Turkish Journal of Education

TURJE

2012

www.turje.org | January, 2019 | Volume 8, Issue 1 | eISSN: 2147-2858

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Azerbaycan Avenue 64 / 22 46040 Onikişubat - Kahramanmaraş TURKEY

Journal Name: Turkish Journal of Education Türk Eğitim Dergisi

Acronym: TURJE

Turkish and English Quarterly Publishing Scientific Peer Reviewed Online Journal

Türkçe ve İngilizce olarak üç ayda bir yayımlanan Bilimsel Hakemli Elektronik Dergi

eISSN: 2147-2858
Year: 2019
Volume: 8 Issue: 1
URL: www.turje.org
Email: turjeorg@gmail.com
Telephone: +90344-300-1310
Address: Azerbaycan Bulvarı 64/22 46040 Onikişubat Kahramanmaraş TÜRKİYE

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First published in 2012

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Turkish Journal of Education is a DOAJ listing Open Access Journal

TURJE
www.turje.org
Volume:8 Issue:1
https://dx.doi.org/10.19128/turje.426051
Turkish Journal of Education
Research Article

Received 22.05.2018
Accepted 17.12.2018

Development of an attitude scale towards story writing for third-fourth-grade primary school students

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ABSTRACT The aim of this study is to develop a valid and reliable Likert-type attitude scale for toward story writing for third- and fourth-grade primary school students. 354 children from three different schools in the Ereğli district of Zonguldak province, Turkey constituted the sample of this research. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were carried out to analyze the data. EFA identified 20 items and two factors for the scale. These factors were termed as "positive attitude" and "negative attitude." CFA confirmed the two-factor structure of the scale. The Cronbach's alpha coefficients were found to be .92 for the overall scale, .90 for the first factor, and .89 for the second factor. The test-retest reliability coefficients were .82 for the overall scale, .87 for the first factor, and .83 for the second factor. The results indicate a valid and reliable measure for students' attitudes towards story writing.

Keywords: *Story writing, Attitude, Scale development, Validity-Reliability, Third- and fourth-grade primary school students*

İlkokul üçüncü-dördüncü sınıf öğrencileri için hikâye yazmaya yönelik tutum ölçeği geliştirilmesi

ÖZ Bu çalışmanın amacı, ilkokul üçüncü ve dördüncü sınıf öğrencilerinin hikâye yazmaya yönelik tutumlarının belirlenmesi için geçerli ve güvenilir bir tutum ölçeği geliştirmektir. Araştırmanın çalışma grubunu Zonguldak ili Ereğli ilçesinde üç farklı ilkokulda üçüncü ve dördüncü sınıfta öğrenim gören toplam 354 öğrenci oluşturmaktadır. Veriler üzerinde Açımlayıcı Faktör Analizi (AFA) ve Doğrulayıcı Faktör Analizi (DFA) yapılmıştır. AFA sonucunda ölçeğin 20 maddeden ve iki faktörden oluştuğu belirlenmiştir. Bu boyutlar "olumlu tutum" ve "olumsuz tutum" olarak adlandırılmıştır. DFA analizi sonucunda iki faktörlü yapı doğrulanmıştır. Ölçeğin tamamı için Cronbach Alfa güvenirlik katsayısı .92 iken birinci alt faktöre ilişkin α .90, ikinci alt faktöre ilişkin α .89 olarak bulunmuştur. Ölçeğin tümüne ait test tekrar test güvenirliği .82 iken, birinci alt faktöre ilişkin test tekrar test güvenirliği .87, ikinci alt faktöre ilişkin test tekrar test güvenirliği ise .83 olarak hesaplanmıştır. Bulgular sonucunda, ölçekle hikâye yazmaya yönelik tutumun geçerli ve güvenilir bir şekilde ölçülebileceği ortaya konmuştur.

Anahtar Kelimeler: *Hikâye yazma, Tutum, Ölçek geliştirme, Geçerlik-Güvenirlik, İlkokul üçüncü ve dördüncü sınıf öğrencileri*

Cite This Article: Kaya, B. & Kan, A. (2019). Development of an attitude scale towards story writing for third-fourth-grade primary school students, *Turkish Journal of Education. 8*(1), 1-15. https://dx.doi.org/10.19128/turje.426051

INTRODUCTION

Affective variables such as attitude, self-efficacy, and anxiety affect many other factors in students' willingness and interest in a course (Kan & Akbaş, 2005). According to Tompkins (2006) affective variables such as attitude and motivation have a significant role in literacy education. It is stated that the attitudes which affect writing skills may also affect story writing skills as well. At this point, it may be helpful to explain the concept of attitude before talking about writing skills and attitudes towards story writing.

