.59	.92

**Note. ***p<.01; Rp1, Rp2, Rp3= Parcels of resilience; Awt: Alternative Ways Thinking; At: Actuating thinking; Pwbp1, Pwbp2, Pwbp3= Parcels of psychological well-being. All correlations is significant at the .01 level.

Testing Structural Equation Modelling

Testing the Measurement Model

In the first stage of structural equation modelling, the measurement model was tested. The measurement model consists of three implicit variables (psychological resilience, hope, and psychological wellbeing) and eight observed variables. As a result of the measurement model, it is seen that the standardised factor loads of the observed variables related to all implicit variables in the model vary between .66 and .91, and all of them are statistically significant. Since goodness of fit indices are found as [$\chi 2$ (15, 1059) = 68.74, $\chi 2$/sd = 4.58, p < .01; CFI = .99, TLI = .98, GFI = .99, NFI = .99; RMSEA = .06 90% CI (.05, .07)], the measurement model has been

proved to be well fit and validated. Table 3 below shows the factor loads, standard errors, t-values, and explained variances of the measurement model. After the measurement model was verified, the structural model was tested.

Table 3. Factor loadings, standard errors, t-values, and r^2 for the measurement model

Latent Variable and Measurement	Unstandardized Factor Loadings	SE	Standardized Factor Loadings	t	R^2
Resilience					
Rp1	0.85	0.04	0.66	17.36*	0.43
Rp2	0.89	0.04	0.74	19.13*	0.55
Rp3	1	-	0.88	-	0.77
Hope					
At	1	-	0.83	-	0.69
Awt	0.99	0.03	0.81	26.74*	0.66
Psychological well-being					
Pwbp1	1.87	0.07	0.91	26.87*	0.83
Pwbp2	1.47	0.05	0.91	26.89*	0.83
Pwbp3	1	-	0.79	-	0.62

Note. All *t* values were significant. p<.01; SE: Standard Error; Rp1, Rp2, Rp3= Parcels of resilience; at: Actuating thinking; Awt: Alternative Ways Thinking; Pwbp1, Pwbp2, Pwbp3= Parcels of psychological well-being.

Testing the Structural Model

When the structural model was tested, the goodness of fit indices found as [$\chi2$ (15, 1059) = 68.74, $\chi2$ / sd = 4.58, p <.01; CFI = .99, TLI = .98, GFI = .99, NFI = .99; RMSEA = .06 90% CI (.05, .07)] and were at an acceptable level. According to the goodness of fit indices, the data proved to fit well with the model. The path coefficients and factor loads for the tested model are shown in Figure 2 below. Since the coefficient of the path from psychological resilience to psychological wellbeing was not statistically significant (β=0.06, p>0.05), this path was removed from the model. The model was re-tested and the goodness of fit indexes were determined as [$\chi2$ (16, 1059) = 71.40, $\chi2$/sd = 4.46, p < .01; CFI = .99, TLI = .98, GFI = .98, NFI = .99; RMSEA = .06 90% CI (.04, .07). While the coefficient of the path from psychological resilience to psychological wellbeing was significant (β=0.50, p<0.05) when the effect of hope was eliminated in the model, it was found that it was not significant when hope was added to the model. This finding proves that hope has a fully mediating effect in the relationship between psychological resilience and wellbeing considering the mediation effect assumptions of Baron and Kenny (1989). Finally, it is necessary to clarify the meanings of model fitness coefficients and the standardised values of the model and the direct, indirect, and mediation relations. The effect size of the coefficients in the developed model was also considered in the evaluation of the model, shown in Table 4 below.

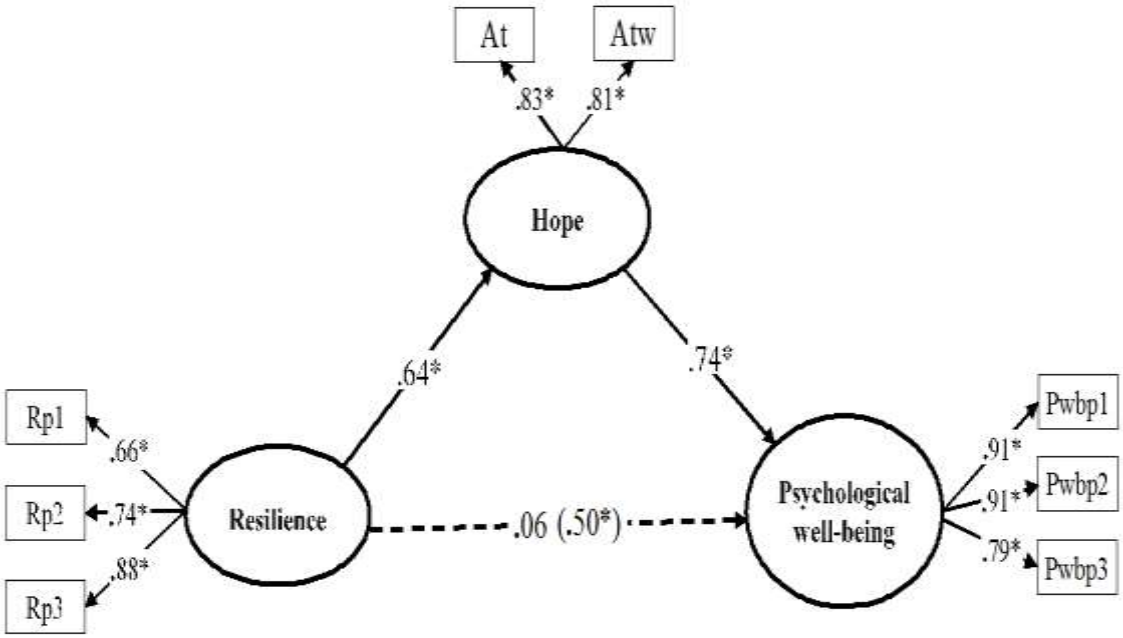

Figure 2. Standardized path coefficients of the structural model

Note. *p<.01, SE: Standard Error; Rp1, Rp2, Rp3= Parcels of resilience; At: Actuating thinking Awt: Alternative Ways Thinking; Pwbp1, Pwbp2, Pwbp3= Parcels of psychological well-being

Table 4. Evaluation of the final model

Model pathways	Standardized Coefficients	Effect Size
Direct effect		
Hope→Psychological Well-Being	0.74	High
Resilience →Psychological Well-Being	0.06	Low
Resilience →Hope	0.64	High
Mediator Effect		
Resilience →Hope →Psychological Well-Being	0.47	Moderate
Total Effect		
Resilience →Psychological Well-Being	0.53	High

Table 4 above shows the standardised path coefficient of independent variables on psychological wellbeing. Kline (2015) classifies path coefficients effect size as low below .10, medium below .30, and high above .50. According to this, the strongest predictor in the model is hope. A one-unit increase in hope increases psychological wellbeing by .74. The second predictor in the model is resilience. A one-unit increase in resilience quality increases psychological wellbeing by .06 points. The mediating effect for hope between resilience and psychological wellbeing in the model is 0.47. Based on this, the standardised total effect size of resilience quality on psychological wellbeing is 0.53.

Boottsrapping Process

Bootstrapping analysis with 10,000 resamplings was conducted to provide additional evidence of whether teachers' hope has a significant mediating role between psychological resilience and wellbeing. The coefficient for the indirect effect resulting from this bootstrapping analysis and the confidence intervals for this coefficient is given in Table 5 below.

Table 5. Bootstrap estimates of ındirect effects

Model pathway	Effect	95% CI	
		Lower	Upper
Indirect effect			
Resilience →Hope →Psychological Well-Being	.47	.40	.56

Note. Bootstrapping process was confirmed with 10.000 bootstrap samples. *p<.05

Considering the bootstrapping coefficient and the confidence intervals of this coefficient presented in Table 5 above, it is seen that the confidence intervals of the indirect path coefficient of hope between psychological resilience and wellbeing do not include zero; in other words, it is meaningful (b = .47, 95% CI= .40, .56). When all these results are evaluated, teachers' hope proves that they play a fully mediating role between psychological resilience and wellbeing. As a result of the evaluation of the variances explained in the model, it is determined that the psychological resilience variable explains about 41% of the hope variable and that psychological resilience and hope variables explain approximately 61% of the psychological wellbeing variable

Discussion

It is known that the COVID-19 pandemic affecting the whole world and causing many casualties negatively affects the psychological wellbeing of individuals and causes many psychological problems (Prime et al., 2020; Zhou et al., 2020). Dodge et al. (2012) define wellbeing as a state of balance between available resources and challenges. Psychological resilience is required (Rutter, 1985) to provide the necessary balance for wellbeing and benefit from resources in the face of troubles. The concept of hope, whose mediating role between psychological resilience and wellbeing was examined in this study, is accepted as a basic resource that helps people cope with life difficulties (Kylma, 2005) and a power that supports the maintenance of their wellbeing (Holdcraft & Williamson, 1991; Snyder et al., 1991). In this context, this study aimed to examine hope as a mediator in the relationship between psychological resilience and psychological wellbeing in a study group consisting of teachers at the beginning of the COVID-19 epidemic.

The results show a fully mediating role of hope in the relationship between psychological resilience and wellbeing. In other words, the fact that teachers have high feelings of psychological resilience enables them to experience higher hope, which increases their psychological wellbeing. Noddings (2005) explained that the happiness of a

teacher could affect the classroom climate and, therefore, students. According to Barker and Martin (2009), happy teachers teach students better. However, in a study, a significant positive relationship was found between the psychological wellbeing of teachers and students. A significant negative relationship was found between the psychological wellbeing of teachers and the psychological distress levels of students (Harding et al., 2019). Therefore, the high psychological wellbeing of teachers in this epidemic is important for themselves and their students.

This research showed that all of the hypotheses established for the research were confirmed and that psychological resilience and hope had significant positive relationships with psychological wellbeing. Although studies deal with hope as a mediator in the relationship between psychological resilience and subjective wellbeing (Ghavidel & Zarei, 2018; Satıcı, 2016), they did not focus on psychological wellbeing as a construct. Nevertheless, previous studies showing that psychological resilience (Harding et al., 2019; Keye & Pidgeon, 2014; Malkoç & Yalçın 2015; Mayordomo et al., 2016; Souri & Hasanirad, 2011) and hope (Charles, 2013; Faso et al., 2013; Toner et al., 2012; Vacek et al., 2010; Yeung et al., 2015) predict psychological wellbeing, support the results of this research. Additionally, our hypothesis that psychological resilience predicts hope has also been confirmed.

Scioli (2007) defines the concept of hope as a protective factor for psychological resilience and a structure that supports wellbeing in the multidimensional hope theory he has developed. Similarly, Horton and Wallander (2001) revealed that hope functions as a psychological resilience factor against psychological distress in their study. According to Seligman and Csikszentmahalyi (2000), the two pioneers of the positive psychology movement, psychological wellbeing can be improved by increasing hope and psychological resilience. The findings of this research are in line with previous studies examining the relationship between these structures.

Conclusion

This study reveals the mediating role of hope in the relationship between psychological resilience and psychological wellbeing for a group of teachers who work in different branches and levels in Turkey. This study aiming to determine the factors that will contribute to psychological wellbeing provides a model of wellbeing for researchers, practitioners, and decision-makers to protect teachers' mental health during and after the pandemic.

Limitations

There were some limitations to this study. First, we conducted the study thoroughly online during the COVID-19 pandemic. Therefore, it was difficult to control the side effects. Secondly, this study was conducted only via a quantitative method; however, qualitative research methods would be helpful to understand the protective needs of teachers' wellbeing. Thirdly, the study participants are composed only of the population who have a suitable electronic device for completing the instruments; therefore, those without suitable electronic tools have been eliminated from the study.

Recommendations

Some suggestions have been made for further research within the framework of the findings of this study. Snyder (2002) suggested that the theory of hope can be applied to different segments of society on a larger scale to reduce risk and instil hope against despair. According to Vander Weele et al. (2020), positive psychological conditions such as a sense of purpose, a feeling of life satisfaction or optimism are associated with physical and mental wellbeing. Based on this, researchers, healthcare professionals, decision makers, and policy makers should first evaluate the protective and healing effects of psychological resources such as psychological resilience and hope against all psychological disorders occuring during the COVID-19 pandemic. Secondly, positive psychology practices based on psychological sources such as psychological resilience, hope, and psychological wellbeing can be applied nationally and locally to interfere with the psychological problems caused by the COVID-19 pandemic. These interventions can be carried out through online applications to eliminate the risk of COVID-19 contamination and reach more people in less time. Online interventions were successfully carried out in China during the COVID-19 pandemic (Liu et al. 2020). For this purpose, different online tools like Online Photovoice (OPV) can examine the main three concepts through qualitative and/or mixed methods. Finally, to increase the psychological wellbeing of teachers, psycho-education programs can be offered within the scope of in-service training. These programs should have some modules such as psychological resilience, hope, and psychological wellbeing.

Acknowledgements or Notes

Compliance with Ethical Standards

All procedures performed in studies involving human participants were in accordance with the ethical standards and the Helsinki Declaration and its later amendments or comparable ethical standards. The authors declare that they have no conflict of interest. Informed consent was obtained from all participants included in the study. We did not receive any financial support for the research, authorship, and/or publication of this article.

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Development of Test-Taking Strategies Scale: High School and Undergraduate Form

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Development of Test-Taking Strategies Scale: High School and Undergraduate Form

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Abstract

Test-taking strategies are discussed in the literature as an important factor affecting test scores and are recommended to be taken into consideration regarding the validity of tests. Although studies have been conducted for more than a quarter century, no agreement has been reached on the dimensions of test-taking strategies. The purpose of this study is to develop a valid and reliable scale of test-taking strategies for university and high school students who experience intense periods of testing. In the scale created for this purpose, we consider tests with different types of titems and focus on strategies before, during, and after the test, excluding test preparation. Two separate forms of test-taking strategies were developed for the high school (27 items) and undergraduate (18 items) levels, using promising measurement theories and models.. Results indicated that the Person Separation Index, as a reliability index, was calculated as .88 for the high-school form and .93 for the undergraduate form. This study is significant in presenting valid and reliable tools for measuring test-taking strategies and can be considered exemplary research that uses the Partial Credit Model for Likert-type scale development.

Keywords: Test-taking strategies, Scale development, Likert type, Item Response Theory, Partial Credit Model

Introduction

Students face numerous tests and examinations throughout their educational life. Test scores are used for a variety of purposes, such as determining course performance, certification, admission to higher levels of education such as a university, or when seeking employment. Especially, the results of high-stakes tests such as a university entrance exam or civil service personnel selection exam, in the case of Turkey, are of significant importance in terms of their influence and impact on students' future lives.

The main objective of educational testing is to measure students' competency related to certain traits measured by the test. In general, students who demonstrate boundless efforts achieve the required competency and obtain significantly high scores from exams. It has been significantly reported that students may spend years preparing for high-stakes tests, with content-focused publications generated for full test preparation (Educational Testing Service, 2001). Practice, as part of exam preparation can have an important effect that reinforces learning. However, apart from the measured traits, numerous cognitive, psychological, physiological, and environmental variables may affect test results such as motivation, self-efficacy, perception, test anxiety, physical disability, or test-taking strategies. There are also numerous variables outside the focus of an assessment that can affect the results of exams. Test validity is theoretically defined as 'the characteristics of the examiner that are not related to measured trait' that may affect the test results. For this reason, creating standard test conditions to increase the validity of measurement results (American Psychological Association, American Educational Research Education, National Council on Measurement in Standards, 1966), providing test adaptations for people with disabilities (Şenel & Kutlu, 2018; Şenel & Şenel, 2018), using test anxiety counselling programmes (Demirci & Erden, 2016), and teaching test-taking strategies (Beidel et al., 1999; Dodeen, 2015; Kesselman-Turkel & Peterson, 2004) are becoming increasingly important. Therefore, it is important to be able to measure such constructs that may affect test scores and provide evidence of a test's validity.

On the validity of test scores, the literature focuses on the content of the measurement, test plan preparation, test development, and test statistics. However, respondents' answering behaviours and test-taking strategies are not considered within the focus of research and discussions regarding test validity (Bachman, 1990; Cohen, 2007).

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Where some respondents effectively employ appropriate test-taking strategies, other respondents at the same proficiency level may face difficulties regarding what the exam measures, in other words, the validity of the test. Test-taking strategies have been discussed in the literature as an important factor affecting test scores (Beidel et al., 1999; Dodeen et al., 2014; Therrien et al., 2009), and are recommended to be taken into consideration in terms of the validity of tests (Bachman, 1990; Cohen, 2007). Test-taking strategies can also be evaluated as a part of the test itself (Cohen, 2007).

It should be considered how strategic approaches may be used for different test item types, which may affect the score and validity of the exam. 'Strategy' can commonly be defined as a set of tactics and methods applied to achieve a specified goal (Ün Açıkgöz, 2003). On the other hand, *test-taking strategies* consist of various information, techniques, and methods used to answer test items, apart from the cognitive skills of the respondent, to achieve exam success or to gain a higher test score. In the literature, such strategies are referred to as *test-taking strategies* (Chittooran & Miles, 2001; Dodeen, 2015; Hong et al., 2006; Peng et al., 2014; Therrien et al., 2009) or *test-wiseness strategies* (Cohen, 2007), and as a more inclusive term *test-taking skills* (Boyd, 1989; Chittooran & Miles, 2001; Dodeen et al., 2014; Lewandowski et al., 2013). In the current study, it was found appropriate to apply the term *test-taking strategies*. However, the scale's theoretical framework includes all testing types as simply the 'exam', with *exam,* considered a much broader concept than simply *testing*. While 'test' is used for a specific measurement tool or technique, 'exam' refers to the entire end-to-end assessment process. For example, university entrance exams commonly consist of quantitative and verbal tests. *Exam* is a more inclusive expression and is used as a term that explains the application of tests and the entire assessment process (Tekin, 1996). In contrast, *test* is a more general label that covers measurement tools much broader (Baykul, 2010).

The literature explains the relationship between test-taking strategies and various psychological characteristics, and these studies can be summarised as follows:

- There is a negative correlation between test-taking strategies and exam anxiety (Bruch, 1981; Dodeen et al., 2014; Dodeen, 2015; Peng et al., 2014). Exam anxiety can be reduced through training on test taking strategies (Beidel et al., 1999; Chittooran & Miles, 2001; Dodeen, 2015; Lewandowski et al., 2013). Kesselman-Turkel and Peterson (2004) and Chittooran and Miles (2001) also considered the reduction of test anxiety as a form of test-taking strategy.
- Using test-taking strategies has increased exam scores (Bruch, 1981; Lewandowski et al., 2013; Therrien et al., 2009) and positive attitudes towards exam-taking (Dodeen, 2015).
- Low-achiever students tend to use test-taking strategies more (Cohen, 2007).
- It is important to teach test-taking strategies to students with special needs (Lewandowski et al., 2013; Therrien et al., 2009), otherwise such strategies are unlikely to be adopted. Using test-taking strategies can prevent students with special needs from falling behind their peers due to a lack of strategies.The use of test-taking strategies indicates a positive correlation with course motivation (Peng et al., 2014).
- Recent studies on test-taking strategies focus on technologies that enable individuals to record variables such as time spent answering and eye movements in computer-based tests (Brunfaut & McCray, 2015; Roderer & Roebers, 2014).

The first step in a scale development study is to define the construct to be measured and establish its theoretical basis (Erkuş, 2012). As observed in the literature, there are various conceptual definitions of test-taking strategies and theoretical models based on different dimensions. However, no consensus has been reached on the dimensions of test-taking strategies, although this area has been studied for more than a quarter of a century (Cohen, 2007). The dimensions of studies that have looked at test strategies over the past 20 years and the instruments and techniques they have used to determine test strategies are summarised in Table 1.

When Table 1 and similar studies in the literature (e.g., Kesselman-Turkel & Peterson, 2004) are examined, the major test-taking strategy dimensions can be summarised in three different approaches. First, some deal separately with affective, cognitive, and metacognitive dimensions. The importance attributed to the exam, self-efficacy, test motivation, and attitude are the affective characteristics that are particularly emphasised for reducing test anxiety. The cognitive dimension refers to the cognitive processes employed whilst answering, other than the measured feature. Metacognitive strategies can be expressed as the ability to be aware of the students' cognitive and affective strategies, organise them. Many studies are based solely on the metacognitive dimension. Second, some studies consider the test preparation as test-taking strategies; however, since test preparation includes a dimension that could also be considered as studying skills, it may not be possible to focus solely on the exam. It should also be taken into account that some students follow the lessons and can make an exam-oriented preparation by carrying out a planned study (Yıldırım et al., 2000). Apart from this, classifying test-taking strategies as pre-test, during-test and post-test is another accepted classification (Dodeen, 2008).

Table 1. Summary of the research focusing on test strategies

Research	Peng et al. (2014)	Bıçak (2013)	Hong et al. (2006)	Dodeen (2008)	Chittooran & Miles (2001)
Dimensions	*Motivational* • Importance of exam • Effort • Self-efficacy • Test anxiety *Cognitive* • Tactics • Metacognitive strategies	*Test preparation* • Cognitive • Social • Metacognitive *During test* • Item analysis • Time scheduling • Correct response estimation *Post-test*	• Test preparation strategies • Test preparation awareness • Test-taking strategies	• Pre-test strategies • Strategies during testing • Post-test strategies • Time management	• Familiarity with test features • Familiarity with test content • Test preparation • Test wisdom • Management of test anxiety
Data Collection Tool	*Test-Taking Strategies Questionnaire* (Hong & Peng, 2004) and applied by adding new items for research purposes	• *Test Preparation Scale* • *Test-Taking Strategies Scale* (secondary education students)	Interview	31-item scale (university students)	Literature review

Studies aimed at determining test-taking strategies are mostly conducted with qualitative research or using checklists and questionnaires based upon self-evaluation and perception (Cohen, 2007; Hong et al., 2006; Pehlivan & Kutlu, 2014; Peng et al., 2014). More recent research studies have assessed test-taking strategies using psychological measurement tools (Bıçak, 2013; Dodeen, 2008). As test-taking strategy vary according to the item types of the exams (Anderson, 1991; Boyd, 1989; Cohen, 2007; Kesselman-Turkel & Peterson, 2004), scale items differentiate according to exam item types. For instance, a strategy for multiple-choice items such as 'When answering questions, I eliminate the option that looks different from the others' cannot be applied in an exam consisting of open-ended items.

The literature includes scale development studies to determine test preparation strategies and test strategies, and various studies that have applied the developed scales (e.g., Bıçak, 2013; Dodeen, 2008; Dodeen et al., 2014). However, the focus of these studies was on high school (Bıçak, 2013) and university students (Dodeen, 2008), and the literature has mostly discussed strategies for multiple-choice items excluding open-ended items and other item types (Bıçak, 2013). Furthermore, the studies in which test preparation strategies were examined were mainly based on indicators of studying skills. Thus, the goal of the current research is to develop scales that include test-taking strategies for pre-test, during-test, and post-test, but not test preparation strategies for high difficulty exams that university and high school students often face and that have different item types.

In order to collect validity and reliability evidence of the scale development process, techniques based mainly on the Classical Test Theory are used. For the reliability proofs of a Likert-type scale, the Cronbach alpha or split-half methods are mainly used as an indicator of internal consistency, and item-total correlations are presented as a statistical value for item validity (Kartal & Dirlik, 2016; Kizilkaya & Aşkar, 2009; Kutlu et al., 2009). Classical test theory has its limitations as it provides values that depend on the study group or item sample, focuses on only one source of error (the internal consistency indicator Cronbach's alpha focuses on the consistency of item scores), and provides a single reliability value (Crocker & Algina, 2006; Embretson & Reise, 2000; Hambleton et al., 1991; Kaya Uyanık et al., 2019). The Item Response Theory (IRT), which largely exceeds these limitations, is a powerful theory widely used among current measurement theories.

In light of the latest developments in measurement and evaluation, although there has been a slight increase in the use of IRT-based models in the development of Likert-type scales, there has been limited research undertaken in this area (Demirtaşli et al., 2016; İlhan & Güler, 2018; Wongpakaran et al., 2020; Yaşar & Aybek, 2019). There are many advantages suggested for the use of the Rasch model in the process of collecting validity evidence for a Likert-type scale (Bond & Fox, 2015; Boone et al., 2014; Engelhard & Wind, 2017; Güler, 2014; İlhan & Güler, 2018; Linacre, 1994; Primi et al., 2019).

In the current study, Partial Credit Model (PCM) was used, one of the models based on IRT. PCM has both the advantages of IRT and the features of the Rasch model. It was developed by Masters in 1982, and is an extension of the Rasch model developed for two-category items. This model is used when distances between the response categories in Likert-type items differ from item to item. One of the important features of the model is that it is possible to score individuals with a moderate level θ (Koch & Dodd, 1989). The use of PCM is strongly recommended due to its advantages over IRT (Van Zile-Tamsen, 2017). In addition to the main purpose of the

research, this study aims to contribute to the literature by reflecting current and valid measurement approaches in the field and providing an example of Likert-type scale development based on the Partial Credit Model (PCM).

Method

In the current study, we aimed to develop a measurement tool to determine students' test-taking strategies. In this context, this research is a scale development study. Information about the study group and the processes followed throughout the development of the test-taking strategies scale are as follows.

Study Group

In scale development studies, the trial application group should be as heterogeneous as possible regarding the feature to be measured (Erkuş, 2012). In this way, statistical results can be examined for their ability to measure individuals who have the measured characteristic at different levels. For this reason, we choose a working group that would include individuals using different strategies at different levels. The scale was chosen to include the high school and undergraduate students of the group it was developed. It is thought that these groups may show different characteristics in being exposed to different types of exams and test-taking strategies. A total of 321 high school students in their final grade (i.e., 12^{th} grade) from Anatolian, Science, Social Sciences, and Vocational high schools in Turkey were reached with convenience sampling. 71% are female (n = 229) and 29% male (n = 92). Additionally, 337 undergraduate students attending Tourism, Education, Engineering and Science, and Literature faculties were reached, with 68% of the students being female (n = 231) and 32% male (n = 106). Additionally, 110 students-49 high school students for the high school form and 61 university students for the undergraduate form the study to examine the criterion-referenced validity of the final forms.

Development of the Items

A review of the different methods used to examine testing strategies in the literature can be found in Table 1. The items in this study targeted pretest, duringtest, and posttest strategies based on the scales, questionnaires, and findings used in the literature presented. The reason for developing items that take into account these three different time intervals is that strategies differ at certain points in the testing process. Prior to an exam, students may use certain strategies to prepare themselves physiologically, psychologically, and cognitively. These strategies include, for example, consuming drinks that they believe will increase their alertness, trying to relax by taking a walk in the fresh air, and discussing controversial topics with friends. During an exam, the primary goal is to answer as many questions as accurately and completely as possible. Following an exam, it is about evaluating the answers given and assessing the strategy used during the exam by monitoring one's time management, reviewing any mistakes, and organising or changing strategies before and during the exam to better prepare for the next exam.

While developing scale items, the literature (Chittooran & Miles, 2001; Cohen, 2007; Dodeen, 2015; Rozakis, 2003; Yıldırım et al., 2000) and items from similar scales in the literature (Bıçak, 2013; Dodeen, 2008) were used in the current study. The scale was developed as a 5-point, Likert type instrument consisting of *never*, *rarely*, *sometimes*, *often*, and *always* response categories. Following the item writing process, a 49-item trial form was created. The form was then reviewed by three lecturers from the field of Assessment and Evaluation, and one faculty member from the field of Guidance and Psychological Counselling, in terms of reflecting the relevant structure of the items, the accuracy of the statements used, and whether or not the scope was reflected adequately and accurately. Finally, as the scale was developed and applied in Turkish, the language and clarity were evaluated and edited by a faculty member from the Turkish Language and Literature department. With revisions taking into account the expert opinions received, the form was subsequently reduced to 47 items.

The trial form was then applied as an online instrument. A pre-trial application was first applied to a total of 19 students (eight high school and 11 undergraduates) to observe in advance any unforeseen issues with comprehensibility or implementation. The participants found the trial form to be mostly clear and understandable. However, one respondent stated having to read Item 23 several times to understand it. This item was subsequently changed to a more simplified structure. The original items (included and excluded) are presented in Appendix 5.

Data Collection

A trial application is the process of collecting data for validity proofs of the scale. In this process, participant volunteerism is very important as the accuracy of the data affects the structure of the final scale. Sending out the online form of the scale electronically and requiring no personal information may provide the necessary freedom

for volunteering; however, education level, faculty and department, gender, and grade level were obtained from the participants for analysis.

Data Analysis

After the data collection had been completed, the scale development assumptions of the Rasch model were tested, with unidimensionality and local independence being the two basic assumptions. Wright (1996) stated that factor analysis should test unidimensionality as an assumption in the Rasch model. In this first phase of the current study, we aimed to develop a single form for high school and undergraduate students. Based on this aim, Explanatory Factor Analysis (EFA) was performed on the data of 658 participants, without separating them according to educational level (i.e., high school and undergraduate students) to test unidimensionality. However, the factor structure of the high school and undergraduate student level indicated significant differences in terms of the number of items, factor loads, total-explained variance, and afterwards in producing distorted results in model-data fit. At this stage, we decided that test-taking strategies indicate dissimilar constructs at the high school and undergraduate level. Therefore, the subsequent analyses were conducted as two separate participant groups to test the validity of two separate scales, i.e., a high school form and an undergraduate form.

The scree-plot graphs (see Appendix 1 and Appendix 3) were used to determine the scale factors. Both forms of the scale were shown to have a one-dimensional structure, and factor loadings (see Appendix 2 and Appendix 4) were considered in deciding on the items included in both forms. According to Tabachnick and Fidell (2007) and Kline (2011), factor loads should be at least .32 to be included. In the current study, the .32 value was used to determine when items were included in the scale. EFA proofs and Martin-Löf test results were used for unidimensionality. Tennant and Conaghan (2007) suggested using inter-item residual correlation values to meet local independence, which is an assumption of the Rasch model. In the current study, we used a .40 value in analysing residual correlations between items.

Reliability was evaluated using the Person Separation Index (PSI) from the Rasch analysis. This is similar to coefficient alpha, but uses the metric latent trait in place of the summed score. The literature suggests that a PSI value of .7 or above reflects consistency (Tennant & Conaghan, 2007). After the Rasch model assumptions had been tested, estimates were made regarding PCM. The calculation used to assess the probability of getting an *x*-score from Item *j* of Student *i* is given in Equation 1.

$$\boldsymbol{P_{ijx} = \frac{exp \sum_{k=0}^{x}(\theta_i - \beta_{jk})}{\sum_{k=0}^{m} exp \sum_{t=0}^{k}(\theta_i - \beta_{jt})}} \quad \textbf{(1)}$$

PCM has an individual parameter θ and an item parameter β. The β parameter is defined as the 'step difficulty', which describes a student's successful completion and then moving on to the next step. The 'step difficulty' parameter is also known as the 'category intersection' parameter. Consequently, the step difficulty parameter was defined as the difficulty of choosing one response category over another response category. In PCM, the step difficulty parameters are one less than the item category number. For example, there would be three-step difficulty parameters for an item with four categories.
Insignificance of chi-square fit statistics is an indicator of item-model fit in PCM. Chi-square statistics are based on the difference between expected and observed values at different trait levels. In the current study, considering the Bonferroni correction, the .002 level was used to fit the item model (Bland & Altman, 1995). RStudio and R4.0.3 software with norm, mice, mnormt, psych, classInt, and eRm packages were used for the PCM estimates. IBM SPSS Statistics version 20 was used to process the data for the EFA and other analyses.

The 20-item Test-Taking Strategies Scale developed by Bıçak (2013) was used as the criterion reference to measure the validity of the scales. The developed forms and the Test-Taking Strategies Scale (Bıçak, 2013) were applied to 49 high school students for the high school form and 61 university students for the undergraduate form. Since the data was not normally distributed, the Spearman-Brown rank-order correlation coefficient was calculated for the correlation index.

Results and Discussion

Validity and Reliability Measures of High School Form

EFA was conducted to test unidimensionality, one of PCM's assumptions. The KMO value was found to be .95, and the Bartlett sphericity test result was significant (χ^2 = 8089,89; SD = 990; p = .000). Considering these results, we determined that the data was a good fit for factor analysis. It was revealed that the scale consisted of 47 items

within a one-dimensional structure. The factor loading values of two items were excluded from the scale since they were lower than .32. When the scree-graph in Appendix 1 is examined, it can be seen that the 45-item scale has a single dominant factor. Factor loadings of the items and their contributions to common variance are also presented in Appendix 1.

In testing the local independence, residual correlations between items were examined. The residual correlation value between the ninth and 10th items was determined to be .43. In examining these items, it was found that the ninth item ('I plan how I will use the time in relation to the whole test lesson') and the tenth item ('I try to estimate how much time I have available for each item') measured similar features and thus interfered with local independence. For this reason, it was decided to retain the ninth item, which is both more comprehensible and has a higher factor loading, while the 10th item was retained.
After testing the assumptions, the analysis of the remaining items in the scale was carried out according to PCM. It was determined that 17 of the 44 items did not show item-model compatibility. According to the Martin-Löf test statistic result for 27 items, no significant difference existed between the expected and observed values (LR-value: 796.518, p =.99). This result formed the second proof of unidimensionality. Item-model fit values for the remaining 27 items are presented in Table 2.

Table 2. PCM Item-Model Fit Indexes-High School Form

Item No	X^2	p	Outfit MS	Infit MS	Item No	X^2	p	Outfit MS	Infit MS
M8	328.501	.345*	1.027	0.774	M27	367.895	.031*	1.150	1.166
M9	366.095	.035*	1.144	1.048	M28	273.724	.968*	0.855	0.864
M11	389.714	.004*	1.218	1.182	M29	306.347	.685*	0.957	0.968
M12	324.365	.406*	1.014	1.044	M31	356.310	.074*	1.113	1.058
M14	391.029	.004*	1.222	1.147	M36	346.091	.142*	1.082	0.910
M16	341.149	.188*	1.066	1.091	M37	359.497	.059*	1.123	1.043
M17	246.575	.999*	0.771	0.768	M39	326.755	.370*	1.021	0.995
M18	286.628	.903*	0.896	0.939	M40	266.714	.985*	0.833	0.852
M19	326.348	.376*	1.020	1.043	M41	236.168	1.000*	0.738	0.786
M21	319.902	.475*	1.000	1.057	M42	267.441	.984*	0.836	0.888
M22	312.095	.598*	0.975	0.970	M43	311.057	.614*	0.972	0.942
M24	348.358	.124*	1.089	0.842	M45	228.121	1.000*	0.713	0.772
M25	367.548	.032*	1.149	1.129	M46	266.279	.986*	0.832	0.866
M26	343.724	.163*	1.074	1.000					

*p > .002

As summarised in Table 2, all 27 items showed item-model fit. Convenient quantitative measures of fit discrepancy are mean-square residual summary statistics, such as Outfit and Infit. These statistics have an expectation of 1.0, and range from 0 to infinity. Mean-squares greater than 1.0 indicate underfit to the Rasch model, i.e., data less predictable than the model expects. Mean-squares less than 1.0 indicate overfit to the Rasch model, i.e., data more predictable than the model expects. However, the reasonable ranges for Outfit and Infit for rating scales is considered to be 0.6-1.4 (Wright, 1996). According to Table 2, all values were within the 0.6-1.4 range. Item parameters calculated within PCM for 27 items are presented in Table 3.

Table 3. Item Parameters of High School Form

Item No	Location	b1	b2	b3	b4	Item No	Location	b1	b2	b3	b4
M8	0.100	-0.725	-0.348	0.369	1.106	M27	0.728	-0.110	0.365	1.407	1.250
M9	0.687	-0.262	0.421	0.943	1.645	M28	0.222	-0.711	0.209	0.620	0.769
M11	0.335	-0.509	0.175	0.840	0.835	M29	0.832	-0.681	0.883	1.290	1.835
M12	0.487	-0.267	0.177	0.542	1.496	M31	0.568	-0.458	0.473	0.748	1.508
M14	0.688	0.146	0.302	1.205	1.100	M36	-0.097	-0.985	-0.607	0.559	0.643
M16	0.180	-1.477	-0.299	0.908	1.586	M37	0.415	-0.432	0.326	0.793	0.974
M17	-0.195	-1.568	-0.518	0.169	1.135	M39	0.254	-1.296	0.321	0.522	1.469
M18	0.296	-0.398	-0.016	0.603	0.994	M40	-0.082	-1.511	-0.172	0.408	0.949
M19	0.167	-0.999	-0.207	0.610	1.266	M41	0.116	-0.736	-0.183	0.386	0.997
M21	0.582	-0.290	0.272	0.944	1.399	M42	0.157	-0.497	-0.008	0.382	0.751

Item No	Location	b1	b2	b3	b4	Item No	Location	b1	b2	b3	b4
M22	0.443	-0.366	0.208	0.462	1.468	M43	0.504	-0.447	0.019	0.636	1.806
M24	-0.155	-0.512	-0.260	0.078	0.074	M45	0.161	-0.636	-0.172	0.632	0.820
M25	0.352	-0.714	0.100	0.976	1.044	M46	0.478	-0.534	-0.017	0.857	1.605
M26	0.089	-1.061	-0.125	0.337	1.205						

As Table 3 shows, there were no disordered thresholds. As all of the items were polytomous, an analysis was conducted of each category's ordering. The issue here is whether the transition from a lower to a higher response category within an item was consistent with increases in the underlying trait. The scale's reliability was examined using Person Separation Index (PSI), which is equivalent to Cronbach's alpha, but has a linear transformation regarding the Rasch model. Tennant and Conaghan (2007) suggested that a coefficient score above .70 proves the consistency of a scale, and the PSI coefficient for the current study was calculated as .93. The correlation between high school form scores and criterion scale scores (Bıçak, 2013) was calculated to be 0.689 ($p < .01$). This mean correlation is evidence that the scales measure similar constructs. The result can also be interpreted as the degree of criterion-related validity.

Validity and Reliability Measures of Undergraduate Form

EFA was conducted to test the unidimensionality of the scale, which is one of PCM's assumptions. The KMO value was found to be .87 and the Bartlett sphericity test result was shown to be significant ($\chi^2 = 3771{,}149$; $SD = 561$; $p = .000$). Considering these findings, we determined that the data was well-fitted for factor analysis. It was revealed that the scale consisted of 47 items within a one-dimensional structure. The factor loading values of 13 items were excluded from the scale because they were lower than .32. When the scree-graph in Appendix 2 is examined, it can be seen that the 34-item scale has a single dominant factor. Factor loadings of the items and their contributions to common variance are also presented in Appendix 2.

In testing the local independence, residual correlations between the items were examined. The residual correlation value between the ninth and 10th items was determined to be .41. Examination of these items revealed that the ninth item ('I plan how I will use the time in relation to the whole test lesson') and the tenth item ('I try to estimate how much time I have available for each item') measure similar features and therefore interfere with local independence.For this reason, it was decided to retain the ninth item, which is both more understandable and has a higher factor load, whilst the 10th item was excluded from the scale.

After testing the assumptions, the analysis of the remaining items in the scale was carried out according to PCM. It was determined that 15 of the 33 items did not show item-model compatibility. According to the Martin-Löf test statistic result for 18 items, it was revealed that there was no significant difference established between the expected and observed values (LR-value: 399.42, $p = 1.000$). This result is considered as a second proof of unidimensionality. The item-model fit values for the remaining 18 items are presented in Table 4.

Table 4. PCM item-model fit indexes of undergraduate form

Item No	X^2	p	Outfit MS	Infit MS	Item No	X^2	p	Outfit MS	Infit MS
M5	336.609	.419	1.024	0.881	M38	365.218	.101	1.156	1.008
M8	318.322	.696	0.941	0.955	M40	404.040	.004	1.216	1.006
M9	368.928	.079	0.989	0.971	M41	326.974	.568	0.982	0.898
M17	300.465	.892	1.050	1.021	M42	340.701	.359	1.025	0.955
M18	368.169	.084	0.897	0.889	M43	286.451	.966	0.879	0.845
M19	332.427	.483	1.144	1.089	M44	265.771	.997	0.789	0.754
M22	371.701	.066	0.998	0.989	M45	260.580	.999	0.794	0.751
M28	298.103	.909	1.131	1.047	M46	328.430	.545	1.019	0.935
M29	387.678	.019	0.885	0.903	M47	406.961	.003	1.189	1.089

*$p > .002$

As summarised in Table 4, all 18 items showed item-model fit. Convenient quantitative measures of fit discrepancy are mean-square residual summary statistics, such as Outfit and Infit. These statistics have an expectation of 1.0, and range from 0 to infinity. Mean-squares greater than 1.0 indicate underfit to the Rasch model, i.e., data less predictable than the model expects. Mean-squares less than 1.0 indicate overfit to the Rasch model, i.e., data more predictable than the model expects. However, reasonable ranges for Outfit and Infit for

rating scales are suggested to be 0.6-1.4. (Wright, 1996). According to Table 4, all of the values are within the 0.6-1.4 range. The item parameters calculated within PCM for the 18 items are presented in Table 5.

Table 5. Item parameters of undergraduate form

Item No	Location	b1	b2	b3	b4	Item No	Location	b1	b2	b3	b4
M5	-0.662	-2.022	-0.534	-0.412	0.319	M38	-0.309	-1.627	-0.210	-0.020	0.619
M8	-0.181	-1.664	-0.290	-0.174	1.403	M40	-0.086	-1.621	-0.504	0.034	1.745
M9	0.561	-0.744	0.337	0.830	1.820	M41	0.586	-0.282	-0.001	0.941	1.684
M17	0.403	-0.515	-0.058	1.783	1.830	M42	0.563	-0.063	0.204	0.279	1.831
M18	0.779	-0.415	0.741	1.185	1.606	M43	0.616	-0.652	-0.575	0.307	2.078
M19	0.448	-0.539	-0.329	0.738	1.923	M44	0.567	-0.403	-0.355	0.250	1.969
M22	0.727	-0.758	0.850	0.857	1.960	M45	0.329	-0.372	-0.319	0.446	1.562
M28	0.049	-1.267	-0.419	0.231	1.649	M46	0.618	-0.600	0.115	0.769	2.187
M29	1.069	0.353	0.502	1.161	2.262	M47	0.577	-0.212	-0.038	1.302	1.502

As Table 5 shows, there were no disordered thresholds. As all of the items were polytomous, an analysis was undertaken of the ordering of each category. The issue here was whether or not the transition from a lower to a higher response category within an item was consistent with an increase in the underlying trait. The scale's reliability was examined using the PSI, which is equivalent to Cronbach's alpha, but has a linear transformation from the Rasch model. In the current study, the PSI value was calculated as .88. The correlation between undergraduate form scores and criterion scale (Bıçak, 2013) scores were found as 0.805 ($p>.01$). This high correlation emphasize the similarity of the constructs measured by the scale developed for similar purposes. The finding constitutes important evidence for criterion referenced validity.

Discussion and Conclusion

Examination and test scores play an important role in modern life, and test-taking strategies are considered an important factor affecting test scores. However, attempts to measure test-taking strategies are seen as relatively new, and there is no complete agreement, as yet, from a theoretical perspective (Bıçak, 2013; Cohen, 2007; Dodeen, 2008; Hong et al., 2006; Pehlivan & Kutlu, 2014; Peng et al., 2014). The effect of test-taking strategies on different psychological characteristics related to testing has been investigated in the literature (Beidel et al., 1999; Bruch, 1981; Chittooran & Miles, 2001; Dodeen, 2014; Dodeen et al., 2014; Kesselman-Turkel & Peterson, 2004; Peng et al., 2014). On the other hand, test results should be calculated without using an test-taking strategy (Smith, 2017) as a confounding psychological feature unrelated to the measured structure. As a result of the current research, valid, reliable, and up-to-date scales measuring test-taking strategies were developed for different grade levels. The developed scales are expected to contribute to the field and to their application as they have been shown to make assessments with a high degree of validity.

The study was initiated to develop a scale focusing on the 17-22 year old student age group, which frequently encounter exams during their education. However, in the validity analysis of the research data, it was observed that test-taking strategies at the high school and undergraduate level showed significant differences in the psychological construct. Aside from the purpose of the current study, an additional finding was that test strategy structures differed according to the schooling level. Therefore, in the current study we developed both a high school form (consisting of 27 items) and a university form (consisting of 18 items) so as to measure students' test-taking strategies. The developed scales are 5-point, Likert type instruments, with no reverse scoring item in either scale. The minimum score for the high school form is 27 and the maximum score is 135. The minimum score of the undergraduate form is 18, and the maximum score is 90. As the scores approach the maximum score, the students' level of using test-taking strategies increases.

Literature focusing on determining test strategies include qualitative research which describe individual's response processes (Hong et al, 2006; Chittooran & Miles, 2001), questionnaires (Hong & Peng, 2004; Peng et al, 2014) and contemporary research examine scale development (Bıçak, 2013; Dodeen, 2008). With this study, two scales have been developed to determine test strategies; that have not been well-defined construct in the literature. Two developed scales differ from similar by IRT based validity studies and the test items are structured according to the temporal dimension of the test as "pre-test, during test and post-test" indicators. In particular, this research will shed light on future research by presenting two separate forms for different educational levels.

Exams that students encounter in high school and university may differ in terms of practice, the skills they test, and the associated stakes (Boud & Falchikov, 2007). In the case of Turkey, the grades obtained throughout high

school education and the results of university entrance exams are used in decision-making to enter higher education; in other words, to commence education for a profession (Abrams, 2004; Flitcroft et al., 2017). The test-taking strategies that high school students may employ are varied and numerous to be successful in such high-stake exams that will ultimately shape their lives from that point onwards. In supporting these high-risk exam behaviours, several scale items were included in the high school form regarding the duration of the exam (Item 36), caring about response control (Item 37), and efforts to prove what they know (Item 27 and Item 31). In high-stake tests, multiple-choice items are predominantly included. It is noteworthy that some items (e.g., Item 24, Item 25, and Item 26) that refer to multiple-choice items in the high school form are not included in the university form. In higher education, educational goals focus more on high-level skills and specialisation (Fallows et al., 2000), and measurement is conducted accordingly. The number of test strategies that can be used in examinations for high-level skills such as making a product, a performance, an evaluation, and a synthesis, and their effects on the measurement result can be somewhat limited. Therefore, the university form consisted of nine fewer items than the high school form.

The Rasch model in psychological tests that use scoring with grading totals, such as Likert-type scales, is still considered to be quite new. It is known that more valid and reliable results are provided due to the advantages of IRT and the Rasch model. The PCM helps by comparing different versions of scales to decide which form provides the most valid and reliable results for the construct being measured. Therefore, it is possible to use the results of two forms to monitor and improve measures until they reach the level of measurement accuracy required for decision making (Van Zile-Tamsen, 2017). The validity and reliability of the two forms developed in the current study were supported by precise estimates.

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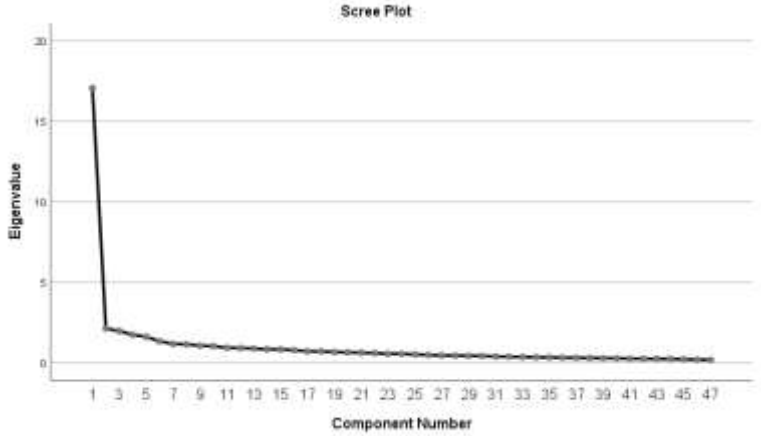
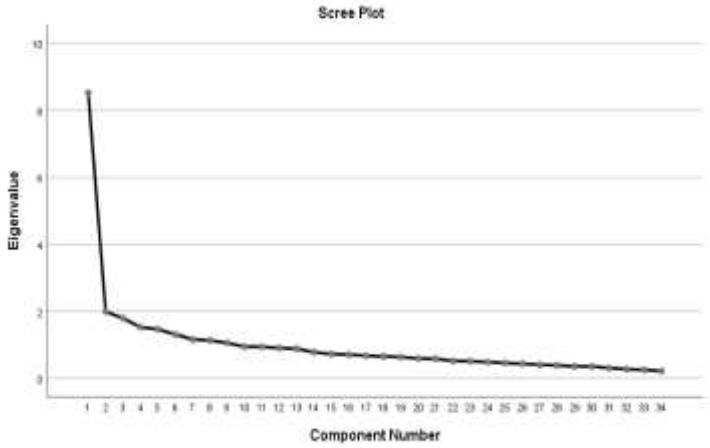
Appendix 1. Scree-Plot Graph of Secondary Education Data



Appendix 2. EFA Results of High School Data: Factor Loadings and Communalities

Item number	Factor loading	Communality	Item number	Factor loading	Communality
M2	.37	.13	M25	.56	.31
M3	.34	.11	M26	.61	.37
M4	.56	.32	M27	.53	.28
M5	.69	.48	M28	.68	.47
M6	.57	.33	M29	.61	.37
M7	.53	.28	M30	.53	.28
M8	.75	.56	M31	.62	.38
M9	.61	.38	M32	.51	.26
M10	.57	.33	M33	.65	.43
M11	.56	.31	M34	.44	.19
M12	.62	.38	M36	.69	.47
M13	.56	.31	M37	.62	.38
M14	.56	.31	M38	.79	.62
M15	.54	.29	M39	.63	.39
M16	.55	.31	M40	.70	.49
M17	.73	.53	M41	.75	.56
M18	.68	.46	M42	.71	.50
M19	.60	.36	M43	.67	.45
M20	.57	.32	M44	.68	.46
M21	.58	.34	M45	.76	.58
M22	.64	.41	M46	.69	.48
M23	.43	.19	M47	.52	.27
M24	.70	.49			

Appendix 3. Scree-Plot Graph of Undergraduate Data



Appendix 4. EFA Results of Undergraduate Data: Factor Loadings and Communalities

Item number	Factor loading	Communality	Item number	Factor loading	Communality
M3	.40	.16	M28	.58	.34
M4	.40	.16	M29	.52	.27
M5	.52	.27	M30	.39	.16
M8	.54	.29	M31	.45	.20
M9	.56	.32	M33	.43	.19
M10	.54	.29	M36	.40	.16
M12	.41	.17	M37	.43	.18
M13	.32	.10	M38	.50	.25
M16	.44	.19	M39	.47	.22
M17	.59	.35	M40	.52	.27
M18	.56	.31	M41	.59	.35
M19	.55	.30	M42	.54	.29
M20	.36	.13	M43	.61	.37
M21	.39	.16	M44	.68	.46
M22	.54	.30	M45	.69	.47
M24	.35	.12	M46	.59	.35
M26	.34	.12	M47	.52	.27

Appendix 5. Test Strategies Pilot Scale Items and Included in Scales (in Turkish)

Item No	*OE* abbreviation was used for Open-ended test items. *MC* abbreviation was used for Multiple-Choice test items.	High School Form	University Form
M5	Sınava gerekli tüm materyalleri getiririm.	-	Included
M8	Sınav açıklamalarını dikkatli biçimde okurum.	Included	Included
M9	Toplam sınav süresine göre, süreyi nasıl kullanacağımı planlarım.	Included	Included
M11	Yanıtlamaya başlamadan önce sınav kâğıdındaki tüm sorulara hızlıca göz atarım.	Included	-
M12	Sınav kâğıdının boş yerlerine soruları yanıtlarken yararlanabileceğim notları (formül, anahtar kelime vb.) yazarım.	Included	-
M14	Sınava en kolay olduğunu düşündüğüm sorudan başlarım.	Included	-
M16	Soruları yanıtlarken sorunun kökünü birden çok kez okurum.	Included	-
M17	Soruları yanıtlarken sorunun köküne (ne istendiğine) odaklanırım.	Included	Included
M18	Sorudaki anahtar sözcüklerin altını çizerim.	Included	Included
M19	Karmaşık soruları, kendi cümlelerimle zihnimde tekrar düzenlerim.	Included	Included
M21	Bir soruyu planladığım sürede yanıtlayamamışsam diğer soruya geçerim.	Included	-
M22	Her yanıtımdan sonra yanıtımı hızlıca kontrol ederim.	Included	Included
M24	(MC) Öncelikle kesinlikle yanlış olduğunu düşündüğüm seçenekleri elerim.	Included	-
M25	(MC) Soruları yanıtlandırırken diğerlerinden farklı görünen seçeneği elerim.	Included	-
M26	(MC) İki-üç seçenek arasında kaldığımda doğru yanıtı tahmin etmeye çalışırım.	Included	-
M27	(OE) Sorunun yanıtını bilmiyorsam, konu ile ilgili bildiğim her şeyi yazarım.	Included	-
M28	(OE) Yanıtımı yazmadan önce, yazacaklarımı zihnimde düzenlerim.	Included	Included
M29	(OE) Soruların altında, düzeltme / ekleme için bir miktar boşluk bırakırım.	Included	Included
M31	(OE) Bazı sorular için zamanım kalmazsa, yanıtların ana hatlarını yazarım.	Included	-
M36	Sınav süresini sonuna kadar kullanırım.	Included	-
M37	Tüm soruları yanıtlayamamış olsam bile son birkaç dakikamı, yanıtlarımı kontrol etmeye ayırırım.	Included	-
M38	Zamanım kalırsa, yanıtlarımı kontrol ederim.	-	Included
M39	Sınav anında, sınav sonucundan çok sınava odaklanırım.	Included	-
M40	Yanıtı bilmiyorsam, akıllıca tahminlerde bulunmaya çalışırım.	Included	Included
M41	Sınav sonrasında doğrularımı, yanlışlarımı, eksiklerimi ve hatalarımı kontrol ederim.	Included	Included
M42	Sınav sonrasında diğer öğrencilerin veya ders sorumlusunun yaptığı değerlendirmeleri dikkatle dinlerim.	Included	Included
M43	Sınav anındaki çabamı objektif olarak değerlendiririm.	Included	Included
M44	Puanımı düşüren nedenleri düşünürüm.	-	Included
M45	Bir sonraki sınavda performansımı nasıl artırabileceğimi düşünürüm.	Included	Included
M46	Sınav sonucuna göre, gerekirse sınava hazırlık yöntemlerimde değişiklik yaparım.	Included	Included
M47	Sınavım iyi geçerse kendimi ödüllendiririm.	-	Included

(-) excluded

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A Study of Teachers' Self-Efficacy Beliefs, Motivation to Teach, and Curriculum Fidelity: A Path Analysis Model

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A Study of Teachers' Self-Efficacy Beliefs, Motivation to Teach, and Curriculum Fidelity: A Path Analysis Model

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Abstract

This study aims to test a path analysis model that examines teachers' self-efficacy beliefs, motivation to teach, and curriculum fidelity. A correlational survey model was used while designing the study. The study sample consisted of 414 teachers working in a province of Turkey during the spring semester of the 2019-2020 academic year. The Teacher Self-Efficacy Beliefs Scale, the Teachers' Motivation to Teach Scale, and the Curriculum Fidelity Scale were used as data collection tools. Prior to data analysis, the data set was tested for both univariate and multivariate normality; descriptive statistics, Pearson correlation, and path analysis were also used to test the data. The results of the study show that the teachers have strong self-efficacy beliefs. While they have high intrinsic motivation, their extrinsic motivation is moderate. Based on the results of the path analysis, teachers' self-efficacy beliefs were found to, directly and indirectly, predict both their motivation to teach and their curriculum fidelity. In addition, teachers' levels of intrinsic motivation were found to predict curriculum fidelity directly, while their levels of extrinsic motivation were found to affect curriculum fidelity indirectly.

Keywords: Self-Efficacy Beliefs, Motivation to Teach, Curriculum Fidelity.

Introduction

Self-efficacy refers to an individual's belief in their capacity to execute behaviors necessary to produce specific performance attainments (Bandura, 1986), while a teacher's self-efficacy refers to the extent to which the teacher believes he or she has the capacity to influence the performance of students under their supervision (Brouwers and Tomic, 2003; Tschannen-Moran and Woolfolk-Hoy, 2001). In other words, it refers to the teacher's belief in his or her ability to successfully and efficiently build and sustain an effective teaching and learning environment (Dellinger et al., 2008; Tschannen-Moran and Woolfolk-Hoy, 2001). In this context, it can be argued that teachers' self-efficacy beliefs can influence the teaching and learning process (Gibson and Dembo, 1984; Woolfolk and Hoy, 1990). Accordingly, teachers' self-efficacy beliefs have a positive influence on the academic achievement of the students they supervise (Khurram and Sajida, 2017). Moreover, teachers with strong self-efficacy beliefs tend to create a learning environment that enables students to learn more effectively (Fritz et al., 1995; Tschannen-Moran, Hoy and Hoy, 1998); these teachers are also able to transfer new teaching concepts into a teaching and learning environment in a more motivating way (Czerniak and Lumpe, 1996). Thus, it can be stated that a person's self-efficacy beliefs can noticeably influence their motivational processes (Bandura, 1997; Bektaş and Karagöz, 2017; Pajares, 1997; Stajkovic and Luthans, 2003; Yazıcı, 2009).

On the other hand, motivation is the willingness to exert high levels of effort toward a particular goal (Robbins and Judge, 2012). In addition, it refers to a driving force behind human actions (Hersey and Blanchard, 2001). Motivation can be divided into two categories: intrinsic motivation and extrinsic motivation. Extrinsic motivation refers to human behaviors that arise from and are the byproducts of external sources and factors (Deci at al., 1991). Therefore, individuals' extrinsic motivation is a set of behaviors driven by responses that they receive from their social circles. On the other hand, intrinsic motivation is motivation that arises from an individual's inner self and leads them to engage in a specific behavior (Gagne and Deci, 2005; Ryan and Deci, 2000). When regarded as a conceptual whole, both intrinsic and extrinsic motivation play an important role in determining the behavior of different individuals. Therefore, it is safe to say that education, which can be considered a process of behavioral change, is closely connected to motivation; the latter is regarded as a cornerstone of the teaching and learning

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process (Akbaba, 2006; Viau, 2015). Like this, as the designated leaders of the teaching and learning process, teachers' motivation levels may affect the quality of education (Butler, 2007; Owens, 1998) because they affect the way teachers integrate technology into their classrooms as well as pedagogical and subject knowledge (Karakuyu and Karakuyu, 2016). In addition, teachers' motivation levels influence their students' motivation levels (Engin, 2020) and on curriculum fidelity as well (Bond et al., 2000).

The concept of curriculum fidelity refers to how closely programs apply relevant curriculum content as it is originally designed (Dusenbury et al., 2003; Pence, Justice, and Wiggins, 2008). In other words, it indicates the degree to which the designed curriculum conforms with the one that is delivered (Furtak et al., 2008). Curricula are specifically-designed road maps that guide teachers through the teaching and learning process and determine the proper way and time to perform activities (Ertürk, 2013; Oliva, 1997). The delivery of originally-designed curriculum plays a key role in enabling students to learn efficiently (Fullan and Pomfret, 1977). There is a correlation between students' academic achievement and the delivery of originally-designed curricula (O'Donnell, 2008). Teachers are the implementers of planned activities during the teaching and learning process (Demirel, 2007; Özden, 2014), they have significant responsibilities and duties when delivering curricula. Therefore, teachers' curriculum fidelity is an essential variable in the process of creating an efficient teaching and learning environment.

An examination of the relevant theoretical framework reveals that teachers' self-efficacy beliefs, motivation to teach, and curriculum fidelity play a crucial role and have a direct impact on the teaching and learning process. Moreover, there are a large number of studies in the relevant academic literature (Bal-Taştan et al., 2018; Barni, Danioni, and Benevene, 2019; Canrinus et al., 2012; Harun, Putrawan and Miarsyah, 2019; Johnakin-Putnam, 2020; Kao, Wu, and Tsai, 2011; Karakuyu and Karakuyu, 2016; Lauermann et al, 2017; Patrick, 2016; Sehgal, Nambudiri, and Mishra, 2017) that examine the relationship between teachers' self-efficacy beliefs and their motivation levels. In addition, these prior studies were found to have limitations in identifying and describing predictive relationships between teachers' self-efficacy beliefs and their intrinsic and extrinsic motivation, indicating that further research examining predictive relationships between teachers' self-efficacy beliefs and their motivation is needed. Investigating the predictive effect of teachers' self-efficacy beliefs on their teaching motivation can supply researchers with data and information that provide insight into teachers' motivational processes. In studies carried out by Bay et al. (2017), they point out that teachers' motivation to teach may affect their curriculum fidelity, while Bümen, Çakar and Yıldız (2014) state that there may be a relationship between teachers' curriculum fidelity and their self-efficacy beliefs. A study conducted by Kabaş and Yıldız (2020) shows that teachers' self-efficacy beliefs are important in predicting their curriculum fidelity.

Curriculum development is a dynamic process that is in a constant state of flux. It is an undeniable fact that this dynamic process is important to achieve the desired efficiency of the curriculum (Demirel, 2007). One of the important factors in achieving the goals of the curriculum is the curriculum fidelity (Dane and Schneider, 1998). In other words, curriculum fidelity has a decisive effect in revealing the quality of a curriculum. Studies in the literature also support this effect (Baş and Şentürk, 2020; Gelmez-Burakgazi, 2020; Iskandar, 2020; Russel, 2020). The education stakeholders responsible for implementing the curriculum are the teachers (Hord and Huling-Austin, 1986). In this respect, examining teachers' curriculum fidelity can give clues about the quality of the curriculum. A study of the relevant literature and the theoretical framework shows several indications that the variables affecting teachers' curriculum fidelity include their perception of competence in teaching profession and their motivation to teach. Although a holistic assessment of the results of their study reveals that teachers' self-efficacy beliefs and their levels of motivation can affect their curriculum fidelity, the amount of information presented in the study results that discuss this effect was limited. Therefore, it is believed that further study is needed to extensively scrutinize predictive relationships among teachers' self-efficacy beliefs, their motivation to teach, and their curriculum fidelity. Also, no studies that examine all three of these variables together have been encountered in the current body of relevant literature; for this reason, we believe that this study will provide researchers with a different perspective on this issue and fill a knowledge gap in the field. Moreover, the results of the interpretation of the predictive relationships among the variables can serve as a guide for teachers (as designated implementers), school administrators, and agencies responsible for in-service teacher training. Thus, the main purpose of this study is to test the relationships among teachers' self-efficacy beliefs, their motivation to teach, and their curriculum fidelity using a path analysis model. The hypotheses to be tested using the path analysis model can be found below.

Teachers' self-efficacy beliefs play a key role in creating a positive classroom environment and ensuring that students have productive learning experiences (Jungert and Rosander, 2010). On the other hand, motivation can be seen as a separate factor that enables the teaching and learning process to function properly (Viau, 2015). Studies in the relevant body of literature indicate that these two variables, both of which are key components of

the teaching and learning process, are interrelated (Johnakin-Putnam, 2020; Kao et al., 2011; Lauermann et al., 2017; Patrick, 2016; Schunk, 1991). Studies conducted by Harun et al. (2019) suggest that teachers' self-efficacy beliefs are a statistically significant predictor of their motivation levels. Below, there are hypotheses constructed within this purview:

H1: Teachers' self-efficacy beliefs (SEB) positively and significantly affect their intrinsic motivation to teach (IM).
H2: Teachers' self-efficacy beliefs (SEB) positively and significantly affect their extrinsic motivation to teach (EM).

Curriculum fidelity can be seen as another concept that is related to teachers' self-efficacy beliefs (Bümen et al., 2014). A study conducted by Kabaş and Yıldız (2020) revealed that classroom teachers' self-efficacy beliefs regarding their first reading-writing classes predicted their fidelity to the relevant curriculum. Furthermore, various studies (Rohrbach, Graham, and Hansen, 1993; Thierry, Vincent, and Norris, 2020) provide ample evidence of the correlation between self-efficacy beliefs and curriculum fidelity. Keeping this correlation in mind, a hypothesis can be constructed as follows:

H3: Teachers' self-efficacy beliefs (SEB) positively and significantly affect their curriculum fidelity (CF).

Motivation to teach can be divided into two categories: intrinsic motivation and extrinsic motivation (Güzel-Candan and Evin-Gencel, 2015). Additionally, the sources of motivation for both intrinsic and extrinsic motivation are interrelated (Gök and Atalay-Kabasakal, 2019). Furthermore, Baltaş (2002) stated that sources of extrinsic motivation may affect sources of intrinsic motivation while engaging in a particular activity. Likewise, Aslan and Doğan (2020) also noted that extrinsic motivation may influence intrinsic motivation. Teachers' levels of motivation may affect their curriculum fidelity (Bay et al., 2017), and hypotheses regarding this idea can be constructed as follows:

H4: Teachers' extrinsic motivation (EM) positively and significantly affects their intrinsic motivation (IM).
H5: Teachers' extrinsic motivation (EM) positively and significantly affects their curriculum fidelity (CF).
H6: Teachers' intrinsic motivation (IM) positively and significantly affects their curriculum fidelity (CF).

Method

Model

The correlational survey model, a type of survey model, is used to determine both the degree and direction of the relationship between two or more variables (Karasar, 2006). Therefore, the correlational survey model was chosen as the model for this study, as path analysis was going to be used to assess relationships among teachers' self-efficacy beliefs, their motivation to teach, and their curriculum fidelity.

Population and Sample

The study population consisted of 436 teachers working in one province of Turkey during the spring semester of the 2019 - 2020 academic year. Due to the Covid 19 epidemic, the criterion of easy accessibility was used to select the sample and, accordingly, teachers working in a specific city were identified as the target population. In this context, convenience sampling was preferred in the selection of the sample. The sample used for this study comprised 414 teachers. The data of the sample can be found in Table 1.
As indicated in Table 1, 237 (57.2%) of the teachers who participated in the study were female, and 177 (42.8%) were male. 170 (41.1%) of the teachers were primary education teachers, while 244 (58.9%) were subject teachers. 60 (14.5%) of teachers who participated in the study had between one and five years of work experience, 120 (29%) had between six and ten years, 104 (25.1%) had between eleven and fifteen years, 60 (14.5%) had between sixteen and twenty years, and 70 (16.9%) had twenty-one years or more. 165 (39.9%) of the teachers worked in an elementary school, 157 (37.9%) worked in a middle school, and 92 (22.2%) worked in a high school.

Table 1: Demographic Profile of the Sample

Categories	Groups	(f)	(%)
Sex	Female	237	57.2
	Male	177	42.8
Teacher Subject Areas	Primary Education	170	41.1
	Subject Teacher	244	58.9
Years of Experience	1-5 years	60	14.5
	6-10 years	120	29
	11-15 years	104	25.1
	16-20 years	60	14.5
	21+ years	70	16.9
Educational Stage	Elementary School	165	39.9
	Middle School	157	37.9
	High School	92	22.2

Data Collection Tools

Teacher Self-Efficacy Beliefs Scale: The Teachers Self-Efficacy Beliefs Scale (TSEBS) was developed by Schmitz and Schwarzer (2000) and adapted by Yılmaz et al. (2004) for use in a Turkish cultural context. The scale, which consisted of ten items, was first translated into Turkish and then used to measure the beliefs of 87 teachers from different subject areas. Principal component analysis (PCA) was used to ensure that the scale has construct validity. After subjecting the data set to Varimax rotation, a scale with a single dimension and eight items was created. The Cronbach's alpha value of the scale was calculated to be 0.79. The scale is in 4-point Likert type. As a result of the reliability analysis applied within the scope of the present study, the Cronbach alpha value was calculated as .83. There is no confirmatory factor analysis during the scale development stages. In this respect, confirmatory factor analysis was applied within the scope of the present study. One modification was carried out during the analysis phase. As a result of the analysis, it can be said that the goodness of fit values (CMIN/DF= 3.202, RMSEA= 0.073, RMR= 0.036, SRMR= 0.055, CFI: 0.941, GFI= 0.95) are acceptable values (Hu and Bentler, 1999; Sümer, 2000; Tabachnick and Fidell, 2001).