There are many different definitions of "attitude" in the literature. Attitude, according to Thurstone, is the degree of negative or positive affect related to the psychological object (Edwards, 1957). According to Cohen and Swerdlik (2015), in formal terms, attitude is a tendency which is most likely learned, used to react in a characteristic way to a certain stimulus. Another definition of attitude is "a learned tendency towards continuously giving a positive or negative response regarding a certain object" (Fishbein & Ajzen, as cited in Graham, Berninger, & Fan, 2007, p. 518; Williams, 2012, p. 15). Traditionally, attitudes are conceptualized as either negative or positive along the unit of endpoints (Graham et al., 2007; Kear, Coffman, McKenna, & Ambrosio, 2000; Knudson, 1991). For this reason, it can be stated that when an individual relates a psychological object to a positive situation, s/he develops a positive attitude towards it; similarly, an individual who relates a negative situation with the same psychological object develops a negative attitude towards it (Edwards, 1957). According to McKenna et al., there are three concepts involved in the formation of attitude: the individual's beliefs about an object, behavioral intentions regarding that object, and experiences about the object (cited in Williams, 2012).

Every individual has different interest, willingness, and attitude regarding writing skills, which is an aspect important in individuals' social life and communication (Göçer, 2014a). As explained in Elementary Turkish Curriculum and Guide for grades 1-5 (Republic of Turkey Ministry of National Education Board of Education and Discipline, 2009) Akyol (2013) describes different types of writing, such as narrative, descriptive, and persuasive, described for the motoric production of symbols, and signs necessary to express our thoughts. Expressions of feelings, thoughts, desires, designs in writing is a multidimensional skill and requires a desire to write, which is why writing is a process that involves hard work and practice for many years (Susar-Kırmızı, 2009).

While writing is an essential part of some people's life (Göçer, 2014b), for the others it is an activity which is engaged in only when necessary. Tompkins (1982, p. 718) explains a similar situation for story writing: "Some children write a story since they want it, and some children do it because they have to." The emotions and thoughts that emerged in positive and negative ways against writing by individuals reflect their attitudes towards writing.

Graham et al. (2007) described the act of writing in relation to writing attitude as an emotional manner which includes the way the writers' feelings change from happiness and sadness. In line with this definition, it can be stated that story-writing attitude is an emotional state relating to how story-writing behavior is affected by whether students enjoy the story-writing process.

John Daly's work since 1975 has contributed greatly to research on writing attitude (Krawczyk, 2005). According to Daly (1985), positive attitude towards writing depends on the improvement of writing skills, and continuity in writing. Students' writing attitudes are mostly measured on Likert-type scales (Graham et al., 2007; Kear et al., 2000; Knudson, 1991). The Bogardus, Thurstone, and Guttman's scale is also among the most widely used scales (Turan-Oluk, Kan, & Ekmekçi, 2016).

When the writing attitude scale is used after students have completed their writing tasks, at home or at school, their desires and feelings are measured retrospectively, including their happiness or sadness at

different times (Graham et al., 2007). Based on these views in the literature, it can be said that it is important to determine -as a form of writing- the story-writing attitudes of students and that Likert-type scales can be used to measure this attitude.

Individuals use their writing skills throughout their lives for a variety of reasons, such as expressing themselves, conveying feelings and thoughts. For this reason, it is important to conduct research to determine the attitudes of students in relation to this skill in order to acquire and effectively use writing skills. However, since the pre-school period, students are familiar with the structures of narrative texts (Ateş, 2011), and in primary school, writing studies are usually focused on story texts, so the existing body of research indicates the need for research on story text. While many studies have developed instruments to measure attitudes towards writing (Clark & Dugdale, 2009; Graham et al., 2007; Kear et al., 2000; Knudson, 1991; Knudson, 1992; Susar-Kırmızı, 2009; Temizkan & Sallabaş, 2009); any research determining the attitudes towards story writing which is a type of writing has not been observed. In Gallick-Jackson's (1997) study on story writing, students' attitude towards writing was determined using a writing attitude instrument. However, students' attitudes towards story writing may differ from their attitudes towards writing. For this reason, the aim of this study is to develop a valid and reliable Likert-type attitude scale for toward story writing for third- and fourth-grade primary school students and to contribute to the elimination of deficiencies seen in the field by examining the writing attitude of primary school students. The validity and reliability of a Likert-type scale which was developed to measure the story-writing attitudes of third- and fourth-grade primary school students. With this purpose in mind, a review of the literature was carried out first to identify relevant definitions of attitude. The items of the proposed scale were prepared based on the definitions of attitude in the literature. The definitions on which the items were based are given in the "Scale Development" section.