Teachers' Motivation to Teach Scale: The Teachers' Motivation to Teach Scale (TMTS) was developed by Kauffman, Yılmaz-Soylu and Duke (2011) and adapted by Güzel-Candan and Evin-Gencel (2015) for use in a Turkish cultural context. The scale, which consists of two dimensions and twelve items, was translated into Turkish and then used to analyze 342 prospective teachers' motivation levels in a university's teacher education program. Confirmatory factor analysis was used to ensure that the scale has construct validity. The goodness of fit values determined as a result of confirmatory factor analysis revealed that the model showed a good fit (CMIN/DF =3.10, CFI= 0.94, NFI= 0.92, GFI= 0.94, AGFI= 0.89, RMSEA=0.08). After conducting various analyses, it was found that the scale had two dimensions and twelve items just as the original scale; the dimensions were referred to as *intrinsic motivation* (IM) and *extrinsic motivation* (EM). The Cronbach's alpha value of the scale was determined to be 0.79. The scale is 6-point Likert type. As a result of the reliability analysis applied within the scope of the present study, Cronbach's alpha values were calculated as .83 for Intrinsic Motivation (IM) dimension, .68 for Extrinsic Motivation (DM) and .85 for the overall scale.

Curriculum Fidelity Scale: The Curriculum Fidelity Scale (CFS) was developed by Yaşaroğlu and Manav (2015). After conducting a comprehensive literature review, a draft scale with thirty-four items used to assess the responses of 167 teachers. After the exploratory factor analysis was completed, a scale with a single dimension and twenty items was created. Sixteen of the items in the scale were coded as positive and four as negative. The Cronbach's alpha of the scale was calculated to be 0.896. The scale is a 5-point Likert scale. As a result of the reliability analysis conducted in the present study, the Cronbach's alpha value was calculated to be .90.

Data Collection and Analysis

During June 2020, data was collected digitally through electronic mediums due to the COVID-19 pandemic. The data set was checked for extreme values, and two pieces of data were subsequently removed. The data set was then tested for both univariate and multivariate normality. Measures of kurtosis and skewness for the data were calculated to be between -1 and +1. George and Mallery (2010) found that measures of kurtosis and skewness in a data set between -1 and +1 were sufficient to conclude that the data were normally distributed. Therefore, the data was deemed to be normally distributed. Also, data was analyzed using AMOS statistical software to test multivariate normality. Data from this analysis can be found in Table 2.

Table 2. Assesment of multivariate normality

	skewness	c.r.	kurtosis	c.r.
Self-Efficacy Beliefs (SEB)	-.366	-3.042	.080	.332
İntrinsic Motivation (IM)	.256	2.124	-.261	-1.084
Extrinsic Motivation (EM).	-.628	-5.218	-.145	-.604
Curriculum Fidelity (CF)	-.561	-4.664	-.207	-.858
Multivariate			.433	.636

Table 2 contains data from the multivariate normality analysis. According to Gürbüz (2019), the kurtosis and skewness values of the data should be between -3 and +3. When the data in Table 2 are examined, it is seen that these values are between -3 and +3. Kline (2011) noted that the measure of kurtosis critical value derived from multivariate distribution should be no more than 10; the measure of kurtosis critical value for our data set was 0.636. Therefore, the data was deemed to have a multivariate normal distribution. This conclusion was reached using the maximum likelihood estimation routine in AMOS.

As scales employed in this study have different levels of agreement in the Likert scale, the intervals between values assigned for each Likert item vary. For instance, the Self-Efficacy Beliefs Scale was designed as a four-point Likert scale, and intervals between values were designated as follows: values between 1.00 and 1.59 were considered *very low*, 1.60 and 2.19 *low*, 2.20 and 2.79 *moderate*, 2.80 and 3.29 *high*, 3.30 and 4.00 *very high*. The Teachers' Motivation to Teach Scale was designed as a six-point Likert scale: values between 1.00 and 1.99 were considered *very low*, 2.00 and 2.99 *low*, 3.00 and 3.99 *moderate*, 4.00 and 4.99 *high*, 5.00 and 6.00 *very high*. The Curriculum Fidelity Scale was created as a five-point Likert scale and intervals between values were determined as follows: values between 1.00 and 1.79 were considered *very low*, 1.80 and 2.59 *low*, 2.60 and 3.39 *moderate*, 3.40 and 4.19 *high*, 4.20 and 5.00 *very high*.

The Pearson correlation coefficient was used to measure reciprocal relationships between variables using the SPSS 21 software package. If the coefficient value is less than 0.30, the degree of correlation is deemed to be *low*; if it lies between 0.30 and 0.70, it is regarded *moderate*; if it is higher than 0.70, it is considered *high* (Büyüköztürk, 2007). Also, the path analysis model was scrutinized based on *observed* variables using AMOS 21 software; in addition, various fit indices of the model (χ^2/df, RMSEA, SRMR, RMR, NFI, NNFI, GFI, and CFI) were taken into account. Moreover, standardized coefficient values less than 0.10 were identified as having a *low effect*, values between 0.10 and 0.50 as having a *moderate effect*, and values higher than 0.50 as having a *strong effect* (Shur, 2008). The theoretical model that was tested in this study can be found in Figure 1.

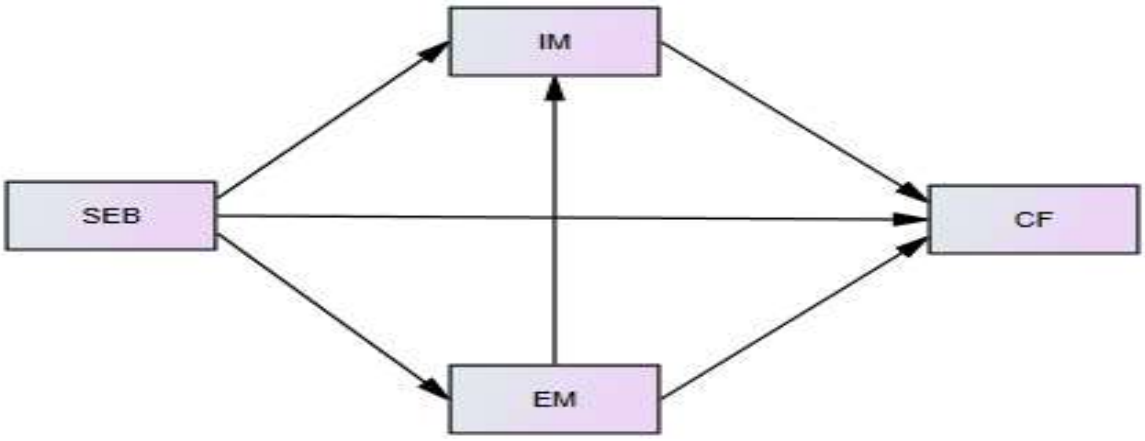

Figure 1. The theoretical model

Results

Descriptive statistics data sets that were related to variables in the study were evaluated in this section. Then, results from Pearson correlation analysis, which measures reciprocal relationships between variables, were introduced. Finally, path analysis results, which show predictive relationships between variables, were presented.

Descriptive statistics data related to variables

Table 3 contains descriptive statistics data for the three variables of this study: teachers' self-efficacy beliefs, their motivation to teach, and their curriculum fidelity.

Table 3. Descriptive information about variables

Dimensions	Minimum	Maximum	Mean (M)	Standard Deviation (SD)
Self-Efficacy Beliefs (SEB)	1.50	4.00	3.16	0.48
İntrinsic Motivation (IM)	1.00	6.00	4.07	1.12
Extrinsic Motivation (EM).	1.00	6.00	3.24	1.03
Curriculum Fidelity (CF)	2.90	5.00	4.34	0.48

As shown in Table 3, descriptive statistics data shows that teachers' self-efficacy beliefs (M=3.16, SD=0.48) and their levels of intrinsic motivation (M=4.07, SD=1.12) were found to be high. In contrast, their levels of extrinsic motivation (M=3.24, SD=1.03) and curriculum fidelity (M=4.34, SD=0.48) were found to be moderate and very high, respectively.

Relationships between variables

Table 4 contains the Pearson correlation analysis results, which reveals reciprocal relationships between teachers' self-efficacy beliefs, their motivation to teach, and their curriculum fidelity.

Table 4. Pearson correlation analysis for variables

	SEB	IM	EM	CF
Self-Efficacy Beliefs (SEB)	1			.
İntrinsic Motivation (IM)	.39**	1		
Extrinsic Motivation (EM).	.22**	.62**	1	
Curriculum Fidelity (CF)	.55**	.37**	.18**	1

**p<.01

Based on the results shown in Table 4, there is a moderate, positive relationship between teachers' self-efficacy beliefs and both their intrinsic motivation (r=0.39) and curriculum fidelity (r=0.55), while the relationship between teachers' self-efficacy beliefs and their extrinsic motivation (r=0.22) is low and positive. Also, there is a moderate, positive relationship between teachers' curriculum fidelity and their intrinsic motivation (r=0.37), while the relationship between teachers' curriculum fidelity and their extrinsic motivation (r=0.18) is low and positive. There is also a moderate, positive relationship between teachers' intrinsic motivation and extrinsic motivation (r=0.62).

Findings from the path analysis

Table 5 contains the findings from the path analysis, which reveals predictive relationships between teachers' self-efficacy, their motivation to teach, and their curriculum fidelity.

Table 5. Path analysis results of the model

				Path	t	P	Result
H1	SEB	→	IM	.26	7.016	**	Confirmed
H2	SEB	→	EM	.22	4.539	**	Confirmed
H3	SEB	→	CF	.47	10.829	**	Confirmed
H4	EM	→	IM	.57	15.170	**	Confirmed
H5	IM	→	CF	.24	4.454	**	Confirmed
H6	EM	→	CF	-.08	-1.510	.131*	Disproved

**p<.01, *p>.05

Table 5 has the results that show correlation coefficients between variables. Teachers' self-efficacy beliefs were found to have a moderate effect on teachers' intrinsic motivation (β=0.26), extrinsic motivation (β=0.22), and

curriculum fidelity (β=0.47). Teachers' intrinsic motivation was also found to have a moderate effect on curriculum fidelity (β=0.24). Extrinsic motivation had a strong effect on intrinsic motivation (β=0.57), but it didn't significantly affect curriculum fidelity (β=-0.08). Consequently, the hypotheses H1, H2, H3, H4, and H5 were confirmed, while H6 was disproved. In the next step, the path from EM to CF was removed from the model and the analysis was performed again. The results of the path analysis of the second model can be found in Table 6.

Table 6. Path analysis results of the second model

				Path	t	P	Result
H1	SEB	⟶	IM	.26	7.016	**	Confirmed
H2	SEB	⟶	EM	.22	4.539	**	Confirmed
H3	SEB	⟶	CF	.47	10.850	**	Confirmed
H4	EM	⟶	IM	.57	15.170	**	Confirmed
H5	IM	⟶	CF	.19	4.419	**	Confirmed

**p<.01

Table 6 has the results that path analysis results of the second model. It was determined that the path coefficients of H1, H2, H3 and H4 are the same as the coefficients obtained from the first path analysis model. However, it is understood that the path coefficient of H5 changes and takes the value (β=0.19). The fit indices (CMIN/df: 2.273, RMSEA: 0.056, SRMR: 0.015, RMR: 0.007, NFI: 0.99, NNFI: 0.98, CFI: 0.99, and GFI: 0.99) of the model suggested a perfect fit (Hu and Bentler, 1999; Kline, 2011; Sümer, 2000; Tabachnick and Fidell, 2001; Thompson, 2004). In addition, the percentages of the variance of the dependent variable explained by the independent variables are 46% for intrinsic motivation (IM), 5% for extrinsic motivation (EM), and 35% for curriculum fidelity (CF). Direct relationships between variables and the accompanying standardized path coefficients of the second model can be found in Figure 2.

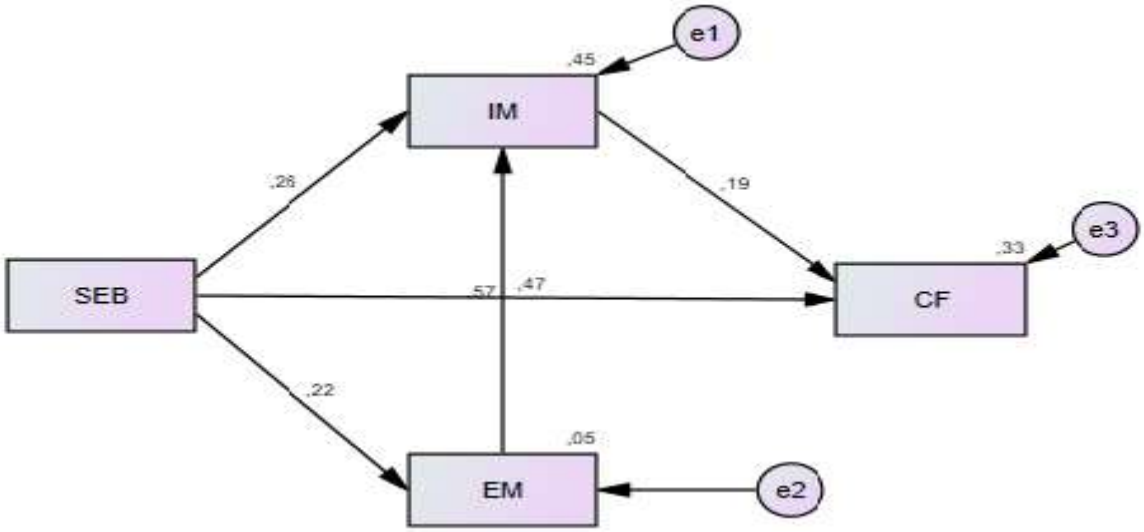

Figure 2. The concomitant standardized path coefficients of the second model

Both direct and indirect effects between variables were examined; the bootstrap method was used and a 95% confidence interval was obtained. Table 7 contains data related to this path analysis.

Table 7. Indirect effects on variables

	SEB	EM	IM
EM	-	-	-
IM	.12	-	-
CF	.07	.11	-

Table 6 contains data that reveals indirect, statistically significant effects regarding variables. In light of this data, the indirect effect of teachers' self-efficacy beliefs on their intrinsic motivation was moderate (β=0.12). In contrast, its indirect effect on curriculum fidelity was found to be low (β=0.07). Also, teachers' extrinsic

motivation had a moderate, indirect effect on curriculum fidelity (β=0.11). All of the standardized regression coefficients were found be statistically significant.

Discussion, Conclusions, and Recommendations

The primary aim of this study was to examine the predictive relationships among teachers' self-efficacy beliefs, their motivation to teach, and their curriculum fidelity using a path analysis model. Also, descriptive statistics data were analyzed to summarize the characteristics of the data set and the reciprocal relationships between variables. In this section, results from both the descriptive statistics data sets and correlation analysis will be discussed before discussion of path analysis results.

Firstly, based on data gathered from descriptive statistics, teachers were found to have strong self-efficacy beliefs; it is evident that teachers believe they are competent at managing an effective and productive teaching and learning process. Results from previous studies (Aydın, 2016; Bozbayındır and Alev, 2018; Kaçar and Beycioğlu, 2017; Kahraman and Çelik, 2019; Pouluo, Reddy and Dudek, 2018) in the relevant body of literature were found to dovetail with the results of this study. Secondly, findings from descriptive statistics revealed that teachers' intrinsic motivation is at a high level, while their levels of extrinsic motivation are moderate. Thus, it can be said that teachers earnestly perform school-related activities because they enjoy doing so, not because of any outside incentives and/or recognition. Although findings from previous studies (Argon and Ertürk, 2013; İhtiyaroğlu, 2017) in the relevant body of literature align with the results of this study, Argon and Cicioğlu (2017) found in their study that teachers' levels of intrinsic and extrinsic motivation were low. The sample of their study might have led them to this conclusion, as the sample consisted of teachers working in vocational schools. Both the working conditions and the student profile in vocational schools may have caused teachers in those environments to have lower motivation levels. In our study, the results from the descriptive statistics datasets showed that teachers' curriculum fidelity was very high, indicating that teachers tend to transfer the curriculum into the teaching and learning process as it was originally designed. A thorough review of the relevant literature revealed that previous studies (Aslan and Erden, 2020; Burul, 2018; Tekbıyık and Akdeniz, 2008) reached similar conclusions.

Findings from correlation analysis revealed that there were positive, statistically significant correlations between the variables. Firstly, teachers' self-efficacy beliefs and their intrinsic motivation to teach were moderately correlated, while there was a low correlation between teachers' self-efficacy beliefs and their extrinsic motivation to teach. Thus, it can be said that teachers' self-efficacy beliefs fluctuate in direct proportion to their levels of motivation during the teaching and learning process. An examination of the relevant literature showed previous studies (Engin, 2020; Johnakin-Putnam, 2020; Karakuyu and Karakuyu, 2016; Lauermann et al., 2017; Patrick, 2016) supported the results of this study. Secondly, teachers' self-efficacy beliefs and their curriculum fidelity were moderately correlated; it is quite clear that teachers' self-efficacy beliefs fluctuate in direct proportion to their perceptions regarding their ability to implement curricula during the teaching and learning process properly. A study conducted by Kabaş and Yıldız (2020) obtained similar results. Thirdly, a moderate correlation was found between teachers' curriculum fidelity and their intrinsic motivation and, finally, there was a low correlation between their curriculum fidelity and extrinsic motivation. In light of these findings, it can be argued that teachers' propensity to feel motivated during the teaching and learning process is directly related to their ability to deliver and implement curricula as they were originally designed. In their study, Bay et al. (2017) indicate a relationship between teachers' motivation and their curriculum fidelity.

The first two hypotheses of the study examined the predictive relationship between teachers' self-efficacy beliefs and their extrinsic motivation; these variables were found to have a positive predictive relationship. This way, it was confirmed that teachers' self-efficacy beliefs significantly affect their motivation to teach: teachers' self-efficacy beliefs moderately predict both their intrinsic and extrinsic motivation to teach. In other words, teachers' self-efficacy beliefs play an important role in understanding their motivation to teach; the degree to which teachers feel competent shapes their motivational processes. The relevant literature shows that results from previous studies (Harun et al., 2019; Kao et al, 2011; Patrick, 2016) align with these results. In particular, one study conducted by Harun et al. (2019) provides strong evidence that confirms the results at hand. Teachers' self-efficacy beliefs were found to predict their motivation in said study significantly.

The third hypothesis of the study examined the predictive effect of teachers' self-efficacy beliefs on their curriculum fidelity. Results showed that teachers' self-efficacy beliefs moderately predicted their curriculum fidelity. In other words, teachers' self-efficacy beliefs play a major role in understanding their curriculum fidelity; the degree to which teachers feel competent determines how closely teachers implement original curriculum content. According to Bandura (1986), individuals' self-efficacy beliefs that they can perform an activity

determine the level of realization of the activity in question. Accordingly, individuals with high self-efficacy beliefs for performing an activity perform that activity with higher efficiency. The teacher's task is to achieve the objectives of the curriculum as far as possible in the process of learning and teaching. In this context, it can be said that a teacher who confidently performs his professional duty can effectively achieve the objectives of the curriculum. Achieving the objectives of a curriculum, that is, carrying out the curriculum in accordance with the original, is called curriculum fidelity. In this regard, it can be said that teachers' self-efficacy beliefs toward their profession are an important factor in their curriculum fidelity. In a study conducted by Kabaş and Yıldız (2020), it was also found that teachers' self-efficacy beliefs have a predictive effect on their curriculum fidelity. Also, Bümen et al. (2014) stated that teachers' perceptions of professional self-efficacy significantly contributed to their program/curriculum content being effectively delivered and implemented as designed. In a study carried out by Babaoğlan and Korkut (2010), teachers' self-efficacy beliefs were found to be related to their management of the teaching and learning process. Given that effectively managing the teaching and learning process plays a major role in implementing and delivering the curriculum content as it is designed, the effect of self-efficacy beliefs on curriculum fidelity can be easily inferred. Results from various previous studies (Rohrbach et al., 1993; Thierry et al., 2020) support this view.

The fourth hypothesis of the study examined the predictive effect of teachers' extrinsic motivation on their intrinsic motivation and found that teachers' extrinsic motivation moderately predicted their intrinsic motivation. Therefore, teachers' extrinsic motivation plays an important role in understanding their intrinsic motivation. Börü (2018) considered factors such as school administration and students as some of the extrinsic sources that sustain teachers' motivation. Therefore, teachers' interaction with external factors such as school administration, parents, and students is a basis for teachers' professional motivation. In a school environment where school administrators encourage teachers' progress and achievement, teachers will undoubtedly be able to manage their intrinsic motivational processes at a higher level. Similar conclusions were reached by previous studies (Ada et al., 2013; Demir, 2018; Doğan and Koçak, 2014; Kocabaş and Karaköse, 2005; Özgan and Aslan, 2008; Ünal, 2000) in the related literature regarding the effect of school administrators on teachers' motivation. Aslan and Doğan (2020) in their theoretical analysis of the topic pointed out the crucial effect that extrinsic motivation has on intrinsic motivation.

The study's fifth and sixth hypotheses examined the predictive effects of both intrinsic and extrinsic motivation on curriculum fidelity. Teachers' intrinsic motivation was found to moderately predict their curriculum fidelity, while teachers' extrinsic motivation didn't have any direct or statistically significant effect on their curriculum fidelity. However, teachers' extrinsic motivation *was* found to affect their curriculum fidelity moderately and indirectly through its connection to their level of intrinsic motivation. Thus, the extent to which teachers feel professionally motivated during the teaching and learning process positively affects their efforts to implement and deliver curricula as they were originally conceived. In other words, teachers' motivational processes during teaching play a crucial role in how closely they adhere to the original design of curricula. Bay et al. (2017) claimed that teachers' motivation plays an important role in curriculum fidelity. Bond et al. (2000) also pointed out that there is a relationship between motivation and curriculum fidelity.

Ultimately, teachers' self-efficacy beliefs were found to directly *and* indirectly affect their motivation to teach and their curriculum fidelity. In addition, teachers' motivation to teach was found to affect their curriculum fidelity. These findings indicate that the extent to which teachers feel professionally competent and motivated during the teaching and learning process matters when it is time to implement programs and content as they were originally intended in the curricula. In this context, it is expected that a teacher who has a high professional self-efficacy belief and high teaching motivation will feel more competent in the learning-teaching process. As a result of this, it is possible to say that the teacher can achieve more accurate results in achieving the goals of the curriculum.

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On the contrary, it can be said that a teacher who considers themselves to be professionally inadequate and has a low motivation to teach may experience some limitations in achieving the goals of the curriculum. Therefore, to increase teachers' curriculum fidelity to a high level, it is necessary to maintain a high level of professional self-efficacy belief and motivation to teach. Undoubtedly, these findings can serve as a guide for experts in charge of creating in-service training programs for teachers. A variety of in-service training programs can be created (along with several initiatives that improve their understanding of workers' rights) to strengthen teachers' self-efficacy beliefs and increase their motivation. In addition, school administrators also play an important role in enhancing teachers' self-efficacy beliefs and increasing their motivation so that the school can constructively monitor teachers' progress during the teaching and learning process and reward them with various certificates based on their performance from time to time. Another external factor that increases teachers' motivation is parent-teacher communication. Once again, the school administration plays an important role by establishing an open

environment for communication within parent-teacher associations and creating an action plan that facilitates and coordinates the relationships between parents and teachers. When schools do this, teachers are externally motivated, which also increases their intrinsic motivation. A teacher with increased intrinsic motivation will make every effort to implement and deliver the curriculum content as it was originally conceived. However, a major limitation of this study was the fact that it was conducted only with a group of teachers working in a single province of a country. Thus, future studies could focus on various groups of teachers working in many different provinces, and it could also use different sampling methods. Also, a mixed method research design could be utilized to enable researchers to more deeply examine the matter at hand.

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Examining Prospective Teachers' Metacognitive Learning Strategies and Self-Regulated Online Learning Levels During Covid-19 Pandemic

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Examining Prospective Teachers' Metacognitive Learning Strategies and Self-Regulated Online Learning Levels During Covid-19 Pandemic

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Abstract

The Covid-19 pandemic is a challenge to education. To address this crisis, online or distance learning came to the fore. Educators recommended student-centered practices to weather the storm. Therefore, the incorporation of self-regulated learning (SRL) and metacognitive learning strategies (MLS) into online learning is considered necessary. Therefore, the aim of this study was to investigate the use of self-regulated online learning (SROL) and students' MLS levels, explore the relationship between them, and find out how the use of MLS predicts the online SRL capacities of Turkish trainee teachers in the period of distance education and contributes to the new educational paradigm after the pandemic.The study was designed as a correlational survey model in which 567 prospective teachers from Fırat University Faculty of Education in Turkey participated. Data were collected using the MLS Determination Scale-SROL questionnaire for prospective teachers. Data were analysed using t-test, ANOVA and simple linear regression. The results revealed that the participants have high levels of SROL and use MLS frequently. While SROL and MLS levels of participants do not differ in terms of gender, they differ concerning participants' departments, class levels, and time of self-study. Lastly, the use of MLS was a positive predictor of SROL.

Keywords: Self-regulated online learning, Metacognitive learning strategies, Covid-19 Pandemic

Introduction

Covid-19 pandemic has accelerated transforming to distance learning cancelling in-person classes. The closure of schools caused anxiety not only among teachers and students but also among policymakers (Khazan, 2020; OECD, 2020). Thus, they determined to transition from face-to-face learning to online and distance learning to resolve the crisis. The move to distance education happened very quickly out of necessity without appropriate preparation. In other words, '*education has become an emergency matter*' (Williamson, Eynor & Potter, 2020) and then the distance education held during that time has been called Emergency Remote Education (ERE) (Bozkurt, et al., 2020). This emergency case has been experienced worldwide and its educational effects have been felt from kindergarten to higher education by all the stakeholders (Green, Burlow & Carvalho, 2020, p.907). Zimmerman (2020) discussed distance education during the Covid-19 pandemic, regarding it as a duty for universities to compare its strengths to the traditional face-to-face instruction to utilize it after that. It is a fact that the global pandemic has been compelling educators to find alternative ways to traditional face-to-face instruction. For this purpose, Bozkurt et al. (2020, p. 8) suggest conducting more student-centered practices to facilitate learning during the pandemic. In student-centred approaches, learners are allowed to control their learning taking responsibility by being involved in the learning process (Slunt & Giancario, 2004). The principles of student-centered learning are in line with self-regulated learning. Since both of them require active and reflective learning and learners (Wangid, 2014). As one of the prominent student-centered approaches, self-regulated learning (SRL) was proposed to remedy distance education during the pandemic. It was also suggested to study the effects of SRL on students (Cai et al., 2020). According to De Corte (1990), SRL is essential in an information technology integrated learning process.

Moreover, online learning environments support self-regulated learning (Baldan-Babayigit & Guven, 2020 Technology has been considered a facilitating factor for SRL in the higher education context (Salter, 2013). However, researchers do not address whether students use technology and the internet for academic purposes anymore. Instead, they seek how they can utilize it at most (Lee & Tsai, 2011). In technologic learning settings,

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students are active constructors of their knowledge and skills. So SRL is a determinant in technology-integrated learning (Ng, 2010, p.10). Therefore, SRL should be fostered and utilized through the distance education period in which technology use is a requisite (Cai et al., 2020),

Self-regulated learners have been defined as '*metacognitively, motivationally, and behaviorally active participants*' (Zimmerman, 1989, p.329) in their learning process. In other words, self-regulated learners are responsible for planning, monitoring, and evaluating their learning in terms of metacognition. Through the motivational perspective, they are expected to strive hard to achieve their goals. They are also behaviorally active participants in their learning process and creating their ideal learning environment (Ng, 2010). To put it differently, learners regulate their learning environments, own thinking and motivational beliefs instead of depending on teachers feeding up and guiding them (Ng, 2010). Thus, SRL is the individual responsibility of learning, a live interaction of 'skill and will' (Baumert, 1993, p.328).

On the other hand, several researchers claimed that the self-regulation process can be directed both internally and externally, which means individuals can steer their learning with and without the help of teachers and textbooks (Boekaerts & Simons, 1995). SRL has been acknowledged as the key to successful learning both in school and out of it. It is believed to create productive learning environments where knowledge, skills, and attitudes can be procured and transferred to different learning contexts. However, it is more than sole successful learning which does not have a definitive aspect. Besides resulting in successful learning, it clarifies correlative interactions among components. It makes a tie among learning, achievement, and the self that is a person's ability to use his power (Boekaerts, 1999). There is a consensus on how to be an effective learner that s/he should actively affect his/her learning process and adapt it on cognitive, metacognitive, and motivational dimensions (Bransford, Brown & Cocking, 2000; Zimmermann, 2002). The cognitive aspect gets at the internal way of representing and processing information. On the other hand, the metacognitive aspect is the goal-oriented ability to regulate cognitive, behavioral and motivational courses (Pintrich, 2000). Self-regulated learners are proactive learners who are aware of their strengths and weaknesses since they set goals for themselves and choose appropriate strategies (Zimmerman, 2002). Thus, those learners have also been defined as autonomous ones to control their learning and find reasonable solutions when needed (Winne, 2015). Therefore, understanding metacognition is strongly related to self-regulation of abilities (Schunk, 2001; Saraff et al., 2010). Furthermore, metacognitive knowledge and self-regulation are considered the most important components of SRL (Schunk, 1990; Zimmerman, 1995) because "self-regulated learning is the application of metacognition" and both metacognition and self-regulation are intended to enhance learning (Mannon, 2020, p. 68). According to Mannon (2020, p. 69), educators need to understand the concepts of metacognition and self-regulated learning and how they are related to have more independent learners. In this way, they can understand the importance of providing students with possibilities to monitor and regulate their learning.

By the shift in educational research in recent years, the academic achievement concept started to be evaluated on students' activities that regulate their learning instead of their mental abilities, social environments, and experiences. In other words, students should be proactive in the process by determining proper strategies to improve their learning (Zimmermann, 2008), particularly metacognitive strategies that allow them to control and manage it.

Student learning research has discoursed on '*cognitive strategies, metacognition, motivation, task engagement, and student-centred learning*. SRL has embodied those arguments and disclosed a more integrative remark of learning strategies (Ng, 2010, p.10). The regulation of one's learning process is the core of metacognition (Borkowski & Turner, 1990) as they are mirror images of each other (Mannon, 2020). Research on this topic suggests examining SRL with each of its dimensions, such as cognitive, motivational and, metacognitive (Gomleksiz & Demiralp, 2012). From this perspective, for the current study, SRL will be viewed from a metacognitive framework. Metacognitive learning strategies (MLS) may be interpreted as essential tools for self-regulated learning. From this point, this research aims to investigate the metacognitive learning strategies and the level of self-regulated online learning of prospective teachers in relation to some variables and then correlate them with each other to reveal the relationship and contribute to the field.Studies have been seeking the role of cognition (Hofer, Yu & Pintrich, 1998; Wirth et al., 2020), motivation in SRL (Aguilar et al., 2021; Ariani, 2016; Daumiller & Dresel, 2019; Pintrich, 1999; Wolters, 2003), and both (Finn, 2020). However, a few studies address metacognition and self-regulated learning (Akamatsu, Nakaya & Koizumi, 2019; Mekala & Radhakrishnan, 2019; Saraff et al., 2020; Sperling et al., 2004) by the best knowledge of the researchers. Moreover, they were all conducted to regulate learning through in-person instructions. Previous research has shown that online learners sometimes have problems regulating their learnings (Lajoie &Azevedo, 2006). Furthermore, Baldan-Babayigit and Guven (2020) claimed that instructors, curricula, and instruction have significant roles to improve undergraduates' SRL skills. Recent evidence suggests undergraduates are not effective self-regulators in their

online courses although they pass their classes and graduate with bachelor's degrees (Pedrotti & Nistor, 2019). On the other hand, it is demonstrated that self-regulated online learners are more successful than the others (Barnard-Brak, Lan & Paton, 2010; Gao &Lehman, 2003; Yukselturk & Bulut, 2007). To be successful in online learning, self-regulated learners had better set additional goals for themselves since course objectives are frequently not clear in online learning (Margaryan, Bianco & Littlejohn, 2015). They also should engage actively through their learning process since they are more autonomous in online learning (Garrison, 2003). Completing the process, students need to reflect and evaluate themselves in the context of their learning goals (Zimmerman, 2002). Considering themselves they need to adjust their learning strategies for future learnings (Pintrich, 2000). SRL embodied self-regulation and metacognition components. To make learners independent in their learning, therefore it is necessary to know about the relationship between SRL and metacognition (Mannon, 2020). According to academics, the major goal of formal education should be preparing students properly with self-regulating skills for being life-long learners (Bandura, 1993; Zimmerman, 2008). Furthermore, higher education requires students to be more aware of effective learning strategies to enhance their learning (Cervin-Ellqvist et al., 2020). Therefore, it is essential to reveal how each of these components predicts the major term. However, there is no research to examine their relationship. The value and significance of this work, therefore, lie in the attempt to show that the metacognitive dimension is one of the most important aspects of self-directed learning and that the use of metacognitive learning strategies promotes this learning.By this aim, the current study seeks to address this gap in the literature by investigating the relationship between self-regulated online learning (SROL) and MLS and how the use MLS predict Turkish prospective teachers' online SRL capacity through the time of distance education and contributes to the new educational paradigm after the pandemic.

In particular, this research seeks to address the following questions:

1. What are SROL and MLS usage levels of prospective Turkish teachers?
2. a. Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their genders?
   b. Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their departments?
   c. Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their class levels?
   d. Is there any significant difference between SROL levels and the MLS usage levels of prospective teachers in terms of their time of study?
3. Does Turkish prospective teachers' usage of MLS predict their SROL level?

Methodology

The study was designed as a correlational survey model. Correlational surveys investigate the existence of the relations among two or more variables and reveal the cause and effect relationship among them to have a better insight (Buyukozturk et al., 2010; Karasar, 2009). In correlational models, the casual comparative research design is used to examine the ties among the variables (Buyukozturk et al., 2010). In this regard, this study took the form of a casual comparison model to examine the differences between the genders, subject areas, grade levels, and years of study of prospective teachers in terms of the level of metacognitive learning strategy use and the level of self-regulated online learning. Moreover, a correlational model was utilized to examine the existence of a relation between metacognitive learning strategies and SRL levels of Turkish prospective teachers.

Research Sample

The research population consists of prospective teachers at Fırat University Faculty of Education. On the other hand, the research sample consists of 567 prospective teachers selected from the population using the convenience sampling method. Of the prospective teachers participating is shown descriptive information about the sample in Table 1. Of the prospective teachers participating in the study, 112 (20%) are male and 455 (80%) are female. Looking at the distribution of prospective teachers in terms of the departments in which they study, 76 (13.4%) are in the Department of Turkish Education, 53 (9.3%) in the Department of Social Studies Education, 98 (17.3%) in the Department of Mathematics Education, 71 (12,5%) at the Department of Science Education, 79 (13.9%) at the Department of English Education, 59 (10.4%) at the Department of Elementary Education, 55 (9.7) at the Department of Kindergarten Education, and 76 (13.4%) at the Department of Psychological Counseling and Guidance. 89 (15.7%) of the prospective teachers are 1st year students, 224 (39.5%) are 2nd year students, 119 (21%) are 3rd year students and 135 (23.8%) are 4th year students.When the distribution of prospective teachers according to their daily study time was examined, it was found that 14 (2.5%) study for less than 1 hour, 368

(64.9%) for 1-3 hours, 164 (28.9%) for 4-6 hours, and 21 (3.7%) for 7 hours or more. When the distribution of their daily internet use was examined, it was found that 222 (39.2%) used internet for 1-3 hours, 238 (42%) for 4-6 hours, and 107 (18.9%) for 7 hours or more.

Table 1. Descriptive statistics of the participants

Variable	**Categories**	**N**	**%**
Gender	Female	455	80
	Male	112	20
Department	Turkish Language Education	76	13,4
	Social Studies Education	53	9,3
	Mathematics Education	98	17,3
	Science Teaching	71	12,5
	English Language Teaching	79	13,9
	Elementary School Teaching Program	59	10,4
	Kindergarten Teaching Program	55	9,7
	Psychological Counselling and Guidance	76	13,4
Class level	1st year	89	15,7
	2nd year	224	39,5
	3rd year	119	21,0
	4th year	135	23,8
Daily study time	Less than 1 hour	14	2,5
	1-3 hours	368	64,9
	4-6 hours	164	28,9
	7 hours or more	21	3,7
Daily internet use time	1-3 hours	222	39,2
	4-6 hours	238	42,0
	7 hours or more	107	18,9

Data collection tools

The data collection tools used in the research were prepared digitally via Google Forms. The survey link was https://forms.gle/toiqrAnxWLETJFg46. The link of the prepared form was sent to prospective teachers through faculty members. The form consists of four parts. The first part consists of the "Informed Consent Form" in which the prospective teachers declare that they voluntarily participate in the study, the second part consists of a Personal Information Form in which the prospective teachers who have declared that they voluntarily participate provide their demographic information, the third part consists of the Metacognitive Learning Strategies Scale for the prospective teachers, and the last part consists of the Self-Regulated Online Learning Questionnaire for the prospective teachers.In addition, the prospective teachers who volunteered to participate in the study were notified that they could quit answering them at any time they wish.

Personal information form:

The personal information form developed by the researchers includes information on the gender, department, year of study, daily study time, and daily internet use time of the prospective teachers.

Metacognitive Learning Strategies Determining Scale:

Metacognitive Learning Strategies Determining Scale (MLS) was developed by Gundogan-Cogenli and Guven (2014). During the development phase of the scale, the applications were carried out with 263 prospective teachers studying at Uşak University, Faculty of Education, Department of Elementary School Teaching program. Developed as a 5-point Likert type, the scale consists of 28 items and four sub-dimensions. Cronbach Alpha reliability for the whole scale was found to be .87. Cronbach Alpha reliability for the sub-dimensions of the scale were found to be .76 for planning strategies, .68 for monitoring strategies, .58 for evaluating strategies, and.53 for affective strategies. The reconstructed CFA results of the present study confirm the five-dimensional structure of the scale (X^2/df = 1.801 GFI = .997, CFI = .999, AGFI = .984, TLI = .997, SRMR = .008, RMSEA = .038). Also, the Cronbach Alpha reliability of the scale was calculated as .90.

In evaluating the responses given to the scale items, the intervals were assumed to be equal, and the score interval for the arithmetic means was calculated as 0.80 (Score Range = (Highest Value - Lowest Value)/5 = (5 - 4)/5 = 4/5 = 0.80). According to this calculation, the evaluation range of arithmetic means is as follows: 1.00-1.80 " Strongly disagree", 1.81-2.60 " Disagree", 2.61-3.40 "Neither agree nor disagree", 3.41-4.20 "Agree", and 4.21-5.00 "Strongly agree".

Self-Regulated Online Learning Questionnaire:

Self-Regulated Online Learning (SROL) Questionnaire was developed by Jansen et al. (2017) and adapted into Turkish by Yavuzalp and Ozdemir (2020). In the adaptation study of the scale, the sample consisted of 569 university students who took at least one course through distance education at Bolu Abant İzzet Baysal University. Adapted as a 7-point Likert scale, the scale consists of 36 items and five sub-dimensions. Cronbach Alpha reliability for the whole scale was found to be .96. It was observed that the reliability values for the sub-dimensions of the scale ranged from .701 to .956. The reconstructed CFA results of the present study confirm the five-dimensional structure of the scale (X^2/df = 1.202 GFI = .997, CFI = .999, AGFI = .987, TLI = .997, SRMR = .014, RMSEA = .019). Also, the Cronbach Alpha reliability of the scale was calculated as .94.

In evaluating the responses given to the scale items, the intervals were assumed to be equal, and the score interval for arithmetic means was calculated as 0.86 (Score Range = (Highest Value - Lowest Value)/7 = (7 - 1)/7 = 6/7 = 0.86). According to this calculation, the evaluation range of arithmetic means is as follows: 1.00-1.86 "Not true at all", 1.87-2.71 "Rarely true", 2.72-3.57 "Occasionally true", 3,58-4,43 "Sometimes true", 4.44-5.29 "Frequently true", 5.30-6.14 "Mostly true", and 6.15-7.00 "Always true".

Accordingly, it can be stated that the scales are appropriate to be used in research.

Data analysis

In the study, SPSS 22 program was used for basic statistical analysis, and AMOS 21 program was used to test the suitability of the scales for this study. Before starting data analysis, the data of 748 prospective teachers who responded were examined. First, the data forms of 39 prospective teachers who gave a negative response to the consent form were excluded from the analysis. Later, the data was checked for invalid or missing data. As a result, it was seen that 56 prospective teachers did not fill in the data collection tools completely. Z scores were calculated to remove outliers from the data, and Skewness and Kurtosis coefficients were calculated to test the normal distribution. The "∓1" interval for the Skewness and Kurtosis coefficients (Cokluk, Sekercioglu & Buyukozturk, 2016), and the "∓3.29" interval for Z scores (Field, 2013) were taken into account. In this context, 86 forms out of the 653 forms collected were excluded and analyses were carried out on the remaining 567 forms. Examining the kurtosis and skewness values of the scales, it can be seen that the kurtosis value of the MLS determination scale is in the range of [-.162; -.699] and its skewness value is in the range of [.268; -.119], while the kurtosis value of the SROL questionnaire is in the range of [.480; -.538] and its skewness value is in the range of [.091; -.939]. Thus, it can be concluded that the normality assumption is satisfied.With 567 forms, arithmetic means for SROL and MLS of the prospective teachers were calculated. The t-test was used to determine whether SROL and MLS of the prospective teachers differ according to their gender. One-way analysis of variance (ANOVA) was used to test whether the prospective teachers' self-regulated online learning and metacognitive learning strategies differ according to their department, year of study, and daily study duration. After the one-way ANOVA in which the main effects of the variables were examined, Bonferroni tests were used to determine the sources of possible differences. In the inferential analysis, the significance level was determined as $p < .05$. Based on Student's t statistics, Bonferroni is a widely used multiple comparison test and does not require the principle of "equal sample size" (Miller, 1969). The effect sizes (η^2) obtained due to the calculations were interpreted by being compared with certain criterion values. These values are (Green & Salkind, 2005, p. 157) "$\eta^2 < 0.01$" indicates that there is small effect size, "$\eta^2 < 0.06$" indicates that there is medium effect size, and "$\eta^2 < 0.14$" indicates that there is large effect size.

Whether prospective teachers' metacognitive learning strategies predicted their self-regulated online learning was tested using a simple linear regression analysis. The Pearson Product Moment Correlation Coefficient (r) was used to determine the relationships between the variables. In interpreting the correlation coefficient, .00 means no relationship, 0.01-0.29 means a low relationship, 0.30-0.70 means a moderate relationship, 0.71 -0.99 means a high relationship, and 1.00 means a perfect relationship (Koklu, Buyukozturk & Cokluk, 2006).

Findings

In this section, the level of self-regulated online learning and the level of use of metacognitive learning strategies of Turkish prospective teachers were compared separately by gender, subject area, grade level and period of study.

R.Q.1: What is the level of self-regulated online learning (SROL) and use of metacognitive learning strategies (MLS) among Turkish prospective teachers?

Table 2 shows the means and standard deviations related to self-regulated online learning and use of metacognitive learning strategies among Turkish prospective teachers.

Table 2. SROL and MLS scores

	N	Mean	Std. Deviation
SROL	567	5,14	,77030
MLS	567	4,24	,34505

The arithmetic mean of SROL level of Turkish prospective teachers was calculated as 5.14. According to the seven-level Likert-scale rating, the level of self-regulated online learning of the prospective teachers was analyzed at the "frequently applies" level. The arithmetic mean of the MLS usage level of the prospective teachers was calculated as 4.24. According to the five-point Likert rating, the use of metacognitive learning strategies was rated as 'strongly true' by prospective teachers.

R.Q.2. a: Is there any significant difference between SROL levels and MLS use levels of prospective teachers with respect to their gender?

A T-test was conducted to determine if there was a significant difference between prospective teachers' SROL levels and MLS usage levels in relation to their gender. The results can be seen in Table 3.

Table 3. SROL and MLS scores by Gender

	Gender	N	Mean	Std. Deviation	p	t
SROL	Female	455	5,17	,756	0.64	1,856
	Male	112	5,02	,817		
MLS	Female	455	4,24	,337	0.95	,061
	Male	112	4,24	,375		

As Table 3 shows, SROL levels of prospective teachers do not differ significantly in terms of their genders. But the arithmetic means of female students ($\overline{X}$ =5.17) are higher than those of males concerning online self-regulated learning levels. The other finding from the same table shows that there is no statistically significant difference between MLS usage levels of students and their genders (female: $\overline{X}$ = 4.24; male: $\overline{X}$ = 4.24).

R.Q.2.b: Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their departments?

One-way ANOVA is used to highlight a significant difference between SROL levels and MLS usage levels of prospective teachers in their departments. The results of the analysis are set out in Table 4.

Table 4. SROL and MLS scores by Departments

		Sum of square	df	Mean square	F	p	η^2	
SROL	Between Groups	15,752	7	2,250	3,930	,000	,046	*ELT>PCG,
	Within Groups	320,094	559	,573				PST>PCG,
	Total	335,847	566					SST>PCG,
MLS	Between Groups	2,540	7	,363	3,127	,003	,038	*KT>MT
	Within Groups	64,849	559	,116				
	Total	67,389	566					

*The abbreviation ELT is used for the English language teaching department, PCG for psychological counselling and guidance, KT for kindergarten teaching, SST for social science teaching, and MT for math teaching.

The results indicate that there is a statistically significant difference among SROL levels of prospective teachers in terms of their departments (F= 3,930; p= .000). However, the difference is in 'medium effect size" (η^2=.046). According to the data, SROL scores of the ELT ($\overline{X}$ =5.34) groups, PST ($\overline{X}$ =5.37) groups, SST ($\overline{X}$ =5.40) differed significantly PCG ($\overline{X}$ =4.93) groups.

The other result obtained from the table above revealed that MLS usage levels of prospective teachers differ significantly in 'medium effect size" (η^2=.038) in regards to their departments (F= 3,127; p=.003). According to the analysis, MLS usage scores of the PST ($\overline{X}$ =4.35) groups differ significantly MT ($\overline{X}$ =4.16) groups.

R.Q.2.c: Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their class levels?

One-way ANOVA is used to compare whether SROL levels and MLS usage levels of prospective teachers differ significantly from one another in terms of their class levels. The results of the analysis are presented in Table5.

Table 5. SROL and MLS Scores by Class Levels

		Sum of square	**df**	**Mean square**	**F**	**p**	**η^2**	
SROL	Between Groups	5,343	3	1,781	3,034	,029	,016	2>3
	Within Groups	330,504	563	,587				
	Total	335,847	566					
MLS	Between Groups	1,162	3	,387	3,292	,020	,017	4>2
	Within Groups	66,227	563	,118				
	Total	67,389	566					

A statistically significant difference was found among SROL levels of prospective teachers in 'medium effect size" (η^2=.016) in terms of their class levels (F= 3,034; p=.029). Data obtained from Bonferroni test show that SROL scores of the "2nd class" ($\overline{X}$ =5.24) groups differed significantly from "3rd class" ($\overline{X}$ =5.00) groups. The other result revealed that MLS using levels of prospective teachers differ significantly in 'medium effect size" (η^2=0.17) about their class levels (F= 3,292; p=.020). Furthermore, MLS scores of the "4th class" ($\overline{X}$ =4.32) groups differed significantly from the "2nd class" ($\overline{X}$ =4.23) groups.

R.Q.2.d: Is there any significant difference between SROL levels and MLS usage levels of prospective teachers in terms of their time of study?

One-way analysis of variance (ANOVA) was used to compare whether the level of self-regulated online learning and the level of use of metacognitive learning strategies of prospective teachers differ significantly in relation to their study period. The results are presented in Table 6.

Table 6. SROL and MLS Scores by Time of Study

		Sum of square	**df**	**Mean square**	**F**	**p**	**η^2**	
SROL	Between Groups	12,573	3	4,191	7,299	,000	,037	4-6 hours>less than 1 hour, 4-6 hours>1-3 hours, More than 7 hours> Less than 1 hour
	Within Groups	323,273	563	,574				
	Total	335,847	566					
MLS	Between Groups	4,516	3	1,505	13,481	,000	,067	4-6 hours>1-3 hours, More than 7 hours> Less than 1 hour, More than 7 hours> 1-3 hours

The result is significant at SROL scores of prospective teachers in "medium effect size" (η^2=0.37) with regard to their time of study (F= 7,299; p=.000). From this analysis, it can be seen that SROL scores of the "4-6 hours" ($\overline{X}$ =5.33) groups differ significantly from the "Less than 1 hour" ($\overline{X}$ =4.65) groups and, the "1-3 hours" ($\overline{X}$ =5.06) groups. In addition, SROL scores of the "more than 7 hours" ($\overline{X}$ =5.38) groups differed significantly from the "1-3 hours" ($\overline{X}$ =5.06) groups.

The other result about MLS using levels of prospective teachers shows statistically significant difference in "large effect size" (η^2=0.37) in terms of their time of study (F= 13,481; p=.000). It can be inferred from the Table 5 that MLS using scores of the "4-6 hours" ($\overline{X}$ =4.34) groups differed significantly from the "1-3 hours" ($\overline{X}$ =4.19) groups. Besides, MSL using scores of the "more than 7 hours" ($\overline{X}$ =4.53) groups differed significantly from the "less than 1 hour" ($\overline{X}$ =4.14) groups and, "1-3 hours" ($\overline{X}$ =4.19) groups**.**

R.Q.3:Does Turkish prospective teachers' usage of MLS predict their SROL level?

Whether prospective teachers' use of MLS predicted their SROL levels was investigated by regression analysis**.** The results of the regression analysis are summarized in Table 7.

Table 7. The Relationship between MLS and SROL Scores

	B	**Std. Error**	**ß**	**t**	**p**	**r**
fixed	-,302	,327		-,924	,356	,574
MLS	1,282	,077	,574	16,682	,000	
R= ,574	**R^2= ,330 $F_{(1\text{-}565)}$ = 278,291 p= ,000**					

According to the data obtained from the regression analysis, it can be seen that there is a statistically significant ($F_{(1\text{-}565)}$ = 278,291; p=.000), positive and, at a moderate level (r=.574 p=.000) relationship between MLS use and SROL level of prospective Turkish teachers. It is also revealed that students' use of MLS predicted their level of SROL (R= ,574, R^2=.330). In this case, it can be observed that students' using MLS explains 33% of their SROL levels. Given these results, the regression equation for predicting SOL levels of students from their use of MLS can be written as: SROL level = -0,302+ (1,282 x using MLS).

Discussion and Conclusion

As mentioned in the introduction part, the distance education conducted through the pandemic goes on compelling educators to find rewarding ways to sustain education. Sustainable learners are the ones who benefit whatever to become effective judges to evaluate their learnings (Boud & Soler, 2016). Particularly in online learning, students should have the ability to control their learning (Gao, 2003; Ally, 2009) and they are required to be at the center of the learning process. Herein, student-centered approaches make ground for sustainable learning in times of emergencies. As one of the student-centered practices, SRL has been suggested as a remedy for distance education during the pandemic by scholars. The use of MLS, relatedly, has been set forth to help regulate one's learning. Teachers and teacher candidates are expected to be self-regulated learners to train students accordingly and prepare them for their future lives. The current research has been designed to reveal SRL and MLS use levels of prospective teachers from various departments from this starting point. The researchers aimed to predict the relationship between SRL levels and MLS use levels of students in online education during the Covid 19 Pandemic.

The first question in this study sought to determine the SROL and MLS use levels of students. SROL levels of students were found out at 'frequently true' level; it was also revealed that their MLS use was at 'strongly agree' level. Therefore, it seems that students participating in this study use MLS and regulate their online learnings easily, which is demonstrated by high scores attained from both of the scales. Recent evidence suggests that flexible learning environments support SRL (Baldan-Babayigit & Guven, 2020; Pintrich, 2004). This finding of the present research has also shown that prospective teachers have high levels of self-regulation in flexible online learning environments. Boud and Soler (2016) remarked on the fact that self-regulation in higher education is subject to metacognition and self-assessment. This finding supports previous research that found high levels of SRL (Aybek & Aslan, 2017; Guler, 2015) and metacognitive awareness and metacognitive skills in students (Ay & Baloglu-Ugurlu, 2016; Baykara, 2011; Kilinc & Uygun, 2015; Ozsoy & Gunindi, 2011; Tuysuz, Karakuyu &

Bilgin, 2008; Unal, 2010; Yesilyurt, 2013). This result may be explained by the strong relationship among SRL, metacognition and MLS. So a high score of one indicates a high score of the other. Another possible explanation for this result is that higher metacognitive knowledge implies higher autonomy and self-regulation (Saraff, et. al., 2010). This result also implies the result of the 3rd research question, which was about the prediction level of both, which we will discuss later.Returning to the second question posed at the beginning of the present study, it is now possible to state that there was no statistically significant difference between SROL levels of students and their genders. This finding is in agreement with Wolters and Pintrich's (1998) finding showing no difference between self-regulatory strategy use levels and genders of participants. This also accords with the studies of Gomleksiz and Demiralp (2012), Oettingen et al. (2015), Ozturhan-Sagirli and Azapagasi (2009), Turan, Demirel and Sayek (2009) and Yukselturk and Bulut (2009), which found no relationship between self-regulation abilities and genders of undergraduates. In contrast to the current study, some research implied significant differences in using SRL in favor of females in traditional (Bidjerano, 2005), and in an online context (Artsin, Kocdar & Bozkurt, 2019). Thus, this result shows that both male and female Turkish prospective teachers are equally concerned about how they regulate their online learning. Considering the research on the relationship between SRL and gender, it should be noted that new research should be conducted to find a more accurate reason for the contradictory results.Likewise, it was also found that their use of MLS did not differ in terms of gender. Therefore, it can be inferred that males and females engage MLS similarly. Several research findings support the present study (Baykara, 2011; Kilinc & Uygun, 2015; Tuysuz, Karakuyu & Bilgin, 2008). However, this current research finding does not support the previous studies (Akin, 2013; Handel, Artelt & Weinert, 2013; Unal, 2010; Wolters & Pintrich, 1998), which showed a significant difference in strategy use levels of students on behalf of females.

There was a meaningful difference between SROL levels of students and their departments. Based on this finding of the current research, it is possible to claim that different departments have different viewpoints and cultures in nurturing their students to be lifelong learners. Baldan-Babayigit and Guven (2020) considered that instruction, curricula and lecturers in higher education play a significant role in improving students' SRL skills. This finding of the current study is consistent with previous research (Aybek & Aslan, 2017; Gomleksiz & Demiralp, 2012; Grossman and Stodolsky, 1994; Wolters & Pintrich, 1998). They all found that students' self-regulation levels varied by discipline. Similarly, a statistically significant difference was found between students' use of MLS and their disciplines. This finding is consistent with the findings of Cervin-Ellqvist et al. (2020) who found a statistically significant difference between different types of courses and students' use of learning strategies.Yesilyurt (2013) on the other hand, found significant differences between planning strategies use levels of undergraduates and their departments. However, several other studies have not demonstrated meaningful differences between undergraduate major and students' MLS usage (Okcu & Kahyaoglu, 2007; Ozsoy & Gunindi, 2011; Veenman, Wilhelm & Beishuizen, 2004).

A statistically significant difference was found between SROL levels of students and their class levels (2>3). Thus, this result demonstrates that students in lower grades have higher SROL scores. This result matches those observed in earlier studies (Aybek & Aslan, 2017; Ozturhan-Sagirli, et. al., 2010; Ozturhan-Sagirli & Azapagasi, 2009). Ozturhan-Sagirli and Azapagasi (2009) commented on this finding as prospective teachers have high SRL levels when they start university. Then some factors such as high self-esteem and less effort make them decrease their level of self-regulation. According to Ozturhan-Sagirli et al. (2010), the high level of self-regulation of the 1st graders depends on their being motivated for university entrance exams while graduating from high school. Contrarily, it was found that prospective teachers' use of MLS differed in favor of upper classes (4>2). This finding shows that the older the students getting the more MLS they use. This finding of the study is in line with the related literature that claims experiences contribute to metacognition development and metacognitive strategies (Brown, 1987). Grolnick and Ryan (1989) also hypothesized that metacognitive development is related to cognitive maturity. This finding of the present research partly affirms the hypothesis. Since fourth graders have higher scores when using MLS. Veenman, Wilhelm, and Beishuizen (2004) conducted a study with different age groups and found that metacognitive skills increased with age. Similarly, students were found to have higher scores in metacognition (Handel, Artelt & Weinert, 2013) and MLS use (Ozsoy & Gunindi, 2011) with increasing age.There was a statistically significant difference between SROL and MLS use levels of students and their self-study time. Hence, these results explained that the more students study, the more they regulate their online learnings and the more they use MLS. This result accords with the finding of the study of Ozturhan-Sagirli and Azapagasi (2009) which confirms that time of study affects self-regulation levels of students. Researchers explained this finding remarking the high SRL levels of students when starting university. Finding the lessons sufficient they did not study more. As a result, it is thought students' levels of SRL would be affected. Another important finding was that some external factors affect students' focus on learning, such as spending too much time on the Internet or social media, which affects not only their study time but also their SRL and use of metacognitive strategies (Saraff, et al., 2020). In line with the findings of the present study, Ay and Baloglu-Ugurlu (2016) and Doganay and Demir (2011) have shown that prospective teachers who study more than two

hours a day use MLS more than the rest and achieve academic performance.Examining the third question posed in the current study, there is a significant, positive, and moderate relationship between MLS and SROL. And MLS are predictors of SROL. Broadbent and Poon (2015) examine several studies to have a meta-analysis and concluded that metacognition is one of the self-regulated learning strategies to have a positive relationship with online learning. This finding of the current study seems to be consistent with the research which found that students using metacognitive strategies have higher self-control in their learnings. They also claimed that students use learning strategies to regulate their learnings (Saraff et al., 2020). Zheng et al. (2020) also demonstrated that the more learners are competent self-regulated, the more effective strategies they adopt and the more accomplished they become. Although it was not conducted in the higher education context the study also revealed that self-regulated learning increases learner independence to control their learning (Ariani, 2016). Ozturhan-Sagirli and Azapagasi (2009) found that self-regulated prospective teachers prefer metacognitive strategies as learning strategies. According to the researchers, this relationship is the result of self-regulation, which means that they know themselves well and then use metacognition to regulate their learning. Saraff et al (2020) designed an experimental study to determine the relationship between SRL and the use of metacognitive strategies.They indicated that higher metacognitive knowledge implies higher autonomy and self-regulation. This finding differs from Van-Laer and Elen's (2019). They expressed that no matter whether the learning is self-regulated or not, learners need to be controlled and directed to choose and apply metacognitive strategies.

Metacognition and self-regulation are two essential components of successful learning (Mekala & Radhakrishnan, 2019; Schraw, 1998) in the 21st century (Handel, Artelt & Weinert, 2013). As online learning in higher education becomes part of distance education during the pandemic, the need for self-regulated and metacognitively competent students grows accordingly. This study highlighted the positive relationship between SROL and use of MLS levels of prospective teachers. It is somewhat surprising that although the present study claims a positive correlation between SROL and MLS use levels of students there are some differences in findings regarding different variables. For instance, different departments have varied scores in SROL and MLS use. Moreover, while a lower grade has higher SROL scores, an upper grade has higher MLS using scores, which should be investigated in future research.

The study also has some limitations due to its sample, method and variables. Therefore, the results obtained should be tested in larger samples, with other research methods and with other variables. In this regard, experimental studies should be conducted to determine whether MLS is a predictor of SROL in online learning environments designed according to SROL. The needs of prospective teachers to increase their use of MLS and SROL should be determined. Studies should be conducted to determine the effects of age, online learning opportunities, and motivational variables on MLS and SROL.

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Comparison of PISA and PIAAC Participants' Reading Habits and Strategies in Terms of Reading Achievement

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Comparison of PISA and PIAAC Participants' Reading Habits and Strategies in Terms of Reading Achievement

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Abstract

This study aimed to compare reading strategies and habits regarding reading achievement of selected age-group participants from the Programme for International Student Assessment (PISA) 2009 and the International Assessment of Adult Competencies (PIAAC) 2015 within Turkey. A cohort design was utilized because it was assumed that reading literacy from PISA and PIAAC were comparable, as well as that participants from PISA 2009 would be in the age range of participants at the time of PIAAC in 2015. The participant population selected from PISA 2009 for the current study consisted of 4719 Turkish students (2334 girls, 2385 boys) aged 15 years old. Those chosen from PIAAC 2015 consisted of 308 Turkish individuals (141 men, 167 women) aged 20-22 years old. Data analysis was conducted through latent class analysis based on participants' gender, the number of books in the home, and reading achievement. Results revealed that female participants were more successful than male participants in PISA, whereas male participants outperformed female participants in PIAAC.

Keywords: Gender, PISA, PIAAC, Reading habits, Reading proficiency

Introduction

Reading skills and having a high level of reading comprehension is necessary for success in language arts courses and all other content area subjects (Oz, 2011). Through reading, individuals can increase their vocabulary and logical reasoning skills and improve their thinking (Johnsson-Smaragdi & Jönsson, 2006). Thus, educators are focused on motivating students to read more inside and outside of school. Importantly, reading frequency is a strong predictor of reading achievement (Evans, Kelley, & Sikora, 2014; Guthrie, Wigfield, & Metsala, 1999; Jerrim & Moss, 2019), so most educational reforms and studies have been focused on effective reading instruction. Additionally, this has occurred because reading achievement is one of the main indicators of academic success (McGeown, Duncan, Griffiths, & Stothard, 2015; Neugebauer, 2013).

There have been various studies in terms of gender differences that occur in reading achievement and reading habits (Loh, Sun, & Majid, 2020; Mullis, Martin, Kennedy, & Foy, 2007). In some cases, it is shown that girls have a higher level of proficiency in reading than boys (Loh et al., 2020; Mullis, Martin, Gonzalez, & Kennedy, 2003; Mullis et al., 2007; Zasacka & Bulkowski, 2017). Even though the reasons were not argued or reflected clearly, Logan and Johnston (2010) also highlighted that, on average, female students outperformed their male counterparts on reading comprehension tests. In the Programme for International Student Assessment (PISA) 2009, which was first implemented by the Organisation for Economic Cooperation and Development (OECD) in 2000 as an international study to assess 15-year-old students regarding reading, mathematics, and science skills, a majority of male and female students achieved level three proficiency. Yet, female students from OECD countries scored an average of 39 points higher in reading skills than their male counterparts. The PISA 2009 results from Turkey were similar, with a 43-point difference favouring female students' reading skills (EARGED, 2010). In the Programme for the International Assessment of Adult Competencies (PIAAC) 2015, the reading skills of adults between the ages of 16-65 were also measured. However, according to the PIAAC results, there is no significant difference in most countries between the reading skills of men and women. In Turkey, it was revealed in the PISA 2009 results that girls had higher scores than boys, yet in PIAAC 2015, men scored an average of 11 points higher than women (OECD, 2016a).

Previous literature has shown that gender differences occur in students' reading comprehension and reading motivation (Logan & Johnston, 2009; McGeown et al., 2015). In fact, in other studies, it was shown that gender differences in students' reading achievement and skills were lower than differences in their reading habits and

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motivation to read. A study conducted with primary school students yielded similar results revealing that there was no significant difference between girls' and boys' reading skills, but girls had higher levels of motivation for reading, and gender identity was explained as the reason for these differences (McGeown, Goodwin, Henderson, & Wright, 2012). Similarly, according to McGeown et al. (2015), there is no significant difference in girls' and boys' reading skills, but girls do report a higher motivation towards reading. For example, girls engaged in longer hours of reading fiction books. Thus, determining that individuals' motivation to read is important. As seen in Toste, Didion, Peng, Filderman, and McClelland's (2020) meta-analysis of 132 articles, there were significant relationships between K-12 students' reading motivation and reading achievements. When it comes to the amount of reading, it was highlighted in a variety of research that girls read more often than boys (Johnsson-Smaragdi & Jönsson, 2006; Logan & Johnston, 2009; Loh et al., 2020; Mullis et al., 2007; Zasacka & Bulkowski, 2017). Johnsson-Smaragdi and Jönsson (2006) compared teenage students' reading frequency and determined that girls were more frequent readers than boys. For example, comparing the frequency of book reading over one week revealed that girls read one day more per week than boys on average. On the other hand, it was determined that boys spent more time watching TV and videos than reading. Furthermore, in the report by OECD/UNESCO (2003), it was shown that a higher number of boys acknowledged reading as a waste of time. Additionally, in a study by Loh et al. (2020), a total of 4830 Singaporean adolescents' reading ratio and preferences were investigated. They found that female students read almost every day, every other day, or on weekends compared to males. Additionally, the duration of their reading was different. For example, female students stated that they usually read more than an hour at a time, while male students read less than 15 to 30 minutes each time. Furthermore, in Chen's (2007) study, it was revealed that reading was associated with feminine activities in Western societies. However, in the same study, it was also shown that Taiwanese students had the opposite response. For example, in Chinese culture, reading was a man's job; as a result, male students in Taiwan might read and consider themselves better readers than female students because of the established cultural norm.

In Wolters, Denton, York & Francis's (2014) study, adolescent students' opinions of reading were investigated, and it appeared that student age affected the value assigned to reading activities. As discussed in the literature, younger students found reading necessary and important because they believed that reading leads to future academic success (Oz, 2011). Taiwanese elementary school students stated that they spent more time on pleasure reading than university students (Chen, 2007). Similarly, Hopper (2005) investigated more than 700 teenagers between 11 to 15 years olds regarding their reading habits and choices. It was determined that reading frequency decreased when students got older, and girls tended to read more than boys. Also, students preferred to read magazines, newspapers or read from online internet sources outside of school. Furthermore, girls read magazines and nonfiction materials more often than boys. Referring to investigations carried out in Turkey, studies conducted with middle school students showed that students did not spend much time for reading. In their study, Can, Turkyilmaz, and Karadeniz (2010) examined the leisure reading habits of 627 adolescents and stated that the reading frequency of female students was higher than male students and that 8th-grade students read more than 11th and 12th-grade students. However, it can be said that, overall, students' reading frequency was low. Similar results were observed in studies conducted with university students, where almost half of 304 university students (46.1%) declared that the highest number of books they read in a year was five. It was understood that almost half of the students either did not read any books or read at most five books. At the same time, a relationship was found between male and female students in low-level and intermediate reading habits, indicating that boys read less (Odabas, Odabas, & Polat, 2008).

In the literature, differences between boys and girls and among children, teenagers, and adults in terms of selecting materials to read have been revealed (Chen, 2007; Hughes-Hassell & Rodge, 2007; Liu & Huang, 2008; McGeown, 2013). Chen (2007) compared college students' extracurricular reading habits in Taiwan and the United States. Newspapers were the most popular, and magazines were the second most popular reading materials among first-year college students. Also, students' choices from most popular to less popular were bestsellers, comic books, and novels. Nonfiction and poetry books were the least popular books read by these students. It was observed that most middle and high school Turkish students read textbooks, novels, and puzzle magazines. On the other hand, it was seen that stories, comics, children's magazines, and science journals were not preferred for reading (Can et al., 2010). Topping (2015) highlighted that boys preferred reading nonfiction texts while girls liked reading fictional texts. On the other hand, in the study of Loh et al. (2020), it was shown that girls' and boys' preferences for reading fiction versus nonfiction texts were not significantly different. However, their choices in each genre changed between the genders. In terms of fiction, they stated liking stories with humor, adventure, and mysteries, while the girls specifically preferred reading about fairy tales and relationships, the boys preferred reading about mysteries. Both genders stated that they liked books about plants, animals, sports, and hobbies when it came to nonfiction. Also, boys tended to read more books about sports, while girls read more nonfiction books about hobbies and travel.

According to research findings in which reading strategies were examined, there was a significant positive relationship between the frequency of using reading strategies and academic achievement (Demirel, Askin, & Yagci, 2014; Kana, 2014); students with high academic success used more strategies (Kus & Turkyilmaz, 2010; Ozdemir, 2018); and there was a significant and positive relationship between reading frequency and using strategies (Kana, 2014; Kus & Turkyilmaz, 2010). In addition, female students had higher metacognitive awareness of reading strategies than male students (Demirel, Askin, & Yagci, 2014; Kana, 2014; Kus & Turkyilmaz, 2010; Ozdemir, 2018). As age progressed, students' ability to use strategies increased. Research has also shown that improving students' metacognitive awareness improved reading comprehension and understanding. This was important because it naturally increased success.