The Elementary Turkish Curriculum and Guide (Grades 1-5) (Republic of Turkey Ministry of National Education Board of Education and Discipline, 2009) shows that story writing is taught from the first grade. The Turkish (Grades 1st-8th) Curriculum (Republic of Turkey Ministry of National Education Board of Education and Discipline, 2015) set the story writing objectives "students are able to write about a certain event following the sequence of events" for second-year students and "students are able to express their feelings and thoughts by means of writing" for third-year students. Starting in the fourth year, objectives regarding narrative writing were included. It is very important to determine students' attitudes towards story writing, and chancing negative into positive attitudes in order to achieve the objectives of the curriculum.

It is stated that there is clearly a need for more research in this field because the literature lacks research on attitudes towards story writing. The scale developed here to measure attitudes towards story writing skills among students in the first years of primary school is the first of its kind, making this study an important contribution.

METHODOLOGY

Participants

Factor analyzes researches the sample should be at least five or ten times bigger than the number of items in the scale was considered in determining the number of the participants (Tavşancıl, 2010). According to Tabachnick and Fidell (1996, p. 640) "it is comforting to have at least 300 cases for factor analysis". With this aim the participants of this study were 354 third- and fourth-grade students from three different schools of high, middle, and low socioeconomic status (SES) in the Ereğli district of Zonguldak province, Turkey by considering the item numbers (30) in the first draft of this scale. Table 1 describes of the number and percentage of the participants' gender and SES.

Table 1
Participants of The Research

Student / SES*	Female	Male	Total
High SES	48 (13.6%)	65 (18.4%)	113
Mid SES	53 (15%)	59 (16.6%)	112
Low SES	64 (18%)	65 (18.4%)	129
Total	165 (46.6%)	189 (53.4%)	354

*Socioeconomic status (SES) of schools was determined by taking into consideration the characteristics of the school environment and the opinions of the school administrators.

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were carried out on the data obtained from 354 students. Additional data were obtained from 12 students from each school, 36 in total, for the test-retest reliability (TRR) analysis. The participants undertook story writing practices in their classrooms in line with the curriculum.

Development of the Attitude Scale Towards Story Writing

In the first phase of the scale development, the relevant scales among the literature were reviewed and researched whether related scales were existed. This review concluded that the literature lacks research on attitudes towards story writing.

The attitude variable contain three dimensions such as cognitive, affective, and behavioral (Tavşancıl, 2010). For this reason, the items were written considering the cognitive, affective, and behavioral dimensions of story writing. In addition, scales produced by other researchers on writing were reviewed and benefited the item-writing phase.

Thirty items were written to measure third- and fourth-grade primary school students' attitudes towards story writing. Three field experts, one assessment and evaluation expert, and a Turkish language expert were consulted on the appropriateness of the items and the language used. An explanation of the aim of the scale was included and a draft scale was developed. Sixteen positive and 14 negative items rated on a five-point Likert-type scale – ranging from (1) "strongly disagree" to (5) "strongly agree" – were included in the draft scale. Prior to the factor analysis, the scores of the negative items were reversed. Categories, indicators, and descriptions of attitudes towards story writing and the items relevant to each description are presented in Table 2.

Table 2
Categories, Indicators, and Descriptions of Attitudes towards Story Writing, and Items Written for Each Description

Category	Indicator	Description	Source	Items with regard to the description
POSITIVE ATTITUDE	Like writing stories	Participating happily in writing activities, explaining thinking, having fun, making it a lifestyle, writing more often, enjoying the writing process and the product	Daly, cited in Krawczyk (2005), Göçer (2014b), McKenna, Kear and Ellsworth, cited in Zumbrunn (2010), Tompkins (1982)	I2, I4, I14, I16, I18, I19, I22, I24
	Self-development	Being more diligent, setting goals	Bandura (1995), Graham, cited in Williams (2012)	I23, I29
NEGATIVE ATTITUDE	Avoiding writing stories	Resisting and avoiding writing activities, reduced efficiency in the writing process	Daly as cited in Krawczyk (2005), Graham et al. (2007)	I5, I8, I9, I10, I25, I27
	Dislike writing stories	Making less effort, physical or emotional show of anxiety, sadness, and anger	Graham et al. (2007), Krawczyk (2005)	I15, I17, I20, I21

This table was reorganized following EFA and items 6, 7, 11, 12, 13, 26, 28, and 30 were excluded from the scale, and so are not included here.