Liu and Huang (2008) found that Chinese graduate and undergraduate male students preferred reading online materials more often than female students. Additionally, female students stated that they prefer to print out online materials to read, whereas their male friends prefer digitally bookmarking online documents for later reading. On the other hand, in the study of Loh et al. (2020), it was found that adolescent Singaporean girls preferred reading digital texts such as articles, e-books, and newspapers via their smartphones more than adolescent Singaporean boys. In contrast, studies with Turkish students showed that reading on the Internet was less preferred among middle and high school students (Can et al., 2010).

In the study by Wolters et al. (2014), adolescents' reading choices affected their reading skills; for example, reading a continuous text like fiction was more effective than reading short or non-continuous texts. Similar results were shared by other researchers, including Evans et al. (2014), Pfost, Dörfler, & Artelt (2013), and Spear-Swerling, Brucker, & Alfano (2010), who found that reading choices, reading fiction, and the amount of reading affected adolescents' reading comprehension, summarization skills, and text reading speed. The PISA 2009 results also supported that fiction reading was highly correlated with students' reading skills. For example, in PISA 2009, reading comics was not positively correlated, while reading nonfiction, newspapers, and magazines were positively correlated with students' reading literacy (OECD, 2010).

In this context, the related literature revealed that in different countries and at different ages, students' gender appears to be related to differences in their reading habits, reading strategies, and reading achievement. Seeing the trends in students worldwide led researchers to investigate reading proficiency levels, reading habits, and reading strategies of male and female students in Turkey. As a result, in this current study, the aim was to analyze and compare PISA and PIAAC assessments. The PIAAC was included because it can be considered in some respects to be a continuation of PISA. In this context, the research focus of the current study was placed on participants' reading skills, which are a requisite of their remaining academic skills.

Aim

Comparing results from the PISA and PIAAC can provide valuable information regarding the development of academic skills over time because there are similarities in how skills are conceptualized and described in these applications. In this context, the current study aimed to compare reading strategies and reading habits through latent clusters regarding reading achievement, number of books in the home, and gender. The research questions of the study are given below:

For the PISA and PIAAC assessments:
1) What model best fits the data when students are classified into latent classes based on their gender, reading achievement, and the number of books they have at home?
2) What are the properties of latent classes formed according to the most suitable model?
3) Do the reading strategies and reading habits used by students predict the latent classes?

Method

Model of Research, Population, and Sample

This study was a cohort design, which utilized participant data from PISA 2009 to reflect the participant data from PIAAC 2015. The PISA is implemented every three years, and for this current study, the data from PISA 2009 was evaluated because reading skills was the primary study focus of PISA 2009. The second part of the data was obtained from PIAAC 2015 because those who participated in the PISA 2009 when they were 15 years old would make up the 20-22 years-old age group for the PIAAC 2015. Multi-stage sample designs were used for each stage

of the selection process, stratified sampling was also utilized, and participants were chosen from those residing in the country at the time of data collection. The participants selected from PISA 2009 for the current study consisted of 4719 Turkish students (2334 girls, 2385 boys) aged 15 years old, while those chosen from PIAAC 2015 consisted of 308 Turkish individuals (141 men, 167 women) aged 20-22 years old (OECD, 2016b).

Tools for Data Collection

In PISA, reading literacy is defined as "understanding, using, reflecting on, and engaging with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society" (OECD, 2009; p. 23). Similarly, in the PIAAC, literacy is defined as "understanding, evaluating, using, and engaging with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential" (OECD, 2012; p. 20). Even though literacy in PIAAC and reading achievement in PISA have similar features, these two assessments are not the same. Therefore, the researchers in this current study paid special attention to select items and/or measures that addressed similar skills and habits found in both studies (e.g., PISA, PIAAC). In other words, the overlap between the target populations of the age cohorts in the two assessments is not complete (i.e., not all adults included in the PIAAC sample would have been included in the PISA sample as 15-year-olds). Thus, the authors are cautious about making causal inferences from these analyses.

After completing the academic test during the PISA study, students also completed questionnaires at their school that took approximately 30 minutes. The data utilized in this study were obtained from the OECD website (https://www.oecd.org/pisa/data/pisa2009database-downloadabledata.htm). According to OECD (2019), theoretically, there is no certain minimum or maximum score in PISA. However, usually, the normal distribution of means in PISA is approximately 500 points. The scale is divided into competence levels with seven levels of literacy (from below Level 1 – the lowest – to Level 6 – the highest) to help comment on scores.

The data collection for PIAAC 2015 took place between April 2014 to March 2015 (OECD, 2016a). The survey is implemented either in the individual's home or in a location agreed upon between the respondent and interviewer. The time taken by each respondent to complete the questionnaire ranges from 30 to 45 minutes (OECD, 2016a). Data regarding the PIAAC 2015 study were obtained from the OECD's international PIAAC website (https://webfs.oecd.org/piaac/puf-data/). Results from the application are stated on a 500-point scale, and a higher score shows a higher competency level. The scale is divided into competency levels with six levels for literacy (from below Level 1 – the lowest – to Level 5 – the highest) to help comment on scores (OECD, 2016a).

All questions from both the PISA and PIAAC studies were reviewed to determine similar questions found in both questionnaires. Then, seven questions (number of books at home and reading habits/reading strategies questions) were chosen for this study. Since the PISA and PIAAC questionnaire items do not match exactly, the researchers examined the items in each questionnaire and matched similar ones. Reading habits consist of reading e-mails, magazines, newspapers, and/or books (fiction or nonfiction). Reading strategies consist of associating newly acquired knowledge with real-life and prior knowledge and seeking additional information if they do not understand the newly acquired information. Additionally, the reading habit variables were generally labelled as "1 - I don't know what it is", "2 - never or almost never", "3 - several times a month", "4 - several times a week", and "5 - several times a day" for reading an e-mail item, and "1 - never or almost never", "2 - a few times a year", "3 - about once a month", "4 - several times a month", and "5 - several times a week" for reading magazines, newspapers, and fiction or nonfiction items. Furthermore, the reading strategy variables were labelled as "1 - almost never", "2 - rarely", "3 - sometimes", "4 - often", and "5 - almost always". Although the options for the questionnaire items are generally consistent in both studies, while interpreting the findings, they were presented following these original options from the questionnaires in Tables 2 and 3 below. For instance, option "2" in PIAAC has no equivalent option in PISA; thus, it is shown as "-" in Table 3 below for reading strategies items.

Data Analysis

In the first stage of the data analysis, the latent class analysis (LCA) was utilized to determine the number of latent clusters based on participants' gender, the number of books in the home, and reading achievement. There are several reasons for using the LCA in the study. First, instead of classifying the data according to a single variable, through LCA, there was the opportunity to determine differences among individuals more accurately by considering the possible variables together and obtaining homogeneous classes from heterogeneous groups. Second, the LCA allows for analyzing categorical and continuous variables together. Consequently, LCA can be utilized for the combined analysis of dependent variables like reading success, gender, and the number of books at home and aid in revealing the relationship between reading habits and reading strategies and these clusters via

a three-step analysis.

In latent class analysis, it is accepted that all observable variables are the cause of an unobservable latent variable (Vermunt & Magidson, 2004). The best way in selecting a model is to determine which model has the minimum latent classes and the least predictive parameters (Vermunt, 2003). The related literature recommends using the Bayesian Information Criterion (BIC) for model selection (Lukočienė, Varriale, & Vermunt, 2010). Also, classification error and Entropy values were the statistics utilized to decide the appropriate class. It is desirable to have a low classification error. Entropy values ranged from 0 to 1, with higher values indicating clearer distinctions among the latent classes. Thus, BIC, classification error, and entropy values were utilized in this current study to determine the most appropriate model. In the second stage, a three-step (3-step) analysis was used to determine the predictive ability of the chosen variables (reading habits and reading strategies) from the individual levels toward the emerging latent classes. The Latent Gold 5.1 program was utilized for data analysis (Vermunt & Magidson, 2013), and in the analyses, the final student weights were used for PISA and PIAAC.

Results

The Best Latent Class that Explains Students' Gender, Reading Achievement, and Number of Books They Own

The first question asked the best model fit into latent class to explain students' gender, reading achievements, and the number of books they owned. In the first step, LCA was conducted, and the log-likelihood (LL) values, BIC, and the numbers of parameters (Npar) are provided in Table 1 below.

Table 1. Fit measures of analysis results for PISA and PIAAC

	Model	LL	BIC (LL)	Npar	Class. Err.	Entropy R^2
PISA	4-Cluster	-5650802.48	11301914.97	23	0.285	0.4775
	5-Cluster	*-5648841.83*	*11298061.06*	*28*	*0.283*	*0.5081*
	6-Cluster	-5648421.20	11297287.19	33	0.313	0.5266
PIAAC	2-Cluster	-36842543.69	53685284.60	13	0.11	0.6191
	3-Cluster	*-26665098.59*	*53330470.25*	*18*	*0.13*	*0.5657*
	4-Cluster	-226666608.42	53333565.75	23	0.20	0.5836

Note: Italic type represents the most compatible model.

The results of this study are provided by first explaining the findings regarding PISA and, secondly, presenting the PIAAC findings. Latent class analyses were conducted based on participants' reading achievement scores, gender, and the number of books owned at home. Considering PISA's latent class analysis results, the BIC estimate decreased dramatically when the number of clusters increased. In addition, according to classification errors, although the number of parameters increased in 5-Clusters, the classification error was low. Considering the entropy values, the best resolution for PISA literacy should be the 5-Cluster model. In other words, latent variables listed above were best fitted in the 5-Cluster model for PISA.

Concerning PIAAC, the LCA results indicated that the lowest BIC was in the 3-Cluster model. However, there was only one person in the third cluster. The size of the class should also be considered in deciding the number of classes. So, it was decided that the 2-Cluster model was the most suitable according to the BIC results, entropy, and classification errors. Latent class analyses were conducted based on participants' reading achievement scores, gender, and the number of books owned at home. Additionally, these listed latent variables were best fitted in the 2-Cluster model for PIAAC. The class probabilities of the models and the mean for each class of dependent variable according to these models are provided in Table 2 below.

The Characteristics of Determined Latent Clusters

The characteristics of the determined latent clusters were investigated through the second question of this study. The features of clusters for the PISA and PIAAC are provided in Table 2.

Table 2. The class probabilities and mean at each class of dependent variables for 4 and 2-Cluster models

	PISA					PIAAC	
	C-1	C-2	C-3	C-4	C-5	C-1	C-2
Cluster Size	0.21	0.37	0.09	0.29	0.04	0.47	0.53
Mean of reading scores	373.96	454.60	471.19	529.93	599.78	222.58	252.22
0-10 books	0.49	0.29	0.01	0.08	0.01	0.78	0.06
11-25 books	0.32	0.33	0.05	0.20	0.08	0.20	0.28
26-100 books	0.17	0.30	0.24	0.41	0.30	0.02	0.46
101-200 books	0.02	0.06	0.25	0.20	0.26	0.00	0.14
201-500 books	0.00	0.01	0.24	0.09	0.20	0.00	0.04
More than 500 books	0.00	0.00	0.20	0.03	0.13	0.00	0.03
Female	0.21	0.55	0.25	0.63	0.89	0.56	0.39
Male	0.79	0.45	0.75	0.37	0.11	0.44	0.61

Note: C stands for cluster.

As indicated in Table 2, there were two small (Cluster 3 and 5), two medium (Cluster 1 and 4), and one large cluster (Cluster 2) for PISA. The literacy scores of individuals increased from Cluster 1 (below the first level) to Cluster 5 (fourth competence level). It was recognized that most of the participants in Cluster 2, 4, and 5 were female. In contrast, male participants dominated clusters 1 and 3. 21% of the participants were placed in Cluster 1 with the lowest average reading scores (373.69), which placed them at 1a proficiency level. In the least achieving group, 79% of the participants were male, and 21% were female. Almost half of these students (49%) had less than 10 books, while 32% had 11 to 25 books. Only 2% of the participants had 101 to 200 books in this cluster, and no participant had more than 200 books. 37% of the participants were placed in Cluster 2 with average reading achievement scores of 454.60. These students were placed at the second proficiency level. 45% of the participants in this group were male, and the remaining 55% were female. 30% of these students had 26 to 100 books at home, and 33% had 11 to 25 books. Again, only 2% of the participants had 101 to 200 books in this cluster, and none had more than 200 books. Next, 9% of the participants were placed in Cluster 3 with average reading achievement scores of 471.19. These students were also determined to be at the second proficiency level. However, in Cluster 3, males made up 75% of participants, while 25% were female. Surprisingly, this cluster had the highest percentage of students who owned the highest number of books. For example, 44% of the students in Cluster 3 had more than 200 books at home. 29% of participants were placed in Cluster 4 with average reading achievement scores of 529.93. These students were determined to be at the third proficiency level. Most of the participants in this cluster were female (63%), and the remaining 37% were male. More than half of the students (69%) had 100 books or less at home, 9% had 201 to 500, and 3% had more than 500 books. 4% of the participants were placed in Cluster 5 with average reading achievement scores of 599.78. These students were determined to be at the fourth proficiency level. Again, most of the participants in this group were female at 89%, and the remaining 11% were male. Additionally, in Cluster 5, 26% of the participants had 101 to 200 books, and 33% had more than 200 books at home.

Also indicated in Table 2 above, there were two large clusters for PIAAC literacy. In the largest cluster, 53% of the individuals were assigned to Cluster 2 that consisted of individuals at the medium level of proficiency in literacy for PIAAC. In addition, it was also recognized that there were higher numbers of female participants in Cluster 1 and a higher number of male participants in Cluster 2. Cluster 1 consisted of 47% of the participants, and their average reading score was 222.58. This score corresponds to the first proficiency level, and this cluster was comprised of 44% male participants and 56% female. For this cluster, 78% of the participants had 10 books or less, while 20% reported having 11 to 25 books at home; none had more than 101 books. In Cluster 2, 53% of the participants were included, and the average reading score for this group was 252.22. Participants in this cluster were at the second level of proficiency, and the group was comprised of 61% male participants and 39% female. For the number of books at home, 60% of participants reported having between 26 and 200 books, while 7% had 201 or more books. In summary, PIAAC yields a clearer pattern of the association between book ownership and reading achievement than our LCA of PISA does.

The Relationships among Students' Reading Strategies, Reading Habits, and Latent Clusters

The third research question in this current study was focused on investigating whether students reading strategies and reading habits predicted their latent clusters. After determining the clusters obtained from the models of PISA (5-Clusters) and PIAAC (2-Clusters), a three-step analysis of the data was conducted. Table 3 below provides the probabilities and parameters from the three-step model for all the reading strategy and reading habit variables

regarding literacy.

Table 3. The probabilities and parameters of the three-step model for all reading strategy and reading habit variables

		PISA-3step						PIAAC-3step		
		C-1	C-2	C-3	C-4	C-5	R^2	C-1	C-2	R^2
Size		0.21	0.37	0.09	0.29	0.04		0.47	0.53	
Reading e-mail	1	0.12	0.09	0.01	0.04	0.03	0.08	0.51	0.11	0.32
	2	0.30	0.26	0.07	0.17	0.14		0.27	0.14	
	3	0.22	0.21	0.13	0.19	0.18		0.10	0.14	
	4	0.24	0.27	0.33	0.32	0.33		0.09	0.30	
	5	0.13	0.17	0.46	0.28	0.32		0.03	0.31	
Reading magazines or newspapers	1	0.01	0.01	0.02	0.01	0.00	0.01	0.32	0.09	0.16
	2	0.01	0.02	0.02	0.02	0.01		0.28	0.14	
	3	0.05	0.08	0.09	0.07	0.04		0.10	0.09	
	4	0.16	0.18	0.19	0.18	0.15		0.16	0.25	
	5	0.77	0.71	0.68	0.72	0.80		0.15	0.42	
Reading books (fiction or non-fiction)	1	0.04	0.04	0.03	0.03	0.03	0.00	0.51	0.32	0.06
	2	0.11	0.11	0.10	0.09	0.09		0.31	0.30	
	3	0.24	0.24	0.23	0.22	0.22		0.08	0.11	
	4	0.36	0.36	0.36	0.37	0.36		0.05	0.12	
	5	0.26	0.26	0.28	0.30	0.29		0.04	0.15	
Associating with real life	1	0.10	0.07	0.08	0.07	0.07	0.00	0.03	0.01	0.11
	2*	-	-	-	-	-		0.31	0.11	
	3	0.41	0.37	0.39	0.37	0.36		0.35	0.28	
	4	0.35	0.38	0.37	0.38	0.38		0.28	0.47	
	5	0.14	0.19	0.17	0.18	0.19		0.03	0.12	
Associating prior knowledge	1	0.11	0.05	0.07	0.03	0.02	0.07	0.02	0	0.08
	2*	-	-	-	-	-		0.20	0.07	
	3	0.42	0.29	0.35	0.21	0.21		0.31	0.20	
	4	0.35	0.42	0.40	0.42	0.42		0.38	0.49	
	5	0.12	0.24	0.18	0.34	0.34		0.10	0.24	
Seek additional information	1	0.09	0.04	0.08	0.03	0.02	0.04	0.04	0.01	0.10
	2*	-	-	-	-	-		0.22	0.07	
	3	0.38	0.28	0.37	0.24	0.18		0.24	0.16	
	4	0.35	0.39	0.36	0.39	0.38		0.42	0.57	
	5	0.17	0.29	0.19	0.34	0.42		0.07	0.19	

Note: C stands for cluster. *The option "2" in PIAAC has no equivalent in PISA, so it is shown as "-" in the Table.

As shown in Table 3 above, all of the chosen variables predicted latent class membership significantly except the "reading fiction or nonfiction books" item for PISA literacy clusters due to the 3-step analysis. Moreover, the R2 results, calculated for each variable, show that individuals' reading habit items (reading e-mails, letters) had the greatest effect on their latent clusters classification for PISA and PIAAC. Concerning "reading e-mails", those who stated: "I don't know what it is" was at 12% probability and the 1a proficiency level. Those at 63% probability were at the second proficiency. And those who replied: "I check them once or twice a day" were at 28% probability and third proficiency level. When we come to "reading magazines or newspapers", those who said "never or almost never" with a probability of 1% belonged to the 1a proficiency level, and those who stated "I read them several times during the week" belonged at the second proficiency level with a probability of 71% and 68%. In all clusters, the percentage of reading newspapers or magazines once or twice a week was over 68%. However, the highest proportion was seen in Cluster 5 at 80%. In addition, "reading fiction and nonfiction books" did not significantly affect the reading success of different individuals.

The participants who responded "almost never" to the statement, "While I am studying, I understand how the information corresponds to real-life events", belonged at the 1a proficiency level with 10% probability. Whereas those who stated "almost always" belonged in the second proficiency level with 36% probability. Furthermore, those who responded as "almost never", "I try to engage the new information with the previously acquired knowledge", belonged at the 1a level with 11% probability. Those who said "almost always" belonged in the second level of proficiency with 42% probability. Those at the third level of proficiency had 34% probability, and

the fourth level of proficiency had 34% probability. Finally, the respondents at the third proficiency level were at 34%, and the fourth proficiency level was at 42% probability.

When all items were evaluated together for PISA, the proportion of students at the level of 1a who said: "never or almost never", "several times a year", or "sometimes" was higher. The rate generally declined concerning the students who stated, "once or twice a day", "several times a week", and "almost always", except for the item reading magazines or newspapers. The opposite applied to students who were at the third level of proficiency. For example, as the level moved from "never or almost never" to "almost always or always", the percentage of individuals at that level also increased.

It can be seen in Table 3 for PIAAC that the conditional probability for Cluster 2 (medium achievement) individuals who responded to the first cell in Table 3 was 0.51, which indicated 51% of the participants from Cluster 1 (very low achievement rates) who replied, "not at all" to "reading letters, information notices, or e-mails". Those who responded "never" to this question mainly belonged in the first proficiency level with a 51% probability. In comparison, those who responded with "every day" belonged at the second proficiency level with a 31% probability rate. In addition, those who replied "never" to "reading news bulletins, newspapers, or magazines" belonged at the first level with a probability of 32%, while those who responded with "every day" belonged at the second level with a 42% probability. Next, those who said "never" to "reading fiction or nonfiction novels" belonged to the first level with a 51% probability, and those who stated "every day" belonged to the second level of proficiency with a 15% probability.

The respondents who replied to the statement "When I read about a new idea or new information, I try to relate it to reality" with "never" belonged at the first proficiency level with a 3% probability, while those who said "I often do that" were in the second proficiency level with a probability of 47%. While those who said "never" to the statement, "If I don't understand something, I look for more accessible information to understand it better", belonged in the first proficiency level at 4% probability. Those who stated "I often do it" belonged in the second level with a 57% probability.

When all of the items were evaluated together for PIAAC, the proportion of participants who were at the first proficiency level with responses of "never" or "not at all" was above 50%, and this proportion generally decreased toward participants who stated "always" or "mainly". The opposite applied to participants at the secondary qualification level, where the percentage of individuals at the level of "never" or "sometimes" increased to "often" or "almost always".

Discussion and Conclusions

When the PISA and PIAAC findings were compared, in the PISA 2009 findings, 15-year-old students were divided into five groups. In comparison, in PIAAC 2015, the individuals aged between 20 and 22 were divided into two groups. This disparity in the number of groups was believed to result from fewer people in the PIAAC age group. These participants were not the same individuals, but due to the separation in age groups and the dates of the studies, PISA in 2009 and PIAAC in 2015, it was assumed that the participants' reading literacy was comparable. When students' proficiency levels and their genders were compared among clusters, it was seen that female students were more successful than male students for PISA. As posited by Mullis et al. (2007) and Loh et al. (2020), girls tend to read more often than boys. Although the number of books students owned in the 4th and 5th clusters was higher than the first clusters, the proportion was still low. It has been determined that the number of books owned by children is an effective factor in increasing their reading habits and attitudes towards reading (Durualp, Cicekoglu, & Durualp, 2013). According to the classification results of PISA data, it was observed that the number of books in the homes of low-reading groups was low, and as the number of books in the home increased, reading success also increased. Evans et al. (2014) found that books in the home positively impacted individuals' test scores in both poor and rich countries.

Students in these clusters at the third and fourth proficiency level generally read e-mails several times a week or each day and read magazines a couple of times a week. In a study with similar findings to the current study, Scales and Rhee (2001) compared the reading habits of 115 Caucasian and Asian-American adults. They determined that most participants read magazines often or very often. On the other hand, students in the least successful groups generally related information in the text to real-life situations and sometimes related new information to previous knowledge and tended to seek out additional information to make subjects clearer and more understandable. The importance of strategy teaching was emphasized in increasing students' reading comprehension skills.

When the classification results of PIAAC data were evaluated, almost all participants at the first proficiency level had very few books in their homes. Most of these participants did not read articles, information notes, e-mails, newspapers, magazines, newsletters, and/or fiction/nonfiction books, and if they did, read them only once a month. The participants in the second group were at the second proficiency level, and the proportion of male participants was higher than the percentage of female participants. An evaluation of the study's findings revealed that female participants were more successful than male participants in PISA 2009, whereas male participants outperformed the female participants in PIAAC 2015. Differences in participants' reading success in PISA and PIAAC may be due to structural differences (Solheim & Lundetræ, 2018). In the research by Solheim and Lundetræ (2018), which took place in four Nordic countries, it was stated that PIAAC is a more male-friendly survey while PISA has a more female-friendly design. By comparing PISA and PIAAC in four Nordic countries (Danish, Finnish, Norwegian and Swedish) found that individuals at the first proficiency level had very few books in their homes. This result highlighted the importance that literature had in the development and maintenance of reading skills. As a result, one can argue that an important reason for students being in a low achieving group is that they do not spend enough time reading inside or outside of school. Reading is important because frequent reading and being a successful reader ultimately increases individuals' reading achievement (Evans et al., 2014; Jerrim & Moss, 2019).

According to the results of the PISA 2009 study's questionnaire, students spent quite a lot of time reading online. It was seen in other related literature (Alvermann, 2001; Spence, 2009) that students liked to engage with technology and tended to spend a lot of their time in front of a screen or a computer. These students' online reading was primarily focused on reading e-mails, chatting online with friends, reading news, searching nonfiction resources, and participating in online discussion forums (OECD, 2010). Similarly, Jackson et al. (2006) argued that online reading activities positively affected students' reading achievement.

Reading e-mails was the most effective variable to explain the reading success of both the Turkish 15-year-old PISA and 20-22 years-old PIAAC age groups in our LCA analyses. In both studies, individuals at the first proficiency level did not or rarely read e-mails. It is thought that the socio-economic level of individuals in this situation may be low. For example, students with internet access in 2009 and who use e-mail can be considered at a high socio-economic level (SEL). The finding that SEL plays an important role in student success was also found in several other studies (Finch & Marchant, 2013; Wolfram, 2005; Yalcin, 2017).

In our study, the second variable that explained the reading achievement of students in the 15-year-old age group at the highest proficiency level was the skill of relating new learning with previous knowledge. In contrast, the reading achievement of students aged 20-22 at the highest proficiency level was explained by their second variable of reading newspapers, magazines, and the news. Spear-Swerling et al. (2010) showed that in comparison to reading other materials, reading fiction was more associated with reading skills such as increasing vocabulary and reading comprehension. Similarly, in the study of Jerrim and Moss (2019) and Pfost et al. (2013), it was found that reading fiction books positively affected the development of reading achievement. Also, another study argued that reading narrative texts was associated with higher-level reading comprehension, whereas reading newspapers, magazines, comics, and nonfiction books was not significantly related to reading achievement and vocabulary development (Maximilian, Tobias, & Cordula, 2013). According to the OECD (2010) report for PISA 2009, reading nonfiction, magazines, and newspapers was less positively related to reading literacy. In this current study, similar findings were obtained regarding PISA 2009; however, reading newspapers, magazines, and the news was highly related to students' reading achievement for PIAAC 2015.

Based on the findings of the study, some recommendations can be given to both researchers and practitioners. While investigating 16-year-olds or older adults' reading skills, Sabatini (2012) stated four domains: visual word recognition, reading fluency, reading comprehension, and metacognitive processes. According to the author, an educator should pay attention to all these domains to understand what underlying cognitive features a skilled reader has. Thus, reading education should implement activities and strategies to increase student's vocabulary and comprehension skills, including reviewing images, underlining important lines, identifying unrecognized parts, separating the text into small units to understand better, finding the main idea of the text, finding the supporting details, inferencing, establishing links between the pre-information and the information they read, using analogies, doing classification, sorting, association, inquiring, summarizing the text, arranging the information with a concept map, etc. Additionally, educators should be aware that teenagers and young adults nowadays are highly engaged in technology and do most of their reading activities online, especially for networking, searching, mailing, and reading for resources (Clark, 2011; Pitcher et al., 2007). Findings on the related literature (Alvermann, 2001; Spence, 2009) showed that students tended to spend more time in front of screens and computers and liked engaging with technology. Thus, educators should find ways to incorporate technology into their educational curriculum in which students can find reasons and motivation to read more.

Since the curriculum is heavy in Turkey, students spend most of their time after school completing their homework. For this reason, their newspaper, magazines, and fiction reading habits for pleasure can be undeveloped. However, further research can interview these age group students to better understand underlying reasons for their not being able to or not preferring to do pleasure reading.

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COVID-19 Crisis Challenges and Management Strategies of Educational Leaders in America

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COVID-19 Crisis Challenges and Management Strategies of Educational Leaders in America

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Abstract

This research was conducted to understand how 30 American school leaders coped with the COVID-19 pandemic. A case study approach was used in the study. The researchers used convenience and snowball sampling to conduct Zoom interviews in May 2020. The research findings revealed that leaders faced numerous difficulties related to having to lead during two crises (a global pandemic and social-racial issues). The results also showed that leaders changed their style and used many strategies to lead during crises. They emphasized communication, became stress managers and cheerleaders, focused on developing a sense of belonging among teachers and students alike, and planned for the school year. This study is important because it expands leaders' understanding of how to lead schools in times of crisis. When leaders lead effectively in times of crisis, then learning, teaching, and well-being are less likely to negatively impacted. The implications of this study also challenge education stakeholders to reimagine how to lead in an increasingly technological world. The study is relevant for K-12 leaders, but the findings could also be useful for leaders in a variety of contexts.

Keywords: Educational leader, COVID-19 pandemic, Challenge, Crisis management, Strategy.

Introduction

While science, technology, informatics, and social networks are rapidly increasing, countries face various crises and try to cope with them to find solutions. One of these crises is a global pandemic known as the Corona virus, COVID, or COVID-19 (Sahu, 2020). This pandemic has affected every country in the world from health to education, from the service sector to social life. It changed all lives and influenced quality of individuals' lives (Netolicky, 2020). This global pandemic began in December 2019 in Wuhan, China. The World Health Organization (WHO) declared this epidemic as a pandemic on 11th March 2020. As of April 1st, 177 countries were infected by the virus, approximately 723,000 people were sick, and more than 34,000 were dead from the COVID-19 virus (John Hopkins University, 2020). As of 16th September, 29,444,198 confirmed cases of COVID-19, including 931,321 deaths were reported to WHO (2020). This pandemic is important for all the countries, and is called a natural crisis. One of the most important features that distinguish this as crisis rather than routine situation is the imperative to respond promptly (McNamara & Sahlberg, 2020). It is imperative to respond and act quickly during a crisis (Darling-Hammond & Kini, 2020). From this point, the crisis situation can be defined as changes that require quick and fast adaptation (Smith & Riley, 2012).

Countries took some precautions because of the pandemic: Many countries had some travel restrictions (external and internal flight or other travels); people refrained from visiting their friends and relatives, shopping places, schools, universities, etc. People practiced social distancing, self-isolation, and quarantine. Many people worked at home, and rather than working in their offices did not work their job places (Bedford et al., 2020). People faced this natural crisis and it has spread all around the world. Whatever crises happen, the crises affect and change all people and organizations (Kafa & Pashiardis, 2020). Countries worldwide have experienced undeniable chaos because of the COVID-19 pandemic crisis (Hargreaves & Fullan, 2020). Leaders played a vital role in crisis management (James & Wooten, 2005). Because the leader is key before, during, and after the crisis, and the leader's quality can determine the length, severity, and ultimate consequences of the crisis. If leaders pay attention to the components of the crisis, they can have a significant positive impact on many people and the negative weather associated with the crisis. This can reduce the negative effects and duration of the crisis in favor of the

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organization (Christensen, 2009). Whether it is an effective leader, the manager of a large company, or the head of a department, he/she tries to solve the problem as soon as possible during a crisis. Often, there is a lot of information that is not true. It is the leader's duty to discover the truth and face it by talking to the right people, listening to the most reliable voices, and going to the right places (Inan, 2008). These situations are the same for educational leaders as for other leaders. In this process it is seen that the educational leader is the most important role for the organizations. Educational leaders' role in the school at the time of the crisis (Harris & Jones, 2020) is to take a lesson from the crisis to create a shared mindset, identify the weaknesses of the organization, make rational and quick decisions, take bold steps, and manage change (Hooge & Pont, 2020), and also communicate with other organizations and people for the benefit of the students and the school (Pius-Uwhubetiyi, 2020). This study first explained the crisis and the problems faced by educational leadership during the crisis. Then the challenges faced by the education leaders working in schools in the United States of America (USA) and the strategies they developed during the crisis were examined.

Crisis and Leadership

The crisis is *"a time of great danger, difficulty or doubt when problems must be solved or important decisions must be made"* (Oxford Dictionary, 2021), a sudden, unexpected event that requires immediate action. It is a situation that threatens the high-level goals of an organization, puts the organization's life in danger and requires quick response, and creates tension in which the organization's crisis prediction and prevention mechanisms are inadequate (Ritchie, 2004). A crisis can be defined as an unplanned event, situation, or series of events with an undesirable outcome (Demirtas, 2000). So, one of the most important for organizations ways to manage the crisis is that a leader who is known, respected, reassured, and listened to is in charge at the beginning of this process (Christensen, 2009). For this reason, leaders have a lot of work to do in crisis times and should use crisis management strategies (Sayin, 2008). The leaders should use the 5E stages in crisis management. It is seen in Figure 1 (Nathanial & Van der Heyden 2020):

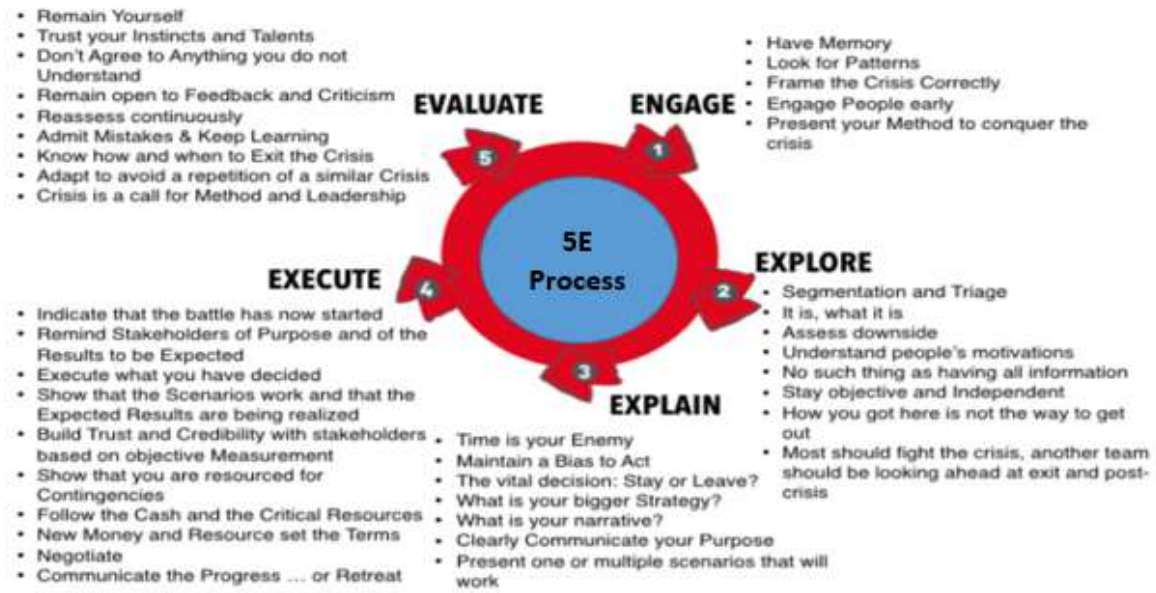

Figure 1. 5E stages in crisis management

It is shown in Figure 1, there are five stages in the time of crisis. (1) *Engage*: Engaging all in framing the crisis and get it right, identifying patterns of how crises unfold and how people respond to them, (2) *Explore*: Exploring the crisis and how to fight and deal with it (goal setting and planning), (3) *Explain*: Explaining what you have decided, why and how it will work, and then committing to action, (4) *Execute*: Executing with focus and constant monitoring, focusing and determining strategies as a leader and checking if it works, (5) *Evaluate*: Evaluating, learning and adapting efforts, as well as your leadership, as new information and feedback comes in. In times of crisis, leaders may not know these stages. They may be inexperienced and have never lived a crisis before. At this point the leadership skills of leaders become important.

During the crisis, leaders should emphasize the crisis is temporary with positive messages (Luecke, 2008) and keep the communication ways open to inform both internal and external groups and to organize various

organizations (Boin et al., 2013). This period allows leaders to keep the organization members together and increase their motivation (Powley & Taylor, 2014). Being experienced, motivating, and communicating is an important task for a leader in this process (Wang, 2007). For this reason, leaders should use communication channels effectively. Communicators should share the current crisis information in a timely and accurate manner (Boin et al., 2013). Sharing the available information openly and honestly reduces uncertainty and prevents people from turning to other sources to meet their information needs, which prevents the growth of the crisis (Veil et al., 2011). Leaders should benefit from the media, especially social media, in their information activities while maintaining the best relationship with media in the event of crisis (Arslan, 2015).

Educational leaders should also effectively use to communication channels (e-mail, mail, phone callings, etc.), media (visual and written), and social media during the crisis process. Crises in the education sector are different from others. This is because the crisis in schools also affects children for whose protection society is responsible (Damiani, 2006; Hooge & Pont, 2020). If society cannot protect the children, it feels vulnerable and there is a loss of confidence. Therefore, crises in education, the most important institution of the society, are of great importance (Damiani, 2006). Children need to be supported in various ways during the crisis to feel safe. At this point, adults have a lot of work to do. They should support and guide children. Because, as in all crises, this crisis can have various effects in terms of physical, social, emotional, psychological, educational, and economic (Mutch, 2015). It gives harms all stakeholders (children, parents, etc.). Educational leaders must give support to their communities (Pius-Uwhubetiyi, 2020). For example, Mutch's (2015) study was conducted about the natural crisis, the earthquake in New Zealand. According to the principals, they give emotional support to families and students to help them for how to cope with it. They gave the synergy of really strong relationships in their community, their focused priority education. They managed to put other people's needs before their own, and use clear communication skills. While the school leaders made decisions during the crisis, they acted calmly and decisively and used communication skills. They also constantly assessed the situation, analyzed new information, and weighed up alternatives as the situation developed.

Educational leadership in times of crisis is about dealing with events, emotions, and consequences in the immediate present in ways that minimize personal and organizational harm to the school and school community (Smith & Riley, 2012). This crisis affected and harmed all school elements particularly students, families, teachers, and leaders (McNamara & Sahlberg, 2020). In times of the COVID-19 crisis, students stopped going to schools, and education styles changed. The education system of all countries was affected by this crisis. According to UNESCO (2020), these nationwide closures impacted hundreds of millions of students. In total 1,048,817,181 students were affected, 60% of all enrolled students and 132 nationwide closures. So this crisis is significant in every state. In addition to school closures, students not being able to go to school, and educators, especially education leaders, who are the head of the school, experienced several difficulties and barriers. America is the country most influenced by the crisis, out of all the countries examined. As of 16th September, there are 6,496,246 confirmed cases and 193,494 deaths. America is the country with the highest number of cases and deaths all over the World (WHO, 2020). Due to the rapid pandemic and deaths, American schools were closed in all the states (until April 10, 2020) at least 55 million students and 124,000 schools in the 2019-2020 academic year (Coronavirus and School Closures, 2020).

The schools were shifted from face-to-face to online or virtual education between March and May 2020 (UNESCO, 2020). The students had some problems with access to the necessary technology, absenteeism, nutrition, etc. in this process. School leaders and education districts tried to mitigate the disruption caused by the unprecedented closures. And they tried to solve these problems. While schools were closed, they arranged for "grab-and-go" meal bags, they gave hotspots for the internet, they changed Cromebooks, etc. They made an effort children's requirements (Goldstein, Popescu & Hannah-Jones, 2020). There are many studies about the COVID-19 pandemic in the closed process (Zhen-Dong et al., 2020; Campbell, 2020, etc.).

When the studies were examined, it was found that there was related to COVID-19 cases, physical and mental health, etc. There have also been some studies done on education. For example, a study in England (Fotheringham et al., 2020) examined pressures and influences on school leaders during the COVID-19 pandemic. Participants responded (35%) that the biggest challenges they faced were the frequent changes in updates. Others were the lack of time and clarity in the information received. So they all imply stress for the leaders.

Hamilton et al. (2020) research showed the principals said that the limitations of distance learning are to provide proper education for all students and internet access for students. The American principals also said that (83%) their primary responsibility is providing students with direct health and education guidance during pandemics. The main challenges were not to reach all of the students and families for rural and high-poverty districts. Schools faced many potential challenges to providing distance learning to students, including financial, technological, and

policy-related factors. The principals' top goals and strategies were to plan for the future. More diverse (high-poverty and more color students) schools' principals' goals were to engage with families, address disparities in academic performance, new academic curricula and initiatives. Because the pandemic made inequality and poverty more visible (Dodley et al., 2020; Dorn et al., 2020; Wright & Merritt, 2020).

Educational leaders struggle with their leadership skills with all of them. Communication, interaction, relationship, influence (Fotheringham et al., 2020; Hamilton et al., 2020; Harris, 2020, etc.), and also policy development, interpretation, and implementation, partnership, motivation, personnel and resource management (Varela & Fedynich, 2020), and time management (Kiral, 2016) are important elements of educational leadership processes (Harris & Jones, 2020). The educational leaders play a greater role in times of crisis because they know how to best practice to their communities and serve, manage the sources, make fast and rational decisions (Kiral, 2019; Netolicky, 2020). COVID-19 has changed the whole understanding of education and management (Harris & Fullan, 2020). This research is important for leaders and the educational system. Based on the findings from this research, it is thought that education leaders will guide other leaders in managing the COVID-19 crisis. This research was conducted to understand the challenges American school leaders experienced during the COVID-19 crisis and what strategies they used to lead schools during these challenges. The following questions guided this study:

1. What specific challenges have school leaders experienced during COVID-19 pandemic?
2. What specific strategies have school leaders used to manage the challenges they faced during the COVID-19 pandemic?

Method

The researchers used a qualitative design and a case study approach for this. The researchers opted for a case study approach because it provides the ability to examine in detail a phenomenon as it manifests in everyday context (Yin, 2014). The present qualitative study, the researchers sought to understand how American school leaders led their schools during the COVID-19 pandemic. Specifically, these researchers examined the strategies school leaders used to lead during times of crisis between March and May 2020.

Participants and Data Collection

The researchers used convenience and snowball sampling for the present study (Bryman, 2012). Snowball sampling is used to describe different events from person to person and from people to various situations. Convenience sampling is used to save money, time and effort (Creswell, 2016). Snowball sampling is a particularly effective technique for identifying individuals or situations that can be a rich source of information regarding the problem of researchers. The researchers asked the research process, "Who might know the most about challenges and strategies?" They started with these questions to the research. Educational leaders are among those who experience the most difficulties in the research. In the process progressed, the leaders obtained grew like a snowball. Education leaders have also helped to grow the snowball and discuss the issue in detail by recommending other colleagues experiencing the same difficulties and strategies. For this reason, the most rational sampling method to be used for this research was thought to be the snowball sampling method. The study participants were 30 educational leaders that one of the researchers met at workshops, conferences, or meetings over a period of two years. These educational leaders worked in five school districts in Ohio. Two districts were in urban areas and three were in suburban districts. The sample, 18 women and 12 men, aging from mid-thirties to mid-sixties, included two preschool principals, 14 elementary principals, five middle school principals, six high school principals, and three superintendents. The researchers conducted 30 in-depth interviews to collect rich data.

The researchers reviewed the literature before starting the research. Following the literature review, the researchers wrote and piloted with two principals a semi-structured interview protocol. To maintain social distancing, the interviews took place in May 2020 using Zoom or Google Hangout. The interview protocol consisted of questions such as, *"Can you tell me the strategies you used to lead in this time of crisis?"* or *"Tell me about the challenges you faced when leading your school during COVID-19."* The interviews lasted approximately 60 minutes each for a total of over 30 hours of interview data and over 200 pages of transcripts. The interviews were recorded and transcribed verbatim. The in-depth interview of each participant allowed the researchers to understand how the leaders adapted their leadership in the remote learning environments and to comprehend the extent to which they were able to sustain these new practices over the spring semester. The researchers gave all study participants pseudonyms to preserve their anonymity.

Data Analysis

To maintain the confidentiality and anonymity of the schools and participants, the researchers used pseudonyms during the transcription and coding process. All documents were coded using qualitative software called Atlas.ti. Coding served as the base of the analysis since it is the interpretation of the data (Saldaña, 2009). Coding began immediately after the interviews and after preliminary field notes and diary entries were written. The researchers first listened to each of the recordings twice and pre-coded the data by highlighting memorable passages and quotes (Saldaña, 2009). Then, the researchers read through the journals, field notes, and transcripts to make notes on them as if we were "conversing with the data" (Merriam, 1988). The researchers then used thematic coding. Thematic coding is a method of analyzing qualitative data. It is applied to a set of texts, such as interview transcripts, and involves recording or identifying passages of text or images that are linked by a common theme or idea. This allows the coders to index the text into categories and establish thematic ideas (Gibbs, 2007). Examples of codes were as follows: Communication, stress managers and cheer leaders, etc.

Trustworthiness and Validity

To enhance the present study's internal validity, the researchers included four particular strategies into the design of the study. First, the sample of 30 leaders in urban and suburban districts allowed to gain a wide array of perspectives and understand the various strategies used by leaders (Patton, 2002). Second, the investigators applied member checking (Mero-Jaffe, 2011). Following data analysis, these researchers contacted the participants to share the results section of the present study with them. The participants confirmed that the findings reflected their own perspectives. Third, this research team created a data trail (Rodgers, 2008). This is a qualitative research practice where copied the participants' quotes from this present study's transcripts data and pasted them under each theme that emerged from the data analysis. This strategy helped ensure that sufficient transcript data supported the results that were reported in the present study. Following this process also ensured that the researchers were not sharing the viewpoint, but rather the perspectives of the participants. Fourth, the researchers used low-inference descriptors (Chenail, 2012). In this qualitative protocol, the researchers used participants' quotes from various transcripts to ensure that their perspectives are reported accurately. To summarize, the researchers used robust qualitative strategies in order to enhance the internal validity and trustworthiness of the present study's findings.

Researchers' Roles

To remain unbiased, the researchers individually wrote journals and analytical memos. They obeyed the ethics and scientific principals; they behaved objectively all the research (interviews, transcriptions and writing the article). In addition, expressions that would reveal the identities of the participants were avoided. And the researchers used code names for all the participants. Code names such as Sarah, Barry, Katie, Michael were used.

Findings

In this section, there are three categories: Faced challenges, crisis management strategies and experiences. What the participants said was quoted verbatim.

Faced Challenges

Leaders shared some challenges as seen in Figure 2. These are logistical difficulties and struggling a global pandemic and racial/social unrest crisis. These are given in direct quotations.

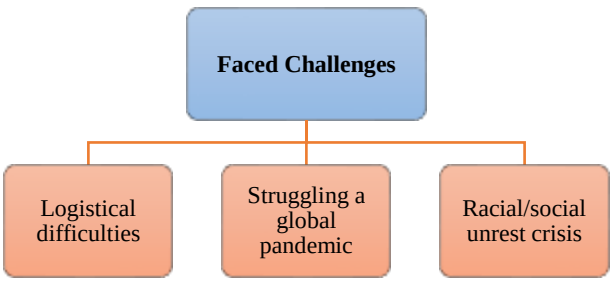

Figure 2. Faced challenges

Logistical Difficulties

The challenges pertaining to the lack of funding required leaders to be more creative and offer more professional development for teachers who did not know how to use an online platform and needed some more social emotional strategies. Leaders also had to manage parents' frustrations with having to be teachers, pick up food at designated locations, while also working and maintaining a household. Heather expressed:

- *Parents were frustrated because they did not have enough devices for all their children or did not know how to support their children and how the platform worked.*

Similar to face-to-face teaching, online learning is an infrastructure that demands routines and procedures. Online learning has its own culture because principals and teachers do not see students daily. As a result, clear expectations are needed. At the outset of COVID-19, participants reported being

- *overwhelmed with directives, information, and orders that would change hour by hour.*

Larry spoke about the confusion and chaos

- *to add to an already confusing and overwhelming time, all schools in our district did things differently, so none of our buildings had a uniform and consistent approach to follow, which delayed us in our ability to provide effective remote learning.*

Other leaders shared that they needed an adaptation period during which they were able to

- *filter the information from the state's department of education and their districts.*

Mary shared the feeling of the group when she said*:*

- *This adaptation period lasted approximately three weeks. After that, we started to have a rhythm and we worked out some of the kinks.*

In the first three weeks of remote instruction, leaders faced several challenges. First, they had to ensure that everyone had access to a mobile device or a computer and could connect to WIFI. This proved to be difficult for schools that did not have one-to-one devices. Although leaders tried to reach everyone, some students were not accounted for, as Dona explained:

- *Even when schools printed some packets for students without a device or WIFI, parents would not always pick up the packets at school because they worked, they may have been worried to come to school, or may not have had transportation.*

Another difficulty involved families. Even when the family had computer(s) or a mobile device and WIFI, caregivers did not necessarily know how to use the devices, as exemplified by Peter:

- *I received many calls daily of parents who were asking for guidance and tutoring on how to operate and navigate the device so that they could assist their child(ren).*

Other difficulties included the lack of bandwidth in households with several children and parents having to use WIFI, the instruction for special education, and English Learner. Leaders constantly spoke about challenges related to

- *bringing the students with individual educational plans online and giving them the services they needed.*

In particular, Brad stated that

- *it was hard to motivate 8th graders because they thought they were on holidays since the testing was suspended and they were easily disengaged.*

Lastly, leaders spoke about the importance of having uniform guidelines with Google classroom, so that all teachers organize their materials a certain way on the platform to make it user friendly and consistent for parents with multiple children. Specifically, Amy shared:

- *I have two children in my own school. One teacher organized his Google classroom by date and the other by assignment. It took me weeks to understand what was needed for whom and to get into a rhythm. As the principal, I saw that we needed to do better and have a consistent way of organizing our online classrooms.*

Besides, these logistical challenges, leaders spoke about the difficulty leading during two crises presented. Leaders felt that they were not only leading during COVID-19, but also during an unprecedented time of social unrest across the nation.

Struggling a Global Pandemic and Racial/Social Unrest Crisis

Principals expressed their difficulty in leading in two pandemics: COVID-19 and the racial and social unrest following the death of George Floyd. Sarah expressed:

- *It is like we have to deal with two pandemics: COVID-19 and the racial unrest that is going on because we have to take a stand on racial inequities and speak about it with our teachers, staff, and students and it is very hard in a time of remote learning and a pandemic.*

Mary concurred and said:

- *I was not ready and prepared to lead in a pandemic and I have learned a lot from it, like being more flexible and focusing on the people first. I was also not prepared to have discussions about race. I feel very uncomfortable with that, yet as a leader I need to model that with my teachers and others.*

Marc agreed with Mary about not being prepared to lead in these conditions and said:

- *We can never be fully prepared anyway so my attitude is to be positive and to take these crises as opportunities to learn and teach some valuable lessons and tools for life to our children and students.*

Marc continued

- *that being said, I need help because it is an overwhelming task to discuss issues of races remotely…and with people who may be resistant.*

John also found it challenging to support teachers to talk to their classes about race and equity, he said:

- *How do you do that with small kids and remotely? It is clear that we were not prepared for none of these two crises.*

Due to the social unrest, leaders started to join Facebook groups, reach out to their university professors, and have discussions among themselves and their teachers on how to address issues of social justice in their schools. Maria said:

- *I reached out to my professor because she had taught a class during my licensure program on equity, diversity, and inclusion. I texted her and she recommended books and such. We had an hour-long exchange. I guess I needed to vent and also continue my learning so I can address these issues in my school.*

Leaders' Crisis Management Strategies and Experiences

Leaders indicated using various strategies to lead their schools during the COVID-19 crisis as seen in Figure 3. These included spending ample time communicating and taking the role of stress managers and cheer leaders, planning, developing sense of belonging and leading with grace and equity. And also leaders shared management experiences with their leadership styles to lead with grace and equity. These are given in direct quotations.

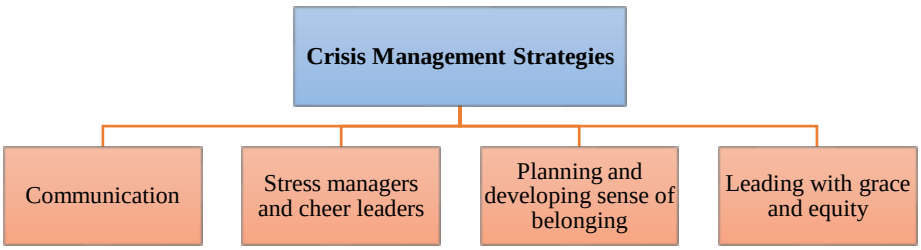

Figure 3. Crisis management strategies

Communication

Leaders stated using a direct communication style because of the urgency to promptly react to the crisis. They communicated often and with transparency. They used various communication channels including social media, website, newsletter, emails, calls, texts, and their districts' automatic calling systems. All leaders emphasized the need to constantly update stakeholders and making intentional efforts to check in with teachers, students, and parents daily.

Principals often communicated the importance of care, patience, safety and giving up perfection. Michael said:

- *Community is bigger than test scores and I want to be one of these leaders who model good listening, care, and grace because we must think of Maslow before Bloom.*

These principals also translated communications whenever possible for their English learners' population. Other leaders said they made sure they were reassuring and encouraging in their messages and online presence. In addition to communicating often, all leaders agreed that they purposefully listened more. Part of their communication strategy was to spend time listening to teachers, students, and parents to better support them. One elementary school principal named Katie shared:

- *I listened more during COVID-19 than ever before because that is what was needed of me.*

As a result of all the listening, leaders saw a need to survey parents regularly and made surveying an integral part of their communication plan. As part of their non-verbal communication, leaders increased their efforts to be more visible. Michael, Katie, Sarah and Mark made themselves visible by

- *visiting classrooms every day, conducting virtual classroom observations and evaluation, respond to calls and emails promptly, keep an updated schedule and conduct weekly mental checks on Zoom with teachers and stakeholders.*

Leaders also read aloud to students, conducted online assemblies, or were secret guests in classes. They taught classes to remain visible. Leaders also took the role of stress managers.

Stress Managers and Cheer Leaders

Leaders spoke about having to manage their own stress and the stress of teachers and students. They stated that they researched and attended workshops to learn more about social-emotional learning (SEL) tools for adults because teachers were feeling anxious and stressed about COVID-19 and the new and sudden online environment. John, one of the vice principals shared:

- *We quickly realized that our teachers needed a different kind of support because they were juggling their own children and their work, and they were very stressed. As a result, I researched SEL for adults and implemented some activities on Zoom to help teachers voice their stress. Such activities included venting sessions, yoga classes, and happy hours.*

Other leaders had their school guidance counselors open their own Google classroom to hold meetings with parents and families. Barry shared*:*

- *After reflection, I would have liked the counselor to also focus more on teachers because they were also juggling their own children and their classroom.*

Leaders emphasized the importance of intentionally keeping morale high, particularly in the first few weeks of the crisis. Sarah explained:

- *I cannot control COVID-19 but I need to be a cheer leader."* Meagan also asserted: *"I constantly tell teachers, students, and parents them that I am there to support them, they all have my cell phone and use it when needed.*

Another leader shared that

- *they celebrated small wins often with teachers by organizing zoom events such as happy hours, birthday celebrations, or wins in the remote classroom. Other strategies used by leaders included writing cards, emails, or text messages to teachers and checking in about the teachers' emotional health regularly. Being a cheer leader also meant understanding the need to find a balance between work and family responsibilities.*

Leaders supported their teachers by purposefully modeling balance between their professional and personal lives. One high school leader with his two children on his lap, said,

- *Now that my home office is the main office of the school, I usually have my children during my staff meeting. This way teachers see that it is ok, I understand and that I am in the same boat as they are.*

Other leaders indicated that

- *they told their teachers to stop working when they realized that their teachers were working 12 hours' day or more.*

All leaders spoke about the importance of modeling physical and mental health. Marty in particular sent reminders via text message to their teachers asking,

- *tell me two things that you are grateful for today and who did you talk to today? Or when is the last time you moved your body today?*

Leaders also communicated the importance to collaborate. School leaders had to learn how to lead virtually and from home. They had to learn from other schools and colleagues. Many of them joined groups on social media and learned how to use technology to interact with their teachers and students better. All leaders spoke about conducting classroom virtual tours and giving regular feedback, as well as providing professional development on how to foster engagement in a remote learning environment. Leaders also prioritized collaboration. Mary illustrated this feeling when she said:

- *I encouraged them to be in communication with one another. It is interesting but I saw more collaboration in the virtual model during COVID-19 than when we were face-to face. They collaborated more on lesson planning during remote learning than ever before.*

Michael reported:

- *I saw teachers who did not use to be team players suddenly meet colleagues on Google Hangout to check in on their classes, students and share ideas.*

When speaking about their leadership style, principals and assistant principals also referred to

- *leading with grace and for equity.*

Planning and Developing Sense of Belonging

In terms of planning, principals asserted having a hard time planning for the long-term because they received new guidelines and mandates every day from the state, the district, and their colleagues. These leaders, however, planned day by day. They planned meals and cromebooks deliveries for the students who needed them, they coordinated additional resources for families in need, and they always made time to create a sense of belonging for all stakeholders. Mary exemplified this when she said:

- *My role changed. The good thing is that I had less discipline to do. I spent more time planning deliveries, reading about health protective measures, and providing academic support to teachers and families so that they felt they still belonged to the school, even remotely.*

John added:

- *My role became much more one of damage control, if I can say this. Instead of being test driven, I became people driven. I planned my day around meeting with teachers, calling parents, visiting classrooms to make sure everyone felt they were still part of our school community, a now remote community.*

These leaders also used creative ways to continue celebrating important events and accomplishments among students, teachers, and families. In all instances, leaders found a way to celebrate birthdays, graduations, and other important events. Peter said:

- *I started to send handwriting notes to my teachers when I saw they were doing something great in their google classrooms. I never anticipated the impact these hand-written notes would have on the teachers receiving my notes, but they talk to me about it all the time saying that it meant a lot to them that I took the time to notice their work and writing to them on a good old fashion paper.*

Shelly sent daily inspirational texts messages to her teachers

- *to boost their morale.*

She explained:

- *I know the teachers were working around the clock and many had their own children at home. I started to read these inspirational messages for myself and then decided to send them to the teachers. I was surprised how many of them thanked me for those and said that it helped them frame their day more positively.*

Jack shared another way he celebrated and encouraged his teachers. He continued celebrating birthdays virtually. He would set up a Zoom meeting and take time to celebrate his teachers' birthdays. Andrew celebrated his teachers in various ways and sent emails, used humorous pictures and attachments, and cancelled all faculty meetings. He shared:

- *To me that is a way to make the teachers feel heard and cared for, because I knew they could not handle one more meeting, so I just cancelled them to relieve the teachers. Many thanked me for it.*

He added:

- *I also let the teachers go early if they need because I know they put long hours anyway, so I am extra flexible, and extra aware of the need to care for them because they care for our students' day after day.*

Leaders also found creative ways to create a sense of belonging among students. All leaders shared that they adapted and used various strategies to make students feel welcomed, cared for, and part of the school community. For instance, leaders celebrated students' birthdays and they hosted virtual graduation ceremonies. Mary shared:

- *I write a birthday card to each student. I put it in the mail with a couple of small gifts, like a small gift card and a candy. I mail those.*

Jack chose to celebrate the birthdays virtually by sending a video to students. He stated:

- *I have a large school, so it is easier, and these students are on their device all day long anyway. I send the birthday student a video and I get together with their teachers, so I know more about the students' needs and interests. This allows me to personalize my birthday wishes.*

Other principals celebrated birthdays in morning assemblies, as they would have done it face-to-face. In terms of long-term planning, Sam recalled

- *planning the fall when schools would hopefully be face-to-face and learned from the Spring semester to ease the transition back to school.*

He said:

- *we spent a fair amount of time discussing scenarios around the end of the school year trying to anticipate what school could look like, re-imagining our services.*

Overall, leaders indicated that they spent their days on the phone, on the road delivering items, and creating a sense of belonging for teachers and students alike while also trying to plan for the future.

Leading with Grace and Equity

Some leaders indicated grace and equity. As Marty illustrated in this title, leaders led with grace. When asked what they meant by that, Marty shared:

- *We cannot control the virus, but we can control how we respond, and I chose to respond with grace. By that I mean being patient, compassionate, and humble.*

Understandings of leading with grace varied among participants. Sam, Mary, Michael, Sarah and Molly stated that,

- *leading with grace meant that they encouraged creativity rather than typical classroom assignments.*

These leaders also

- *became more flexible with teachers because they also had family obligations at home and understood what teachers were going through.*

In her journal, the researchers wrote: In half of the interviews, the leaders, both men and women were feeding their children or playing with them while we were talking. They mentioned that school meetings were held with children around because everyone was juggling schedules and responsibilities. Those leaders who were parents were challenged by the lack of time, freedom, and quiet. Mary, John, Kurt, Joseph, and Molly who did not have a family

- *enjoyed the online learning because there were very few discipline issues and could then focus on supporting teaching and learning instead of discipline.*

In both cases leaders recognized the need for grace and adjusted their leadership style to be more equitable with teachers and students during these unprecedented times. Leaders, such as Mary, Sam, Zoe, and Sarah who served underprivileged students were aware of the need to

- *advocate for equity because COVID-19 affected a lot more those who live in poverty.*

These leaders indicated that beyond instructional materials, families needed additional food, clothing, and medical items. To meet this need, one of the principals formed a partnership with a company and received half a million dollars in food items that her community distributed weekly to families. Other leaders organized barbecues with donated items, drove foods to homes, or arranged for district buses to drop out foods, clothes, and medication. Again, principals and assistant principals often stated,

- *Maslow comes before Bloom, and instruction is important but staying healthy takes precedence.*

Leaders also realized that they needed to be more equitable in their communications, so they enlisted the help of interpreters and translating systems to make sure families stayed informed.

Conclusion and Discussion

This research was conducted to understand how 30 American educational leaders led during the COVID-19 pandemic. Leaders struggled with crisis difficulties the COVID-19 pandemic, social unrest over racial issues, and logistical difficulties. Both the pandemic and social crisis showed the difficulty of real life. Both this study and others (Dodley et al., 2020; Dorn et al., 2020; Wright & Merritt, 2020) showed that COVID-19 has exacerbated financial problems and demonstrated how education inequalities deeply affect society (Harris & Jones, 2020). The pandemic highlighted inequalities in access to digital devices and the internet (Pius-Uwhubetiyi, 2020). When schools were closed, fifteen percent of America's households and thirty-five percent of low-income households with school-age children did not have high-speed internet connectivity at home. As of early April, more than half of leaders in high-poverty areas reported that the basic lack of technology was a "big" problem (Darling-Hammond & Kini, 2020). According to Wright and Merritt (2020) COVID-19 affected several areas of life in America. These areas were inequality in health care; segregation, overall health, and food insecurity; underrepresentation in government and the medical profession, and inequalities in participatory democracy and public engagement (Dodley et al., 2020). According to this study, education leaders faced many difficulties. Poverty, nutrition, medical information, democracy, inequality in social development, cleaning, disinfection, preparation of schools, creating conditions for schools were the responsibility of education leaders. And also Fotheringham et al. (2020), Hamilton (2020), and McNamara & Sahlberg (2020) found similar difficulties like this research. Netolicky (2020) stated that these situations have always existed, but COVID-19 made them visible.

Varela and Fedynich's (2020) research showed that education leaders were not confident in serving students, staff, and parents. They felt a lack of resources and they saw students' inequalities as complicating this situation. Leaders tried to solve all the crisis time, atypical conditions. Education leaders grappled with the inevitable challenge of planning school reopening after the COVID-19 pandemic closes (such as Harris, 2020; Kafa and Pashiardis, 2020; Varela and Fedynich's, 2020 study). In this study, leaders initially felt unconfident just like others. However, they tried to manage the crisis well with their leadership skills.

America, which helped students in the pre-pandemic period, increased these aids even more during the pandemic period. In America, various legal texts include the support of students in various aspects. For example, the No Child Left Behind Act was signed in 2002 and President Barack Obama signed the Every Student Succeeds Act in 2015. In these laws; particular emphasis has been placed on some subgroups, such as students who are disadvantaged in various aspects and have economic problems. For this reason, it was concluded that

administrators should increase the effectiveness of their schools (US Department of Education, 2002). In addition, the Convention on Children Rights (1989), which accepts individuals as children up to the age of 18, supports these aids. These are all legal texts taken into consideration of the principle of the best interests of the child. Based on these legal texts, America has tried to help children as a priority. Education leaders have also applied this as a primary principle in the pandemic crisis.

During the pandemic period, America provided various aid to its citizens. For example, food packages were prepared for the students' families whose financial situation was insufficient, and daily hot meals were distributed. For this, school buses brought daily meals to the closest points to their children's addresses or student families received food packages from their schools (US Department of Agriculture Food and Nutrition Service, 2021). Despite this, the leaders experienced various logistical difficulties. In addition, for students to access education when the courses are online, they offered hotspot passwords for internet access to their citizens. They endeavored for all students to access online and digital education tools (The World Bank, 2020). They used communication channels effectively for this problem. The lack of existing research on how school leaders responded and struggled to the COVID-19 crisis and their implementation strategy is important. It has revealed both this study and other leadership studies the importance of strategies of education leaders such as having a vision, developing others, managing people, capacity building, planning, time management, equality, and effective use of communication channels (Leithwood et al., 2020; Harris, 2020).

Following this research, the interviews with educational leaders identified four basic strategies for coping with the crisis. It was found that the education leaders used strategies such as communication, stress management, creating a sense of belonging among teachers and students, and planning, leading with grace and equity. It was determined through the research that educational leaders used all the communication channels, eg. social media, website, newsletter, emails, calls, texts, and their districts' automatic calling systems during COVID-19 crisis time. Thus, the most important strategy was communication. They communicated with parents, guardians, teachers, and students. They had to share information about reopening schools, school supplies, repairing of chrome books, food, clothing, and medical items, and other information. If the parents or guardians did not have internet, they also gave information about hotspot. They also gave information about specific classes, listening or teachers, etc. The education leaders wanted to reach all their parents/guardians and students. The other strategy was to act as stress managers and cheer leaders. All teachers, parents/guardians, and students had some stressful days because there were some limitations. They had to socially and physically distance themselves from all their friends, relatives, etc. They organized some activities on Zoom such as yoga, counseling, sent postcards, birthday celebration with Zoom or videos, etc. The third strategy was to lead with grace and for equity. They tried to create equality between everyone. The leaders behaved patiently, compassionately, and humbly. They tried to take care of national, spiritual, universal, and religious values. They emphasized the importance of overcoming this crisis as one. For this reason, they chose a more loving, understanding, and just management approach. The last two strategies were planning and developing a sense of belonging. Leaders did not plan for the long term, but from day by day. They tried to instill to sense of belonging in school communities. And they visited and observed online classes, met with teachers who were struggling with this crisis. They struggled to manage this situation and helped to manage the teachers.

All of the education leaders in this study have experienced similar problems and have tried to cope with the pandemic, inequity, education, poverty, and other crisis problems and coping strategies. In times of crisis leaders are the key. Crisis management is more important than anything else. Like all leaders of organizations, education leaders also have a lot of work to do. In a times of crisis, education leaders must act quickly and with foresight, while also carefully considering the options, outcomes, and the side effects of the actions taken. It can be noted that educational leaders have played an important role in managing this crisis, despite the challenges, obstacles, unpredictability, and uncertainty as shown by other researches (Fotheringham et al., 2020; Hamilton et al., 2020; Hooge & Pont, 2020, etc.). As a result of this research, it was found that they created new pathways for all students with determination, continuity, and composure using different strategies. It was also found that communication was one of the most effective of all the strategies. They did everything, could with determination and hope for the students to learn, and they stated that they will continue to do so in the future, including for their teachers and schools. It can be said that it is one of the indicators of educational leadership. So, the educational leaders should play their part in overcoming the crisis in the school with their attitudes, constructive behaviors, and necessary interventions. Similarly, Demirtas (2000) in his research mentioned the importance of leadership competencies in crisis management. The leader should manage the crisis by taking a holistic view of the events in resolving the crisis and evaluating them according to the culture of the organization, management structure, and the use of resources. Moreover, for effective crisis management and plan, joint studies should be conducted with internal and external stakeholders (Ritchie, 2004). Sayin (2008) in his study stated that the attitudes of education leaders are important for crisis intervention management.

Crisis situations are situations that threaten the goals of organizations. Schools with an organizational structure are negatively affected by crisis situations, and this situation is negatively reflected in and around the school. For this reason, it is important to learn from crises. The greatest responsibility in crisis management in schools lies with educational leaders. Considering this situation, education leaders should determine in advance the methods they will use to get out of the crisis situation and ensure that they minimize the possible damages of the crisis. The most important task of the leaders is to anticipate and solve the crisis.

Limitations and Recommendations

This is a qualitative study conducted with a group of educational leaders working in public schools in five Ohio school districts. Therefore, the results may not be applicable for private schools. It can be recommended that future studies are conducted with private schools. Samples from different school districts of different sizes can be selected for such studies. Studies conducted on private schools may also reveal the challenges and strategies in this process in these organizations. This topic should be explored with quantitative research in both private and public schools and the results should be compared.

Since educational leaders inevitably use communication and communication channels, online and face-to-face communication trainings can be provided to leaders in consultation with the university faculty members. Since education leaders are doing various supportive activities, they can be given reading suggestions on this subject. Online orientation studies can be more frequent, especially for students in the first school year. By being more sensitive when speaking, they can talk to parents and students about values such as equality, justice, non-discrimination, and non-racism. Educational support such as video using and preparation can be planned by leaders for teachers who have insufficient use of technology. The number of online classes for families can be increased. Online postcards and mails can be sent more frequently to students on topics such as equality and non-racism. Leaders can be encouraged by teachers to have students watch movies on these topics. Leaders can participate in a variety of online activities to improve themselves in crisis management. This research was with education leaders. Similar research can be conducted with parents, teachers, and students.