Data Collection

By considering ethical issues, in the data collection stage, the potential participants were informed about the aim of the study and those who were willing to participate were determined. The participants were told that they did not have to give their name and were assured that their identities would not be revealed. After explaining the subject of the scale, the researchers asked the participants to fill the scale. The researcher personally collected the data and the cases where students' attention might be distracted and the answering might be prevented were particularly avoided. The students needed 20–25 minutes to complete the scale. The data collection process took approximately one month with the test-retest.

Data Analysis

Various analyses were conducted to obtain evidence of the reliability and validity of the Attitude towards Story Writing Scale. In order to determine the construct validity of the scale, firstly, EFA and then DFA was carried out on the resulting structure.

SPSS 21.0 software was used for EFA, which revealed which factors the items in the scale belong to. At this stage, the Kaiser Meyer Olkin test (KMO) and Bartlett's Sphericity test (BST) were carried out to investigate the appropriateness of the data in the principal component analysis. To identify the factors, varimax rotation was used. Cronbach's alpha (α) coefficients were calculated for the overall scale and for each factor separately.

Lisrel 8.8 software was used for CFA to check the appropriateness of the model revealed by EFA. Chi-squared ($\chi 2$), degree of freedom (DF), adjusted goodness of fit index (AGFI), goodness of fit index (GFI), normed fit index (NFI), non-normed fit index (NNFI), incremental fit index (IFI), comparative fit index (CFI) and root-mean-square error of approximation (RMSEA) values were considered to evaluate model appropriateness.

α coefficients were calculated for the overall attitude scale and individual factors to check the internal consistency of the scale. TRR was also calculated to indicate the reliability of the scale. Tavşancıl (2010) notes that an interval of two–three or four–six weeks is sufficient between two measurements. Hence, the scale was applied again to a group of students two weeks after the first application. Because the literature indicates the need at least 30 participants in order to ensure normal distribution (Tavşancıl, 2010; Aiken, cited in Gürefe & Kan, 2013), thirty-six students completed the second exercise.

FINDINGS

In this section, the reliability and validity issues for the Attitude Scale Towards Story Writing are discussed.

Findings Related to Validity

Both the content and construct validity of the scale were investigated. The principal component analysis was conducted to check construct validity, to determine the factors on which the items loaded, and to label the factors.

KMO and BST were carried out to determine the appropriateness of the data for the analysis. The results revealed a KMO value of .945. Kaiser (1974) indicated that factor analysis can be done when the KMO value is greater than 0.5, while Pallant (2001) suggests a KMO value greater than 0.6 (cited in Kılıç-Çakmak, Çebi, & Kan, 2014, p. 758). The KMO value obtained in this study was greater than the values suggested in the literature.

The significance of the Chi-squared statistics obtained at the end of the BST indicated the normal distribution of the data with multiple variables. The BST was found to be significant (χ^2=3408.91; p=0.00). In the light of these results, the scale was found to be appropriate for factor analysis.

As a result of the first EFA, the items of the scale were collected under five factors. These five factors explained 56.51% of the variance of the scale. It was determined that some factors were loaded with very few items, some items were loaded on more than one factor, and some load values were lower than .30. These items were excluded from the scale one by one and EFA was repeated each time. The results indicated a KMO value of .942. The BST result was also significant (χ^2=4817.85; p=0.00). After the exclusion of inappropriate items with negative conditions, the remaining 20 items were collected under two factors (components). The eigenvalues of these factors are presented in Figure 1.