Contingency plans should be prepared for possible crises that may occur in the future. Because, the crisis management plan can save, minimize the damages of a possible crisis, and can play an important role in achieving these goals. Conducting a study with broad participation in the development of school crisis plans, involving teachers, students, parents, principals, and other school members in the planning will play a very important role in terms of consistency, high foresight, and clarity of the plan. Therefore, it is important for schools to have a plan for the crisis and this plan can be achieved through meetings with broad participation.

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The Relationship between School Administrators' Supportive Behaviors and Teachers' Job Satisfaction and Subjective Well-Being

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The Relationship between School Administrators' Supportive Behaviors and Teachers' Job Satisfaction and Subjective Well-Being

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Abstract

This research aimed to determine the relationships between school administrators' supportive behaviors and teachers' job satisfaction and subjective well-being via a correlational survey model, a quantitative research method. The study group of this research was composed of 400 teachers working employed at primary schools in the city center of Bolu. Principal Support Scale, Teaching Satisfaction Scale, and Teacher Subjective Well-being Questionnaire were used in the study. Since the data had a normal distribution, parametric tests were utilized in data analysis.

Research results demonstrated positive and highly significant relationships between informational support and teachers' job satisfaction and subjective well-being; between informational support and teachers' job satisfaction and between principal support and emotional (expressive) support dimension and teachers' subjective well-being. Supportive behaviors of school administrators were found to have a significant impact on teachers' job satisfaction and subjective well-being.Teachers' job satisfaction was found to affect their subjective well-being levels. The findings that school administrators provided moderate emotional and informational support to teachers and teachers had moderate job satisfaction were also remarkable and striking. This study presented the importance of school administrators' supportive behaviors, finding that school administrators' support predicted both teachers' job satisfaction and subjective well-being.

Keywords: Principal support, Job satisfaction, Subjective well-being, School administrator, Teacher.

Introduction

Education has a vital role in the progress and development of countries and in shaping their future. Personal and professional development is very important for teachers to achieve job satisfaction (Bui and Baruch, 2010). School administrators have important responsibilities in ensuring teachers' personal and professional development (Evers and Eacott, 2016). Rapid changes and developments in the 21st century require innovation and change in education as well. It is believed that support for teachers from school administrators, which provides for innovation and change in schools, not only increases teachers' performance in education, but also has a positive impact on their job satisfaction and subjective well-being by enabling them to develop personally and professionally.

Administrator/supervisor support refers to meeting the needs of employees to increase their performance levels, the supportive activities that will make employees feel that they are a valuable asset and increase their quality of work life and the positive relationship between administrators and employees (Bhanthumnavin, 2003). The main elements of this type of support are respect, trust and the administrator's desire and efforts to help employees (Gagnon and Michael, 2004). Perceived administrative support is employee beliefs about being cared for and valued for their contributions to the organization by their administrators (Pohl and Galletta, 2016). Administrative support provided to teachers in schools includes professional, personal and environmental support (Short, 1992) and time, project, educational support and resources (Kıral, 2016). The attitudes and behaviors that constitute administrator/supervisor support consist of appraisal of teachers' efforts and the degree of this appraisal and placing emphasis on teachers' personal and professional development (Eisenberger, Stinglhamber, Vandenberghe, Sucharski and Rhoades, 2002).

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Principal support, conceptualized by House (1981) as having four dimensions as emotional, instrumental, informational, and appraisal, was adapted to teachers by Littrell, Billingsley and Cross (1994) with the following dimensions: emotional, instrumental, professional and appraisal support. Günbayı, Dağlı and Kalkan (2013) conceptualized the dimensions of principal support as emotional support, instrumental support and informational support. This research was conducted within the scope of these dimensions. Emotional principal support refers to the type of support demonstrated when principals/supervisors accept their employees as they are, value them by showing respect and affection and helping them to cope with conflict, stress and difficulties they encounter (Bhanthumnavin, 2000). Instrumental support refers to the provision of materials, resources, space, and time needed by teachers, while informational support refers to principals' constructive and ongoing feedback on teachers' work, support for teachers' professional development, and the provision of current and useful information and guidance to teachers regarding effective instructional practices (Littrell et al., 1994).It is very important that principals support teachers in creating a school climate where teachers are valued, where they can work peacefully and comfortably, where their ideas, requests and complaints are considered, where their problems are solved effectively and where their achievements are appreciated. Previous studies in the literature show that principal/supervisor support increases employees' job satisfaction (Qureshi and Hamid, 2017), organizational commitment and organizational citizenship behavior (Wang, 2014), and performance (Azman, Sieng, Ajis, Dollah, and Boerhannoeddin, 2009), while decreasing perceptions of organizational cynicism (Oezkara, Taş, and Aydıntan, 2019) and burnout (Salahian, Oreizi, Abedi, Soltani, 2012). Therefore, it can be assumed that the support from the principal is effective in ensuring teachers' job satisfaction..

Job satisfaction refers to the feelings and expectations of employees towards their job and the organization. Job satisfaction can give an idea about employees' general feelings and thoughts towards their job and the organization (Miner, 1992). Job satisfaction occurs only when the jobjob characteristics match the employee's desires (Davis, 1982) or when the employee's psychological and other needs are met (Aziri, 2011). The individual has needs, desires and expectations in work life. The employee may experience job satisfaction as well as job dissatisfaction in regards to these feelings and expectations. Therefore, job satisfaction is the result of job behaviors within the organization.

Employees satisfied with their jobs do not tend to be absent from work, do not intend to quit work and ask fewer sick reports. Therefore, employees participate in work voluntarily in the organizations where job satisfaction is achieved. At the same time, problems related to unions such as strikes and slowdown strikes, decreased productivity, discipline problems and other organizational problems are commonly experienced in organizations where job satisfaction is not achieved (Erdoğan, 1996). Job satisfaction is experienced when the benefits of the job match employee expectations (Bingöl, 1990). Job satisfaction is not possible unless the needs of the employees are met (Kaynak, 1990). The factors affecting job satisfaction are the job itself, wages, promotion opportunities, administrative style, co-workers relations and working conditions. When job satisfaction increases, employee performance and job quality increase in organizations; but job dissatisfaction results in tardiness, absenteeism and decreased organizational commitment (Özdevecioğlu and Doruk, 2009). A high level of job satisfaction and receiving support from their principals will contribute to teachers' happiness and achievement because they will enjoy their work and feel committed to the school. All these positive factors will contribute to high subjective well-being levels in teachers.

Subjective well-being is a concept emphasized in the field of positive psychology in the 21st century. Literature in psychology refers to subjective well-being as individuals' perceptions of their lives as good and high quality and evaluating their lives as being good. In daily life, subjective well-being is expressed as happiness (Diener, 2000). Subjective well-being (Diener, Lucas and Oishi, 2002), the individual's inclination towards positive affect rather than negative affect based on cognitive and affective self-evaluation, is a general evaluation of the individual's life satisfaction and positive-negative affect (Diener, 1984). When individuals have positive feelings and thoughts about their lives, their subjective well-being levels will be higher (Cihangir-Çankaya, 2005). Individuals with high levels of subjective well-being exert more efforts to be socially beneficial (Deci and Ryan, 2009). In this sense, the teaching profession stands out in regards to its social benefits. Teaching is a demanding and stressful profession that requires a high level of emotional labor (Brennan, 2006). This is due to the stress caused by overcrowded classes, lack of material resources in schools, a high paperwork burden, political pressure on schools, disciplinary problems, and insufficient rewards and recognition (Akçamete, Kaner, and Sucuoğlu, 2001). Higher levels of stress can cause teachers' job satisfaction to decrease and negative situations to arise, such as absenteeism, mental disorders, abandonment of teaching, and failure to meet students' needs (Naylor, 2001).When stress experienced by teachers becomes chronic, it may result in burnout (Jennett, Harris and Melsbov, 2003) and cause emotional and physical fatigue and psychological and other health problems (Grayson and Alvarez, 2008; Schonfeld, 2001). On the other hand, burnout starts with fatigue, desperation, hopelessness, negative self-concept, feeling of uselessness and negative attitudes towards other people and can lead to

psychosomatic diseases and, in the end, quitting the profession (Çelik, 2013). Therefore, teachers' subjective well-being is negatively affected in these cases.

Organizations can only be successful when employees are efficient and effective. Efficient and effective work of employees depends on their health and happiness. Employees who are healthy and happy will strive to achieve organizational goals. Therefore, organizations need to ensure employees' physical and psychological health and happiness. In addition, meeting the needs and expectations of teachers will ensure having physically and psychologically healthy teachers at school organizations which are needed to ensure the development of the schools, the education system and the society (Toplu, 2012). In this sense, it is believed that teachers' subjective well-being levels are related to both principal support and job satisfaction.

Moreover, high job satisfaction enables employees to be healthier and happier and to carry these positive feelings to other areas in their lives. The absenteeism of employees with high job satisfaction decreases. They work in more fruitful cooperation with other employees in the organization and strive to achieve more (Tok and Bacak, 2013). Job satisfaction is considered an independent variable in 21st century organizations and human resources policies are developed in this direction (Keser, 2005). Teachers' job satisfaction and subjective well-being levels are important in the quality of educational activities, the achievement of students and schools and innovation and change practices. Teachers should be guided and supported to increase their job satisfaction and subjective well-being levels. At this point, supportive behaviors of school administrators stand out because these behaviors will swiftly and concretely contribute to teachers' happiness, job satisfaction and professional development. Therefore, this research is a significant and original contribution to present the relationships between school administrators' supportive behaviors and teachers' both job satisfaction and subjective well-being levels. In this context, this research set out to determine the relationships between principals' supportive behaviors and teachers' job satisfaction and subjective well-being. For this purpose, answers to the following questions were sought:

1- What is the level of school administrators' supportive behaviors, teachers' job satisfaction and subjective well-being based on teacher perceptions?

2- Is there a significant relationship between principals' supportive behaviors and teachers' job satisfaction and subjective well-being?

3- 3- Does principals' supportive behavior predict teachers' job satisfaction and subjective well-being?

Method

Research Model

Correlational survey model, one of the quantitative research methods, was used in this study. This model is used to obtain the thoughts and attitudes of the teachers participating in the research and to determine the degree of the relationship between the variables with strong statistical techniques such as regression (Balcı, 2013).

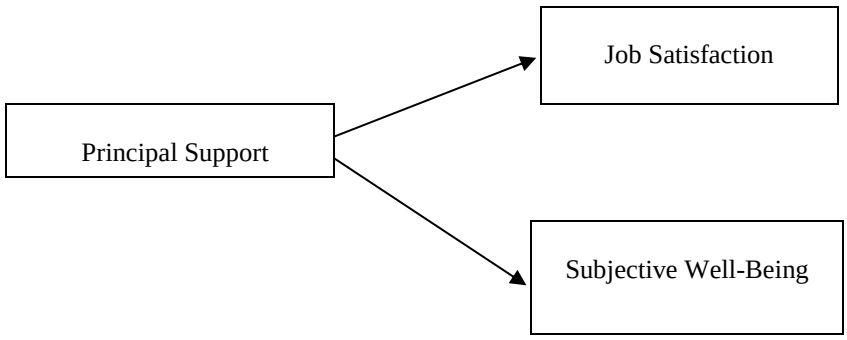

Figure 1. Research Model

Study Group

The study group composed of 400 teachers working in elementary schools in the city center of Bolu. The entire study group was reached in the study; therefore, no sampling was required. The teachers participated in the study group on a voluntary basis. Of the 356 teachers who volunteered to participate in the study, 289 returned the scales that were analyzed in this study.

Data Collection Tools

Principal Support Scale, Teaching Satisfaction Scale, and Teacher Subjective Well-being Questionnaire were used as data collection tools in the study. The data were collected with quantitative data collection techniques.

Principal Support Scale: Developed by Litrell (1992), the scale was reorganized by DiPaola (2012) with 16 items in 4 sub-dimensions as emotional support (4 items), appraisal support (4 items), instrumental support (4 items), and professional support (4 items). The Principal Support Scale, adapted to Turkish by Günbay et al. (2013), consists of a total of 16 items in three sub-dimensions, including emotional support (4 items), instrumental support (4 items) and informational support (8 items). The scale adapted to Turkish by Günbayı et al., (2013) was used in this study. The Cronbach alpha coefficient of the 6-point Likert scale (1= disagree at all, 2= disagree, 3= partially disagree, 4= partially agree, 5= agree, 6= fully agree) was .82 for the emotional support dimension, .94 for the informational support dimension, and .88 for the instrumental support dimension, while the Cronbach alpha coefficient of the total scale was .95.In this study, the Cronbach Alpha coefficient of the scale was found to be .83 in the emotional support dimension, .92 in the informational support dimension, .87 in the instrumental support dimension and .93 for the total scale.

Teaching Satisfaction Scale: The teaching Satisfaction Scale, developed by Ho and Au (2006) and adapted into Turkish by Demirtaş (2010), consists of 5 items and a single dimension. The Cronbach Alpha coefficient of the 5-point Likert type (1= Strongly disagree, 2= Disagree, 3= Moderately agree, 4= Agree, 5= Completely agree) scale was calculated as .84 by Demirtaş (2010). In this study, the Cronbach Alpha coefficient was determined as .86 based on the reliability analysis.

Teacher Subjective Well-being Questionnaire: Teacher Subjective Well-being Questionnaire developed to measure teachers' job-specific subjective well-being by Renshaw, Long and Cook (2015) as a 4-point Likert type scale (1= Almost never, 2= Sometimes, 3= Often, 4=Almost always), was adapted into Turkish by Ergün and Nartgün (2017). The scale consists of a total of 8 items in two dimensions: school connectedness (4 items) and teaching efficacy (4 items). The Cronbach Alpha coefficient of the scale was.81 in the school connectedness dimension by Ergün and Nartgün (2017) and .79 in the teaching efficacy dimension, while the Cronbach Alpha coefficient of the total scale was .82. In this study, the Cronbach Alpha coefficient of the scale was .80 in the school connectedness dimension, .78 in the teaching efficacy dimension and .81 for the total scale. Based on the examination of Cronbach Alpha coefficients of the scales used in the research, it can be argued that they had high reliability.

Data Collection Process- Data Analysis

Before submitting a request to the Bolu Abant İzzet Baysal University Human Research Ethics Committee, the permissions required to use each scale for data collection in this research were obtained from the researchers who developed and/or adapted it into Turkish. After the approval of the Ethics Committee, necessary permissions for the implementation were obtained from the Directorate of National Education and the data collection tools were delivered to 400 teachers online. Principals and teachers were informed about the study. Participation in the study was voluntary. Feedback was obtained from 289 of the 356 teachers who agreed to participate in the study and data was collected for the study..

The data obtained in the research were analyzed using the SPSS 20 program. Skewness and Kurtosis coefficients were utilize to check the normality of the data. Kurtosis and skewness values between +1.5 and -1.5 indicate suitability of data for normal distribution (Tabachnick and Fidell. 2013). The analysis showed that the data were suitable for normal distribution since the following data were between +1.5 and -1.5: Principal support total scale score (Skewness: -.613; Kurtosis: .183), emotional support (Skewness: -.983; Kurtosis: .291). instrumental support (Skewness: -.641; Kurtosis: 1.014) and informational support (Skewness: -.912; Kurtosis: .384) sub-dimensions; Teaching Satisfaction Scale total score (Skewness: -.264; Kurtosis: -.342); and Subjective Well-Being Scale total score (Skewness: -.644; Kurtosis: .236), school connectedness (Skewness: -1.023; Kurtosis: -.280) and teaching efficacy (Skewness: -.116; Kurtosis: -.116) sub-dimensions. Therefore, parametric tests were used in the research. Arithmetic mean and standard deviation scores were calculated to determine teachers' views on school administrators' supportive behaviors, job satisfaction, and subjective well-being. Pearson correlation analysis was used to determine the relationships between school administrators' supportive behaviors, teachers' job satisfaction and teachers' subjective well-being while multiple regression analyses were conducted to determine the effect of school administrators' supportive behaviors on teachers' job satisfaction and subjective well-being.

Findings

Principals' supportive behaviors, teachers' job satisfaction and subjective well-being perceptions

Table 1 presents teacher perceptions of school administrators' supportive behaviors, teachers' job satisfaction, and subjective well-being.

Table 1. Principals' Supportive Behaviors, Teachers' Job Satisfaction and Subjective Well-Being Perceptions

Scales and Dimensions	N	$\bar{x}$	Sd
Emotional Support	289	4.20	0.38
Instrumental Support	289	5.08	0.51
Informational Support	289	4.30	0.36
Total Principal Support	289	4.28	0.41
Job Satisfaction	289	3.36	0.21
School Connectedness	289	2.90	0.35
Teaching Efficacy	289	2.84	0.24
Total Subjective Well-Being	289	2.85	0.29

According to Table 1, teachers "partially agreed" that administrators' supportive behaviors were in emotional support dimension ($\bar{x}$=4.20); informational support dimension ($\bar{x}$=4.30) and principal support scale total ($\bar{x}$=4.28). Teachers "agreed" that administrators' supportive behaviors were centered on instrumental support dimension ($\bar{x}$=5.08). This finding demonstrated that principals moderately supported teachers in emotional support and informational support dimensions as well as total principal support scale. In contrast, they were supported at high levels in the instrumental support dimension.

Teachers' job satisfaction perceptions were moderate ($\bar{x}$=3.36) and their subjective well-being levels were at the level of "often" in the dimension of school connectedness ($\bar{x}$=2.90), teaching efficacy ($\bar{x}$=2.84) and subjective well-being total scale ($\bar{x}$=2.85). These findings indicate that teachers' job satisfaction was moderate and their subjective well-being levels were high.

The relationship between school administrators' supportive behaviors and teachers' job satisfaction and subjective well-being

Table 2 presents the results of the pearson correlation analysis for examining the relationships between school administrators' supportive behaviors and teachers' job satisfaction and subjective well-being.

Table 2. Pearson Correlation Analysis Results regarding the Relationships between School Administrators' Supportive Behaviors and Teachers' Job Satisfaction and Subjective Well-Being

Principal Support Scale and Sub-Dimensions		Job Satisfaction	Subjective Well-Being
Emotional Support	r	.541**	.772**
	p	.000	.000
Instrumental Support	r	523**	.612**
	p	.000	.000
Informational Support	r	702**	.752**
	p	.000	.001
Principal Support	r	653**	.714**
	p	.000	.000

**p<0.01, Note: The correlation coefficient as absolute value points to a high level relationship when it is between 0.71-1.00; to a moderate level relationship between 0.70-0.31and to a low level relationship between 0.30-0.00 (Büyüköztürk, 2011).

Table 2 demonstrates a positive and moderate relationship between the emotional support provided by school administrators and teachers' job satisfaction (r=.541; p<0.01) while there was a highly significant positive correlation was found between the emotional support provided by school administrators and teachers' subjective well-being (r=.772; p<0.01). There was a moderately significant positive relationship between instrumental support from school administration and teachers' job satisfaction (r=.523; p < 0.01) and their subjective well-being (r=.612; p < 0.01), while there was a highly significant positive relationship between informational support from school administrators and teachers' job satisfaction (r=.702; p < 0.01) and their subjective well-being (r=.752; p < 0.01).There was a positive and moderate relationship between the overall principal support scale and teachers'

job satisfaction (r=.653; p<0.01) and a highly significant positive correlation between the overall principal support scale and subjective well-being (r=.714; p<0.01).

The effect of school administrators' supportive behaviors on teachers' job satisfaction

Table 3 presents the results of multiple regression analysis conducted to determine whether emotional, instrumental and informational support -the dimensions of principal support-predicted teachers' job satisfaction.

Table 3. Simple Regression Analysis Results for Predicting Teachers' Job Satisfaction by School Administrators' Supportive Behaviors

Dependent Varable	Independent Variable	ß	t	p	F	p	R^2
Job Satisfaction	Constant	1.16	3.66	0.00			
	Principal Support	0.69	5.86	0.00	79.47	0.00	0.67

* p< 0.01

According to Table 3, principal support (F=79.47; p<0.01) significantly predicted teachers' job satisfaction and explained 67% (R^2 = 0.67) of the total variance in teachers' job satisfaction. Examination of the p value showed that principal support was a significant predictor of job satisfaction (p<0.01). This finding asserts that principal support affects teachers' job satisfaction.

The effect of supportive behaviors of school administrators on teachers' subjective well-being

Table 4 shows the results of multiple regression analysis regarding whether principal support dimensions (emotional, instrumental and informational support) predicted teachers' subjective well-being levels and school connectedness and teaching efficacy sub-dimensions of subjective well-being.

Table 4. Multiple Regression Analysis Results on How School Administrators' Supportive Behaviors Predicted Teachers' Subjective Well-Being

Dependent Variable	Independent Variable	ß	t	p	F	p	R^2
School Connectedness	Constant	1.16	4.19	0.00			
	Emotional Support	0.39	4.79	0.00	73.25	0.00	0.59
	Instrumental Support	0.34	5.36	0.00			
	Informational Support	0.36	5.72	0.00			
Teaching Efficacy	Constant	1.42	3.95	0.00			
	Emotional Support	0.26	3.34	0.00	76.55	0.00	0.67
	Instrumental Support	0.41	5.86	0.00			
	Informational Support	0.46	5.88	0.00			
Subjective Well-Being	Constant	1.02	3.81	0.00			
	Principal Support	0.56	4.82	0.00	68.34	0.00	0.64

* p< 0.01

According to Table 4, the sub-dimensions of principal support predicted teachers' school connectedness (F=73.25; p<0.01) and teaching efficacy (F=76.55; p<0.01) while principal support scale total score was a significant predictor of teachers' subjective well-being (F=75.22; p<0.01). Together, principal support sub-dimensions accounted for 59% of the total variance in teachers' school connectedness (R^2 =0.59) and 67% (R^2 = 0.67) of the total variance in teaching efficacy. Principal support scale total score explained 67% of the total variance in teachers' subjective well-being levels (R^2 = 0.64). When the p-values were examined, it was found that the dimensions of emotional, instrumental, and informational support were significant predictors of teachers' school connectedness and teaching effectiveness, the sub-dimensions of subjective well-being. It was also found that the total score of the principal support scale was a significant predictor of teachers' subjective well-being (p < 0.01).These findings show that the emotional, instrumental and informational support provided to teachers by school administrators affects teachers' subjective well-being levels, school connectedness and teaching efficacy.

Conclusion, Discussion and Recommendations

According to the results of this study, teachers received moderate emotional and informational support from their administrators while they had a high level of informational support. Özdemir (2010), Derinbay (2011), Özdemir-Demirel (2012), Doğan (2014) and Ertürk, Keskinkılıç Kara and Güneş (2016) concluded in their research that teachers' perceptions of principal support were high. While it is a positive finding that the support provided to teachers by principals, who can be regarded as the most accessible administrator staff, is at moderate levels in regards to emotional and informational support and in regards to general principal support, providing higher levels of support to teachers is important to ensure job satisfaction, increase teachers' well-being levels and improve their performance. Primarily, school administrators meet the informational or emotional support needs of teachers at schools. While this finding points to the fact that school administrators support teachers at a moderate level based on teachers' opinions, it also raises questions about the competence of school administrators in supporting teachers. The factors related to school administrators' efficacy can be listed as school administrators' support for teachers' professional development, effective communication with teachers, ensuring teachers' participation in decision-making and making, and being fair, equal, and ethical. Moreover, school administrators' informational support related to the professional development of teachers in many areas, such as support in planning, teaching methods and techniques, evaluation etc., requires efficacy and competence. Employees who believe that they are supported by their administrator/supervisors contribute to the organization by taking an active role in making and implementing creative and original decisions and developing risk-taking and problem-solving skills (Üstün, 2018). Today, the heavy workload of school administrators (especially assistant principals) may have led to a decrease in their supportive behaviors towards teachers. However, most of the administrative tasks done at school can be handled easily through digital systems in the age of technology today. In this sense, school administrators can allocate time to support teachers. The fact that school administrators are responsible for supervising classes means that they need to support teachers at higher levels because ensuring professional development and providing enrichment and guidance activities are important in the 21st century supervision approach. Therefore, the support that school administrators will provide to teachers will ensure that their supervisory duties are more sensible and successful.

School administrators' supportive behaviors such as providing materials, meeting the needs in classrooms, repairing broken furniture and systems, allowing teachers to use their skills and abilities, encouraging them to take the initiative by increasing their motivation and empowering them ensure that educational activities are more efficient and effective (Ertürk, 2008) and positively affect job satisfaction and organizational commitment (Ertürk, 2021; Purcell, Kinnie, Swart, Rayton and Hutchinson, 2009). Therefore, school administrators' supportive behaviors, especially in emotional and informational dimensions, will positively affect teachers in various ways.

Teachers' job satisfaction was found to be "moderate". Although it can be regarded as a positive finding, higher job satisfaction levels will increase teachers' motivation, performance, commitment, professional dedication, student achievement and school efficiency. Employees with high job satisfaction stay in the organization longer (Shalley, Gilson and Blum, 2000), their intention to leave the organization decreases or disappears (Aghaei, Keivan and Shahrbanian, 2012) and high job satisfaction positively affects organizational productivity and employees' physical and psychological conditions (De Simone, Cicotto and Lampis, 2016). In this sense, teachers' job satisfaction can be increased to higher levels and their performance, professional dedication and subjective well-being can be improved. For this, it should be ensured that the teaching profession should be made an ideal profession by better incentives and teachers are offered better conditions to perform their profession. Moreover, higher job satisfaction will improve teachers' attitudes towards work and ensure that teachers have more positive attitudes, increase the quality of pedagogical activities and thus student and school performance, and consequently lead to a decrease in negative situations such as burnout, intention to quit work, stress, alienation and withdrawal. Indeed, the relevant literature supports this finding. The studies conducted by Miles (2010) and Makela (2014) reported that job attendance increased in teachers due to higher job satisfaction and emphasized that lower job satisfaction levels led to undesirable situations such as burnout, desire to quit their jobs and absenteeism. Demirtaş (2010) also found that as a result of the higher job satisfaction, the quality of the educational activities offered to students increased and the students' achievement levels improved.

Teachers' subjective well-being levels were at the level of "often" in the dimension of school connectedness, teaching efficacy and subjective well-being total scale which points to a high level of subjective well-being. Öztürk (2015) reported that teachers had "high" levels of subjective well-being while Sasmoko, Herisetyantri, Suroso, Harisno, Ying, Rosalin, Chairiyani, Pane and Permai (2017) concluded that they had "moderate" levels of subjective well-being. Individuals with a high level of subjective well-being may have a healthier and longer life and higher performance. Therefore, these individuals display more productive and positive organizational behaviors (Diener and Ryan, 2009; Öztürk, 2015).

When teachers' subjective well-being levels are high, both the quality of the education they provide and the relationship they establish with their students increase. They can establish a more positive communication with their students (Spilt, Koomen and Thijs, 2011; Öztürk, 2015). Subjective well-being improves social relations by creating a positive environment in schools (Diener and Scollon, 2014). In this sense, when teachers have positive assessments about their teaching efficacy and have high level of subjective well-being in general, the education they will provide to students will be of higher quality and more effective. Subjective well-being may directly or indirectly affect teachers' motivation levels, psychological states, quality of work life, and performance, therefore, a high level of subjective well-being is crucial in establishing positive relationships among teachers, creating a healthy school climate, and ensuring that teachers, who are at the center of educational activities, fulfill their duties and increase their performance.

The study found a positive and moderate relationship between school administrators' emotional, instrumental support and principal support total scale and teachers' job satisfaction and a positive and high-level relationship between school administrators' informational support and teachers' job satisfaction. This result shows that school administrators' support, especially in the informational dimension, and teachers' job satisfaction tend to move in the same direction. It can be argued that school administrators' supportive behaviors towards teaching are very important for teachers to be productive in their educational activities and to achieve job satisfaction. School administrators' support for teachers on current educational issues and encouragement for participation in congresses and symposiums for teachers to improve themselves in professional matters will facilitate the fulfillment of the professionprofession's requirements, which will increase their job satisfaction levels. Sarıkaya (2019) and Gülbahar (2020) reported a positive relationship between administrator support and job satisfaction. In this sense, the literature supports the result of this research. In addition, school administrators' informational support can contribute to the success of teachers by ensuring that they are effective and productive. Thus they can experience the fulfillment and joy of teaching new things to their students.

The study found that principal support influences teachers' job satisfaction. This result shows that the supportive behavior of the school principal has predictive power on teachers' job satisfaction. In other words, it can be assumed that the job satisfaction of teachers who are supported by the school principal will also increase. Many studies highlighted that job satisfaction and motivation of staff who felt supported by their administrators/supervisors increased and therefore their organizational commitment and performance improved. (Aarons, Sommerfeld and Walrath-Greene, 2009; Chen, Eisenberger, Johnson, Sucharski and Aselage, 2009; Dawley, Andrews and Bucklew, 2008; Rhoades and Eisenberger, 2006). Administrator support was found to affect organizational effectiveness and employee performance (Rhoades and Eisenberger, 2002; Emhan, Kula and Töngür, 2013), sense of belonging (Özbek and Kosa, 2009) and job satisfaction (Ingersoll, 2001; Şahin, 2013; Şahin and Dursun, 2009; Tillman and Tillman, 2008; Waseem, 2010).

School administrators' supportive behaviors in emotional, instrumental and informational dimensions affect teachers' subjective well-being levels, school connectedness and teaching efficacy. School administrators' supportive behaviors were found to have a predictive power on teachers' well-being, school connectedness and teaching efficacy. Therefore, it can be argued that the subjective well-being levels of teachers supported by school administrators will increase. The studies on the organizational and individual effects of administrator/supervisor support in the literature concluded that administrator/supervisor support affected employees' psychological well-being (Ertürk et al., 2016) and their intention to quit work (Payne and Huffman, 2005; Tekleab, Takeuchi and Taylor, 2005; Telli, Telli, Ünsar and Oğuzhan, 2012). Moyle (1998) reported that administrator/supervisor support positively affected the well-being of employees. Üstün (2018) stated that administrator/supervisor support perception had a negative and significant effect on employees' intention to quit their jobs. Therefore, school administrators' support to teachers will increase their teaching efficacy and school connectedness; thereby their subjective well-being levels. Employees who believe their administrators support them are more likely to experience integration and identification with the organization (Üstün, 2018). Since administrative support is the belief of employees that they are cared for by their administrators and that their administrators value their contributions to the organization (Pohl and Galletta, 2016), it can be argued that teachers' subjective well-being is naturally positively influenced by administrators' supportive behaviors.As a result, it was found that school administrators' supportive behaviors significantly affect teachers' job satisfaction and subjective well-being levels. School administrators' supportive behaviors were also found to affect teachers' job satisfaction, subjective well-being levels. In this study, the finding regarding moderate levels of emotional and informational support provided to teachers by school administrators was noteworthy and the finding that teachers' job satisfaction was moderate. The fact that the support provided to teachers by school administrators predicted both job satisfaction and subjective well-being revealed the importance of school administrators' supportive behaviors. Therefore, it would be beneficial for school administrators to support teachers in emotional, informational and instrumental dimensions to increase their job satisfaction and maintain their high-level subjective well-being. Considering that

teachers' job satisfaction affects their performance, intention to quit work, burnout, absenteeism, quality of pedagogical activities and students' achievement (Demirtaş, 2010; Miles, 2010; Makela, 2014), teachers' moderate job satisfaction is not satisfactory because teachers are the most important and the only factor that directly affects the quality of pedagogical activities.The following recommendations can be made in line with the findings and results obtained in the research:

1-In order to increase teachers' principal support perceptions; the school administrators;

a) should give their full attention to teachers while listening to them, be more honest and frank with the teachers, support teachers' decisions, and make them feel valuable (emotional support dimension).

b) should ensure that teachers are aware of current teaching methods and techniques by offering suggestions for the improvement of teaching in their classroom practices, be able to guide teachers' planning, implementation and evaluation activities and support their participation in activities that will contribute to their professional development such as conferences and symposiums (informational support dimension)

2- It is necessary to make the teaching profession more ideal with incentives to increase teachers' job satisfaction to higher levels. For this, teachers' salaries and prestige in the society can be increased and teachers can be provided with the opportunities to develop themselves as required by the profession.

3- Since school administrators' supportive behaviors positively affect teachers' subjective well-being, school administrators should continue providing emotional, informational and instrumental support to teachers. As concluded by this study, the moderate level emotional and informational support provided to teachers (as concluded by this study) should be increased.

4- A qualitative research may be conducted to explore the opinions of both teachers and school administrators about school administrators' support to teachers.

Limitations of the Research

This research is limited to the opinions of 289 teachers employed in the center of Bolu and their responses to the items on the Principal Support Scale, Teaching Satisfaction Scale and Teacher Subjective Well-being Questionnaire.

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Thinking through Arguments on Comparative Education Topics: A Contemporary Learning Approach in Pre-service English Language Teacher Education

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Thinking through Arguments on Comparative Education Topics: A Contemporary Learning Approach in Pre-service English Language Teacher Education

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Abstract

Following Toulmin's Argument Pattern (TAP), this study was conducted to investigate the extent to which argument construction in comparative education topics enhances pre-service teachers' knowledge construction skills.-. This article is different because it synthesis research interests in comparative education and argumentation topics to facilitate pre-service teachers' learning in comparative education. The study was conducted with 22 senior university students studying in the Department of English Language Teaching during the 2018-2019 academic year. The data were collected via observation records and written documents from four pre-service teachers who had opposing claims and were selected from these students. In conclusion, it was found that TAP guided the pre-service teachers on the components of claiming an assumption, backing claims with evidence, applying scientific sources, rebuttal and generating new arguments on the topics of comparative education. The study also included implications for thinking through arguments.

Keywords: Toulmin's Argument Pattern (TAP), Comparative Education, Teacher training, Contemporary Approach

Introduction

Cognitive structuring of information that can be put into practice is important for teacher education and all other branches of professional development. On the other hand, learning through argument is significant for thoroughly constructing pedagogical knowledge, including teacher education (Metaxas, Potari & Zachariades, 2016; Dinkelman, 2003). It has also been proved that teacher education based on argumentation contributes to self-regulation, cognitive awareness, reflective and evidence-based thinking, development of conceptual and pedagogical content knowledge (Dinkelman, 2003; Schwarz, Neuman, Gil & Ilya, 2003; Öztürk, 2017). Because of such contributions, learning through argument in teacher education ought to be investigated. As comparative education topics are in line with learning through argument, it is an area to be examined. While many disciplines have to "produce scenarios", comparative education contains content and scientific evidence directly suitable for argument structure. This stems from the fact that comparative education topics are in an approach that compares and evaluates the reforms affecting international educational systems.

On the contrary, new means of learning are also necessary for comparative education. It has been criticized (Broadfoot, 2000; Thomas & Mosselson, 2018) that comparative education topics are still being discussed with conventional educational concepts. Consequently, these criticisms have revealed a need for comparative education information as generating evidence on assumptionsa need for comparative education information as generating evidence on assumptions, reasoning, and finding new solutions. Discussing comparative education topics by employing TAP can be a significant way to fill this gap.

One of the purposes of comparative education is to determine the country's educational problems the country's educational problems and to generate assumptions to eliminate them by benefitting from the educational systems of successful countries (Erdoğan, 2016). On the other hand, it contains information about developing different perspectives, interpreting, exploring new insights, discovering similarities-differences between educational systems of different countries and generating solutions (Türkoğlu,2015; Balcı,2018; Bakioğlu, 2018). However, most of the studies have been on the comparison of educational systems at different levels of two or more

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countries. A great number of studies on comparative education have focused on characteristics of national fields and handled the subject subjectively. Several studies have implemented methods acquired from social sciences, and almost all of them have focused on comparing systems of countries by conventionally emphasizing qualitative educational outputs (Thomas & Mosselson, 2018). However, comparative education courses with new ways of learning can be a tool for developing thinking skills such as generating assumptions, developing different perspectives, interpreting, exploring new offers and generating solutions. One of these ways is producing arguments by using TAP in comparative education topics.

Studies on teacher education programs have revealed that argumentation in comparative education topics is important for reducing problems and backing solutions. Controversial problems can be handled as two important issues. The first is that teacher education has deficiencies in transferring theoretical knowledge into practice (Rincmond, Salazar & Jones, 2019; Eret-Orhan, Ok & Çapa-Aydın, 2018; Yeşilpınar-Uyar & Doğanay, 2018). The other important issue is that it has deficiencies in main skills such as reflective thinking and questioning (Adler, Zion & Rimerman-Shmueli, 2019; Lemley, Hart & King, 2019). Arguments are prominent in solving all of these problems in teacher education (Dinkelman, 2003; Öztürk, 2017). In addition, they present deeper meanings in interpreting teachers' knowledge, beliefs, decisions and practices. They can be used as an instrument for going deeper into teachers' decisions, practices and the rationale behind them (Metaxas, Potari & Zachariades, 2016). In summary, learning through argument in comparative education topics is one way to improve the competencies expected of today's teachers.

In the present study, prospective English language teachers were involved. In the field of language education there are numerous studies on the contribution of written argumentative skills to second language learning (Campbell & Filimon, 2018; Awada, Burston & Ghannage, 2019; Quin, 2013) and on the contribution of writing argumentative texts in a second language to critical thinking and collaborative work (Soodmand Afshar, Movassagh & Arbabi, 2017; Zainuddin & Rafik-Galea, 2016). Since having a good command of English is a basic quality that prospective teachers should have to be able to teach it, the ability to think through arguments can enhance teacher education concerning this component. Consequently, ways of learning through arguments need to be investigated in teacher education because of their contributions mentioned above and their role in helping eliminate the deficiencies of teacher education. Comparative education topics, because of their knowledge structure, can provide content that promotes argumentation. For these reasons, TAP was used in the present study to investigate pre-service teachers' practices in generating arguments in comparative education in order to explore new ways of learning in teacher education. The discourses and written documents of the four pre-service English language teachers making opposite claims were analyzed and presented as a case study. For this purpose, the research question to which answers are sought is:

What contribution does the use of Toulmin's model in comparative education topics make to the knowledge construction of pre-service teachers, what does it entail?

Comparative Education Topics

The modern education system of the 20th and 21st centuries has become so national that alternative educational goals and visions have become incomprehensible. Comparative education is a significant area for solving this ambiguity because it is a comparative way that helps understand educational goals by examining retrospect and prospect. While basic information about books is meant by retrospect, social topics and creative thinking are meant by prospect (Broadfoot, 2000). Comparative education topics are important tools for understanding educational systems for teacher education. However, the understanding that merely focuses on comparing countries may cause standardized transfer in decontextualized educational policies (Afdal, 2019). In this case, developing the components of comparative education, developing different points of view, generating assumptions, interpreting, exploring new insights, discovering similarities-differences and generating solutions may become more complex. That is the reason why comparative education will find its value when it is structured with TAP. This is because the claim, the data on which the argument is based, the warrant for inference authorizing the step from the data to the claim, supporting the legitimacy of the warrant, the qualifier representing the strength of the data, the rebuttal pointing to the circumstances under which the claim would not hold true are important for comparative education topics. The claim is important for comparative education topics. These components are the elements of TAP (Metaxas, Potari & Zachariades, 2016; Erduran, Simon, & Osborne, 2004).

TAP in comparative education topics was first presented as a scientific paradigm here. We should go beyond traditional understanding for a modern and effective comparative education. For this, new modellings are needed. According to Khakpour (2012), comparative education topics are important in implementing and designing educational changes as modern and effective education systems depend on new techniques and ideas. Therefore, comparative education is necessary in all developed and developing countries because countries can benefit from the progress and reforms of other countries while they are struggling with a crisis. The problems mentioned above and crises shed light on how to deal with our own local or national problems (Watson & Wilson,2018).

Other scientific subject areas (anthropology, sociology, etc.) belief, tradition, morals and social, ethnic characteristic issues, economic and political issues affect educational outcomes. Thus, another important issue to consider while making comparisons in educational systems is to holistically approach the issue (Khakpour, 2012). This approach provides more than one content for data, warrant, backings and rebuttal because comparative education topics depend on experiences, expertise, data and criticism obtained from various contents. They promote understanding and explain changes (Ginsburg, Massón Cruz, Rodríguez Alfonso, & García Isaac, 2019). In addition, there are three trends in comparative education topic. The first one is competitiveness, which is common among countries and organizations. The second one is increasing organizational, cultural and interdisciplinary cooperation, supporting educational studies and exploration. The third one is information comparing educational studies and policies. This necessitates deep comparative analyses. In short, researchers and leaders play an important role in shaping the educational perspectives of countries in the field of comparative and international education. Comparative education ought to be used to make a long-term impact on candidates who will be teachers, researchers or education politicians in the future. Additionally, TAP can enhance the role of comparative education courses in shaping the future of education as they are ignored in teacher education (Thomas & Mosselson, 2018). In a broader sense, questioning and reflection in teacher education are important for supporting thinking skills such as scientific thinking.

Toulmin's Theory and English Language Education

Since Plato's time, argumentation has been considered as the centerpiece for constructing knowledge (Metaxas, Potari & Zachariades, 2016). Argumentation is an important potential tool for knowledge production through reflection. Toulmin (1958 akt. Metaxas, Potari & Zachariades, 2016) identified the components of an argument and relationship between them in 6 basic elements. They are, the claim (C), the data on which the argument is based (D), the warrant for supporting the claim presented by the data (W);, backing the legitimacy of the warrant (B), the qualifier representing the level of strength of the inference and the data (Q), and the rebuttal indicating the circumstances under which the claim and the warrant are invalid (R). The focus of Toulmin's studies was logic and argument. Toulmin claimed that argumentation needs to be considered as a philosophical practice rather than a rational approach meeting formal logical criteria. Basically, Toulmin's rules aim to support and analyze these 6 elements of the argument (Greenwald, 2007). Each argument consists of three elements, namely the claim, the data and the warrant. Claim is the basic knowledge of the argument. The data provides evidence for the claim, and the warrant is the absolute value that links the data to the claim (Gholami, & Husu, 2010). The warrants in Toulmin's model (W) are crucial for the success of argumentation because they build a bridge between the claim and the backing. The other three elements of argumentation (W, Q, R) support the change of ideas and common foundations (Zainuddin & Rafik-Galea, 2016). During argumentation, the data becomes significant when it supports the claim. At this point, the argument writer needs to discuss W, they used, carefully; however, it is difficult to present W since debaters rarely do this in practical arguments (Hegelund & Kock, 1999). According to the authors, the rebuttal shows the level of awareness towards ideas generated against the claim, while Q reflects what students use for supporting the claim. Q deepens the claim.

Toulmin model is an effective tool in teaching argumentative writing in teaching both mother tongue and foreign language content in foreign language teaching (Qin, 2013). Some of these studies have put emphasis only on language teaching. For instance, Campbell and Filimon (2018) concluded that strategy-based teaching of writing supports the development of standard English and improves writing skills. Similarly, Zainuddin and Rafik-Galea (2016) stated that argumentative writing is a challenging area for language students but also for language students and for the majority of all native English teachers, as it requires critical thinking logical reasoning. When the study was used to support mind thinking and argumentative writing skills using Toulmin's model, language skills also improved. Awada, Burston & Ghannage (2019), studying internet-based collaborative argumentative writing practices in English classes, emphasized that this model developed the writing skills of especially students with low level of language skills.

Similarly, Soodmand Afshar, Movassagh, and Arbabi (2017), who investigated the effects of argumentative writing in the second language on the development of critical thinking skills, concluded that arguments particularly promote the development of analysis and evaluation skills. On the other hand, there are several studies that indicate that this model helps prospective language teachers to acquire effective writing skills (Qin & Karabacak, 2010). In addition, in a study examining the conversations between an English class and their teachers, it was concluded that the model improved their scientific thinking skills and facilitated the modeling of pedagogical knowledge for presenting information to the students. In another study revealing that argumentative reasoning studies in the Australian English language classes supported the social structuring, Love (2000) emphasized that arguments promoted higher-order mental functions. The current study investigated pre-service English language teachers' argumentation for constructing knowledge in comparative education topics.

Method

Research Design

The purpose of this case study was to examine the development of the pre-service English teachers' pedagogical knowledge, result that results from generating arguments based on speaking and writing. A case study examines a phenomenon in detail in its own context by collecting a wide range of data from different sources (Creswell, 2016; Yin, 2009). Holistic case studies could be used for justifying or refuting a well-structured hypothesis (Creswell, 2016, p.98). Since this study is the first to examine a topic that has not been studied before, and the possibility exists that it could serve as a guide for further research, it was designed as a case study.Additionally, now that gaining deeper insights into understanding the processes of and changes in the case of concern takes time, the present study lasted for 14 weeks. In this research, the cognitive developmental path in the pre-service teachers' learning style regarding comparative education topics was scrutinized.

Lesson Process Based on Toulmin's Model in Comparative Education Topics:

Comparative education course is an elective course included in the teacher education program of Turkey and consists of two hours of credits. This course was taught by employing TAP model. In the first lesson, the pre-service teachers were given the names of five countries that were successful in PISA exam, and 22 of them were assigned to examine the educational system of a country they preferred.

- In the 2nd, 3rd and 4th lessons, information was obtained by comparing the educational systems of these countries and Turkey (educational levels and reforms, environmental and cultural features) was shared. In the 5th lesson, they were asked to write the factors affecting these countries' different PISA successes and share them with the classroom.
- Then, Toulmin's model was introduced in the 6th lesson. Its elements were explained (e.g.: how can you persuade the whole classroom and your teacher about the fact that international success stems from teacher beliefs?) A library containing articles'_abstracts and course books on two claims prioritized by the majority (related to the variable affecting the educational system of the country at most) was created by the researcher. One of these was about the importance of teacher education, and another one was about the importance of teacher beliefs. The library was shared with the whole classroom through Google drive.
- On the 7th and 8th weeks, they were asked to write a paragraph report (up to 200 words) with Toulmin's model elements using these reading materials. Moreover, they were asked to write in a way to support their points of view based on the conclusions of the article abstracts. They were provided to present the results of a paragraph via in-class discussions. During the discussions, the students were guided to compare the countries' educational levels and present country reforms as evidence. As from the 9th week, 3 groups were created to discuss the elements affecting the international education system for two opposite topics. Then, 2 full articles were given to each group to rebut the counter-view. They were asked to analyze the evidence and research results that would support their claims by analyzing the articles using the TAP chart. They gathered to discuss how to rebut possible counter-views via TAP chart prepared in the 10th and 11th weeks. In-class group discussions were organized. During this process, the researcher gathered with and guided the members of each group on how to examine the articles and arrange them according to Toulmin's model. Each group found verified claims and evidence by analyzing the articles they read using Toulmin's model. In addition, verified claims for refuting views of the opposing group were determined. The students emphasized that "they had never analyzed a paper in that way before and reading according to TAP model affected their comprehension positively".
- In the 12th and 13th weeks, two opposing groups presented their ideas in a debate. In this stage, each group presented its counter-views to the other group. Then the other group had to rebut these counter-views.One group provided evidence that the most important effect was teacher beliefs when the educational success among the countries was compared. The other group provided evidence by comparing scientific results and country reforms on the idea that the quality of teacher education was the most important factor. On the other hand, the third group merely gave general information about the PISA exam. Finally, a final evaluation report was required with two questions which were "Compare the education system of any country with that of Turkey (maximum 200 words)" and "Based on the comparison of the countries' education systems, choose one of the most important factors influencing success at PISA and justify your claim".**Study Group**

The study participants are pre-service English teachers studying at a state university in Turkey in 2018-2019 academic year in the selection of criterion sampling, one of the purposive sampling techniques, was used. The comparative education course was chosen to take the content variable under control. All of these students took part in in-class discussions about comparative education topics. However, 4 of these pre-service teachers were monitored to observe thoroughly and record their verbal arguments. The criteria applied in the selection of the study participants are:

- Presentation of merely one claim without adequate reasoning and
- Stating two contradictory claims during the observation.

For instance, while two of the participants defended the efficacy of teacher beliefs, the other two claimed that the quality of teacher education was more important by refuting the others' claim. The researcher leaded the in-class discussions and took part as a participant in the whole process.

Data collection and Analysis

The data of the research were collected through semi-structured observation and document analysis.

Observation: Observations included the records of four pre-service teachers' discourses during in-class discussions while the researcher was teaching. The researcher kept these records through note-taking.

Document analysis: The writing activities included the reports and final assignments required based on the pre-service teachers' analyses of the articles using Toulmin's model. Similar to oral discourses, these articles were analyzed by two different experts through FCAS. The written reports were written by the participants considering the following questions:

Compare educational system of any country you wish with educational system of Turkey (200 words maximum). Based on comparison of educational systems of the countries, choose one of the most important factors affecting the success of PISA and justify your claim.

The form for determining the level of comparative education argumentation skill (FCAS): *This form*, developed based on Toulmin's model**,** was used to analyse the pre-service teachers' in-class discourses and worksheets. Two different experts interpreted both verbal and written argument records through descriptive analysis using this form. Bias in determining and evaluating the level of argumentation was prevented by the form, and the criteria were made clear.The form, consisting of four levels, was created by considering the codes used in the argument studies conducted in different subject areas by Metaxas, Potari and Zachariades (2016); Öztürk (2017) based on the elements of argument identified by Toulmin (1958). FCAS has explicit indicators for each argumentative level. These indicators were employed as evaluation criteria: Merely acceptable claim without justifications (1 level); The claims were supported with at least an acceptable justification (2 Level); Contains a verified claim and counter claim (3 Level); Contains verified claims and rebuttals (4 Level).

Validity, Reliability and Ethics

Different data collection tools (observation-written documents) were used in the study. To prevent data loss, observation evaluations have been carried out by two teacher educators, one from the department of curriculum and instruction and the other from the English language teaching department, using FCAS forms. The research procedure has been described in detail and the study group criteria have been determined. The interrater reliability was found to be 86%.

Findings

The elements of argument identified by Toulmin (1958) were analyzed in four levels through FCAS. Firstly, the development of argument based on observations was presented. Then analyses were performed on written responses related to the in-class scenarios of comparative education, and they were presented. The analyses were thoroughly presented to provide arguments of the participants better.

Table 1 : The findings related to the development in Spoken Arguments of P1 and P4

FCAS	THESIS	ANTI-THESIS
	Participant 1 (P1): Discourses	Participant 2 (P2): Discourses
Level 1: Merely acceptable claim without justifications	I think teachers' beliefs are more important in differentiating countries' education systems... (3rd week)	Teacher training is more important than teacher beliefs in differentiating countries' education systems...
Level 2	The most important factor affecting international success is teacher beliefs	

The claims were supported with at least an acceptable justification	because teachers choose teaching methods in which they believe efficacy rather than the ones they were taught. (4th-5th weeks)	When educational systems of the countries are compared, it can be stated that the countries giving importance to teacher education succeed faster.
Level 3 Contains a verified claim and counter claim.	Driessen and Meinema stated in their study conducted in 2003 that teachers planned different course designs through the offered program in Dutch education. However, most of them were trained in the same teacher education. (6th-7th-8th weeks)	The group defending the counter idea expressed that regardless of the teacher education curriculum, they would implement it differently based on their beliefs. However, it is teacher education that can shape beliefs. In 2017, the scientist Iş, who indicated the relationship between high levels of PISA exam success and teacher education in countries such as Finland, South Korea and Singapore, reported that the difference in success stemmed from the teacher training policies.
Level 4 Contains verified claims and rebuttals.	Especially in foreign language teaching, the education received is not enough for teachers to make a good assessment and evaluation. As Borg mentioned in 2003, teachers need to know how to transfer the knowledge into practice, that is, to use in the classroom. Their beliefs and thoughts shape teachers' knowledge. This philosophy of teachers is unobservable. Burns revealed the relationship between teachers' self-perceptions - beliefs and classroom roles in his study, based on classroom, in 1992. Therefore, rather than the education they receive, teachers' perceptions about their own and education are prominent for success. (8th-13th weeks).	The Segovia Ministry of Education Council reported in 1995 that teacher education has the most important role in the quality of education; the critics stressed that state-controlled educational systems destroy the professional partnership. For this reason, the Overseas Teacher Training Program in England proposed a pragmatic approach that prioritizes individual needs except for the European Economic Area. According to this approach, teacher philosophy and belief is important, but the most important thing shaping it is teacher education. Moreover, another researcher having compared teacher education in Finland and Turkey reported a relationship between the quality of teacher education and PISA success.

While the participants tended to convey their opposite ideas without justification in the first three weeks, they started to give justifications as of the 5th week. In the 6th week, they began to use scientific information since they read the concept of verified claim by understanding through TAP. As of the 8th week, they suggested more verified claims and used rebuttals. As a result, it can be stated that the ways of developing arguments led the pre-service English language teachers to construct their claims through evidence (verified justifications). This quest led them to examine scientific writings and sources to obtain information. This orientation diversified the teachers' ways of getting information. They began to increase the number of verified justifications as of the sixth week and to use rebuttals by evaluating each other's discourses from the eighth week. It was seen that they started to synthesize by gathering the results of more than one scientific writing as of the 9th week.

Table 2 : The findings related to the development in Speaking Arguments of P3 and P2

FCAS	THESIS	ANTI-THESIS
	Participant 3 (P3): Discourses	Participant 4 (P4): Discourses
Level 1: Merely acceptable claim without justifications	I think beliefs and philosophy are the most influential factors in differentiation of educational systems of the countries … (3rd week)	Teacher education is the most important factor in the differentiation of educational systems of the countries …
Level 2 The claims were supported with at least an acceptable justification	The most significant factor affecting international success is teacher beliefs because teachers attach priority to the elements they believe and attach importance. For example, if a teacher has a subject-based belief, they design teaching accordingly, but if he/she believes that skills are more important, they turn to skill-based teaching designs. In addition, every teacher undergoes an	When educational systems of the countries are compared, it can be seen that one of the factors affecting success is teacher education because a well-organized teacher education promotes the quality of education as well.

	educational process, but their beliefs affect success by shaping their classroom practices. (4th-5th weeks)	
Level 3 Contains a verified claim and counter claim.	According to Fang (1996), teachers' thoughts about their roles, philosophies and values shape their theoretical beliefs. Hence, I think teacher beliefs play an important role in the quality of education. (6th-7th-8th weeks)	Teacher education reforms are of great importance. Beatrice Avalos claimed in her research that changing teachers' philosophies and contributing to their development is directly related to teacher education.
Level 4 Contains verified claims and rebuttals.	I can provide two important evidences revealing that teacher beliefs shape educational success. According to Buehl and Beck (2015), scientists admit that belief and practice are interdependent and affect students' school experience. According to Raths and McAninch (2003); on the other hand, beliefs affect teachers' practices, interactions with their students and the classroom setting. In this case, we see that teachers' beliefs cannot be broken with the teacher education received. All in all, the teachers in this study are the outcomes of teacher education. (8th-13th weeks).	How can a teacher create their philosophy? Of course they can create it with the education he/she has received until now… we cannot say that the teacher is only made up of the belief that he was born with and that a person creates his philosophy without an effort. Beatrice Avalos reported in her article that an uneducated philosophy cannot be considered. T. The fact that teachers, universities and researchers use and develop resources and tools in collaboration significantly affects the quality of education. Hargreaves (1994) stressed that recent studies have argued that teacher education reforms should be a priority. Teachers should be given such an education that they can raise good individuals. Think about it; a teacher cannot express their views, how can they teach an effective lesson? What is more frightening is that they have defend this by regarding it as their own belief. So teacher training should be of high quality so that teachers can try to be useful to their students.

When the arguments were examined, it was seen that the pre-service teachers tended to use evidence-based expressions andtended to use evidence-based expressions and make use of evidence while asserting counter-claims. The pre-service teachers' exemplary explanations and scientific evidences indicating the importance of the evidences for their claims, especially from the sixth week, were presented. As the TAP model was introduced and the studies on the importance of verified claims (evidence) were conducted in the sixth week, the students sought evidence. In addition, the researcher provided some examples on how to find a few arguments to support their own claims among sample scientific sources presented by the researcher. They had great difficulty selecting evidence from what they had read and analyzing what they had read because they tended to express what they read exactly.It took their time to develop a habit of finding a few important justifications from what they read. Comparative education topics and resources are important tools for producing arguments in the elements of claim + justification, claim + justification + verified claim, and they facilitated the process. TAP, containing all of these elements, facilitated the analysis of comparative education topics. Information on the pre-service teachers' development in written argument was presented in Graphic 1.

Levels	**Evaluation criteria**
1	Merely acceptable claim without justifications.
2	The claims were supported with at least an acceptable justification.
3	Contains a verified claim and counter claim.
4	Contains verified claims and rebuttals.

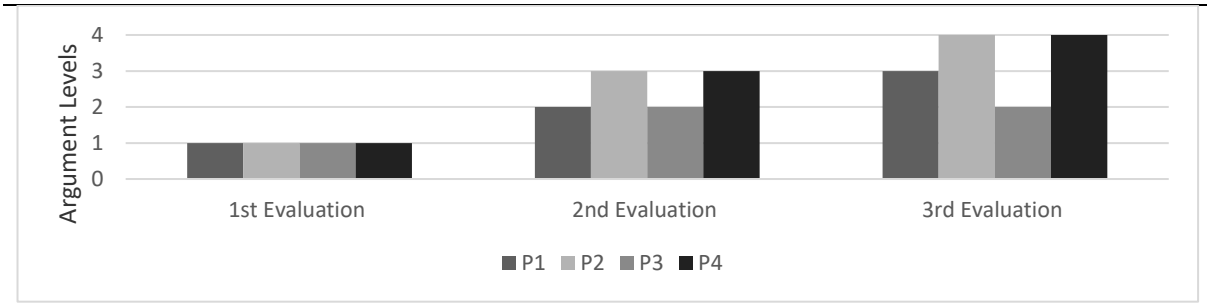

Figure 1: The findings regarding development in Written Arguments

When the development in written argument was examined, it was understood that the writing skills of P1, P2 and P4 in comparative education topics were improved by using Toulmin's model. In the first evaluation (pre-evaluation), all pre-service teachers presented acceptable arguments, but they had argument structures without justifications. For the second evaluation (7th week), arguments including at least one claim and counter claim were presented. At the end of the process, the number of claims (evidence) started to use rebuttals. This is crucial for the development of scientific thinking ways in teacher education. On the other hand, P2, who made process in the fourth level, included more than one verified claim and rebuttals at the end of the process:

> *"I understood very clearly that teacher education affects success much earlier than beliefs when I compared the educational systems of Turkey and Denmark. Danish preschool teachers and primary school - secondary school teachers are required to do a master's degree after finishing 3,5 and 4 years of undergraduate program, respectively. In Turkey, on the contrary, teachers can be appointed via a central examination after completing four years of undergraduate education. On the other hand, while teacher education tries to raise teachers based on the criteria sought by the local government in Denmark, teachers are appointed based on Public Personnel Selection Examination (KPSS) and oral examination in Turkey. Teacher Education Program in England apart from the European Economic Area; on the other hand, proposed a pragmatic approach giving priority to individual needs. In this case, it can be suggested that the countries that satisfy the needs by focusing on teacher education rather than teacher beliefs are more successful. As a result, a well-designed teacher education can affect teacher beliefs as well (P2)."*
>
> *Similarly, P4 stated the verified justifications from the sources she read as follows:*
>
> *"New Zealand addresses teacher competencies in a special framework. Universities and local governments provide continuous education for teachers to acquire these competencies. The teacher council has organized teacher trainings based on these qualifications since 1989. When we consider the success of this country in PISA, isn't this evidence sufficient to directly claim that the quality of teacher education is the main factor affecting the success among countries? ... teachers aim to achieve these competencies regardless of their educational purposes (P4)."*

As can be seen, Toulmin's model improved the pre-service teachers' ability to provide evidence and to rebut the counter claim. Comparative education topics have rich scientific evidence and argument production content. However, P3 could not reach the fourth level in the process of written argument, contrary to the spoken argument. She supported her arguments with at least one justification, yet she provided arguments without verified claims-rebuttals. When we questioned the reason for this, it was seen that she changed her initial claim about the most important factor affecting international educational success during the written argument and admitted the counter group's claims. However, her improvement was in the second level as she provided a new argument. While, in the first evaluation, she defended the claim that teacher beliefs were more important than teacher education, her written argument after the second evaluation was as follows:

> *"When educational systems of the countries are compared, it can be seen that teacher education affects success more than teacher beliefs. Due to the quality of teacher education in the countries, teacher practices of each country are different, too. Even though teacher beliefs are important, a good teacher education can change these beliefs. For example, since Spain has a learner-centred teacher education, professional development of the individuals is significant (P3)."*

This fact suggests that argument development methods promote the generation of new arguments in teacher education and the ability to make evidence-based argument rebuttal.The pre-service teacher was convinced by the evidence. Her claim was rebutted through arguments. Another important point was that while P1 provided more than one verbally verified claim during in-class discussions, she provided only one verified evidence in the activity of written argument. The main reason for this situation may be the teaching based on in-class discussion activities to generate spoken arguments. Since written arguments are usually used for evaluation purposes, the ability to generate spoken arguments may have improved to a higher level. *In the final evaluation, the same participant presented a claim + evidence of the importance of teacher education*:*Especially in foreign language teaching, the education received is not enough for teachers to make a good assessment and evaluation. As Borg mentioned in 2003, teachers need to know how to transfer the knowledge into practice, that is, to use in the classroom. Their beliefs and thoughts shape teachers' knowledge. This philosophy of teachers is unobservable (P1)."*

As it can be concluded, Toulmin's model fostered the pre-service teachers' ability to provide evidence and to rebut the counter claim. The content of comparative education topics has rich scientific evidence and argument production content. Thus, argument production on comparative education topics using the TAP model led the pre-service teachers to seek scientific evidence and present their claims via these verified claims.

Results and Discussion

The research findings revealed that the pre-service teachers' argumentative discourses and writings on comparative education topics contributed to the development of scientific thinking skills such as making assumptions by questioning the reasons for educational success of the countries, supporting these assumptions with evidence and rebutting. Afdal (2019), who investigated the benefits and limitations of international comparative education, stressed that involving this issue in teacher education has developed an international understanding. Still, it can lead to standard transfers in developing non-content educational policies. Broadfoot (2000), discussing how comparative education topics should be in the 21st century, stated that comparative learning can make it easier for individuals to understand the learning opportunities that have been the last century's features. Considering that the pre-service teachers may not only be teachers but also managers or politicians of the future, not only as teachers, argument production in comparative education topics is of great importance for professional development, as comparative education provides a transfer of knowledge based on advances and reforms in other societies (Watson, & Wilson, 2018).Thus, it gives individuals the opportunity to benefit from professional experience on overcoming regional problems. Broadfoot (2000) stated that comparative education should be based on experiences, expertise and criticism from different contents in the century of collaboration and competition. In this study, the teachers examined the variables affecting the PISA success among countries and questioned the reasons. While some pre-service teachers discussed country education reforms to improve teacher education, others focused on what to be done when the teacher changes their own beliefs and philosophy. While this provided evidence for the claims, it expanded the process of the pre-service teachers' structuring knowledge. Nikolaos, Despina and Theodossios (2009), who stressed that argumentative discussions about pedagogical knowledge should be an important part of teacher talk, discussed the importance of the relationship between argument and pedagogy. Metaxas, Potari, and Zachariades (2016) similarly provided an in-depth understanding of teacher arguments and pedagogical issues by examining in-class teacher discourses and stressed the importance of arguments in structuring and obtaining knowledge. In addition, Khakpour (2012) argued in his research on comparative education topics that it was helpful in providing educational changes by comparing the content and process of successful educational systems. In addition, the author argued that comparative education topics should focus on studies with in-depth interpretations rather than quantitative studies. In this study, as suggested by the author, a small number of people in the light of thorough qualitative findings were included.

In conclusion, it can be stated that the ways of developing arguments led the pre-service English language teachers to construct pedagogical knowledge claims through evidence and to study scientific sources. Similarly, Dinkelman (2003) revealed that arguments are generated spontaneously in the classroom environment when the component of supporting reflective learning for self-regulation in teacher education practices. Öztürk (2017), who examined whether socio-scientific argumentation processes of the pre-service teachers with high and low socio-scientific argumentation skills in teacher education differ in terms of cognitive awareness, concluded that the pre-service teachers with higher socio-scientific argumentation skill levels exhibited higher cognitive awareness behaviors (planning, decision making, evaluation, monitoring, and organization organizing). Similar to our study, Qin (2013), who investigated the effectiveness of argumentation on the pre-service English language teachers using Toulmin's model, concluded that the pre-service teachers'argumentative responses reached a higher level in relation to the teaching process and that they willingly participated in teaching during the lesson.. The author stated that elements such as rebuttal and opposing the idea developed in later steps. It was possible to see similar results in this study. Orientations on rebuttal were seen at the end of the study, and development of argumentative writing took more time. It was observed that the counter claim defensive arguments rebutted the first claim of the participant 3. In addition, evidence-based statements on comparative education topics led the pre-service teachers to analyze scientific sources to provide evidence. Evidence-based thinking and using scientific sources are important for developing the pre-service teachers' critical thinking skills. According to Reed (2005), Toulmin's model has been a frequently used method in teaching critical thinking skills.

Similarly, Soodmand Afshar, Movassagh and Arbabi (2017) concluded that arguments particularly supported the development of analysis and evaluation skills. On the other hand, Chen, Park and Hand (2016) investigated the contribution of speaking and writing to the development of scientific conceptual knowledge through structuring knowledge and argumentation. It was concluded that participation in the arguments provided opportunities for learners to support scientific knowledge. Similarly, in the present study, making the in-class discussions analytical via Toulmin's model led the learners to use scientific knowledge. On the other hand, comparative education topics are an opportunity for discussion-based learning. According to Bulut (2019), Argument is an output produced as a result of discussion to support a claim. Discussion-based learning is also an effective approach that can be used to discuss ideas on sociological issues.

Like the present study, Qin and Karabacak (2010) studied argumentative writing with the pre-service foreign language teachers and evaluated the developments using Toulmin's model. As a conclusion, it was revealed that the evidence-based structure of Toulmin's model promoted argumentative writing skills. Teachers who learned to

use Toulmin's comparative education model can use it while teaching English to their students. Simon (2008) concluded in his study conducted with English language students and teachers that Toulmin-based argument conceptualization is a guiding teaching model especially for inexperienced teachers. In addition, the author concluded that the model supported teacher pedagogy and provided professional development. Toulmin-based materials were found to be advantageous for teachers to conceptualize arguments and to model for students.

Similarly, Love (2000), who argued that argument modeling was an opportunity in language teaching for argumentation on texts on reasoning in English language classes, stated that the model also offered a sociological learning environment to learners. Gholami and Husu (2010), who carried out a study on making arguments on English teacher practices, sought the answer to the question "how do teachers reason between their practices and knowledge?". The results showed that teachers used practical arguments. According to the author, the practical argument was carried out as follows: firstly, the teachers asserted claims about different pedagogical subjects. Secondly, they supported their claims with different conceptual information, and thirdly, they connected their conceptual foundations to practical knowledge with two steady warrants (W). These two warrants are related to information's applicability and ethics (pracsiol). Thus, if teachers assert their claims in accordance with moral values (pracsiol), the information is implemented. When the benefit of the action is evaluated, practical information is gained. In another study (Zainuddin & Rafik-Galea, 2016), which investigated the effectiveness of the Toulmin model on argumentative writing and critical thinking of ESL students, it was emphasized that structured models are especially needed for completing argumentative writing drafts, which require higher-order thinking skills. It was even emphasized that argumentative writing requires critical thinking and logical reasoning and is challenging not only for students but also for teachers whose native language is English. Since our study has supported argumentative writing in comparative teaching, it can also be a basis for promoting English writing competence. There are many studies that demonstrate the contribution of argument to the development of English writing competence (Campbell & Filimon, 2018; Zainuddin & Rafik-Galea, 2016; Awada, Burston & Ghannage, (2019).

Conclusion

In conclusion, supporting teacher education through arguments is important for pre-service English language teachers as it is in all subject areas. For this reason, ways of argumentative learning should be investigated and presented in comparative education as a part of professional development courses and field education courses. Toulmin's model was used in learning through arguments on comparative education topics in the present study. Similarly, the courses in teacher education should be examined. It should be noted that the courses including topics that can be applied with argumentation models are an opportunity for teaching pre-service teachers thinking skills. Further studies on different ways and models can be studied in this context. Comparative education topics have an important content for argument development.

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