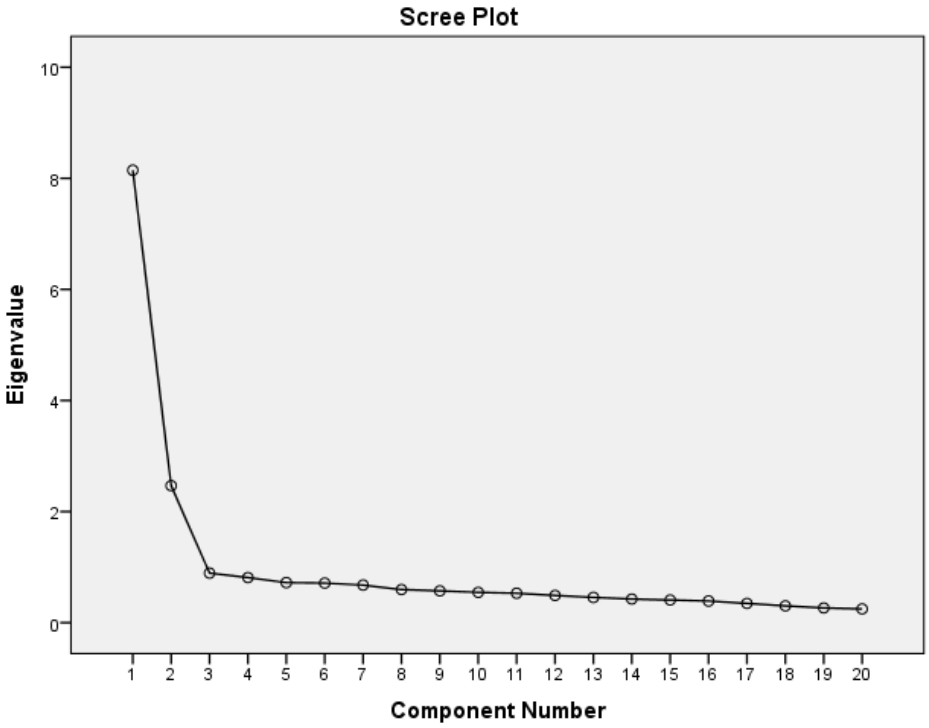

Figure 1. Eigenvalues of scale factors

In order to make the factor loads more distinct in this analysis, varimax, an orthogonal rotation technique, was used. For an item to be loaded on a factor, the factor load should be at least .40 (DeVellis, 2014). For this reason, a value of .40 was considered as the criterion for the factor loads and the items with a factor load lower than .40 were not included in the analysis. Table 3 presents the EFA values of the 20 items kept for analysis.

Table 3
Factor Loadings and EFA Results for Scale Items

Item No	Item	Factor 1	Factor 2	Common Factor Variance
18	I like spending my free time writing stories.	.80		.68
22	I write a story whenever possible.	.80		.65
16	Writing stories is my most favorite activity.	.79		.68
24	I prefer writing stories instead of playing games.	.72		.55
19	Besides my homework, I also write stories on my own whenever I want.	.72		.54
14	I like expressing what I feel/think by writing stories.	.67		.52
2	I cannot think of a more enjoyable activity than writing a story.	.66		.44
29	I do research to develop my story-writing skills.	.59		.40
4	I have a strong wish to write stories.	.59		.40
23	I read books and magazines to develop my story-writing skills.	.55		.40
9	I want to escape from the classroom when my teacher asks me to write a story.		.76	.59
10	I find various excuses not to write stories.		.75	.59
15	I hate my teacher when s/he asks me to write a story.		.73	.53
25	I hesitate to write a story.		.71	.58
21	I do not like writing stories at all.		.70	.70
17	I feel disturb when I need to write a story.		.70	.54
5	I think that writing stories is a waste of time.		.64	.41
20	I feel bored when I am writing stories.		.64	.61
8	Writing a story is not my favorite activity.		.61	.50
27	I spend too much time on my desk and cannot write anything.		.50	.32
	Eigenvalue	8.15	2.27	-
	Variance Explained (%)	40.73	12.33	-
	Total Variance Explained (%)		53.06	-

In Table 3, the factor load values of EFA are listed from high to low. A close look at the table shows that the first factor consists of ten items whose factor loads range between .55 and .80 and that the second factor consists of ten items whose factor loads range between .50 and .76. All of the factors explained 53.06% of the total variance. The first factor explained 40.73% of the total variance and was labeled "Positive Attitude." The second factor explained 12.33% of the total variance and was labeled "Negative Attitude."

The relationships between the factors of the scale were investigated with the same participant group. The correlation coefficients between the factors are presented in Table 4.

Table 4
Correlation Coefficients

Dimensions	Positive Attitude	Negative Attitude
Positive Attitude	1.00	.38*
Negative Attitude		1.00

* $p<0.05$

As seen in Table 4, the correlation between the two factors was .38 and significant at the .05 level.

CFA was carried out to confirm the model (construct) revealed by the exploratory factor analysis. Factor distributions and load values are given in Figure 2.

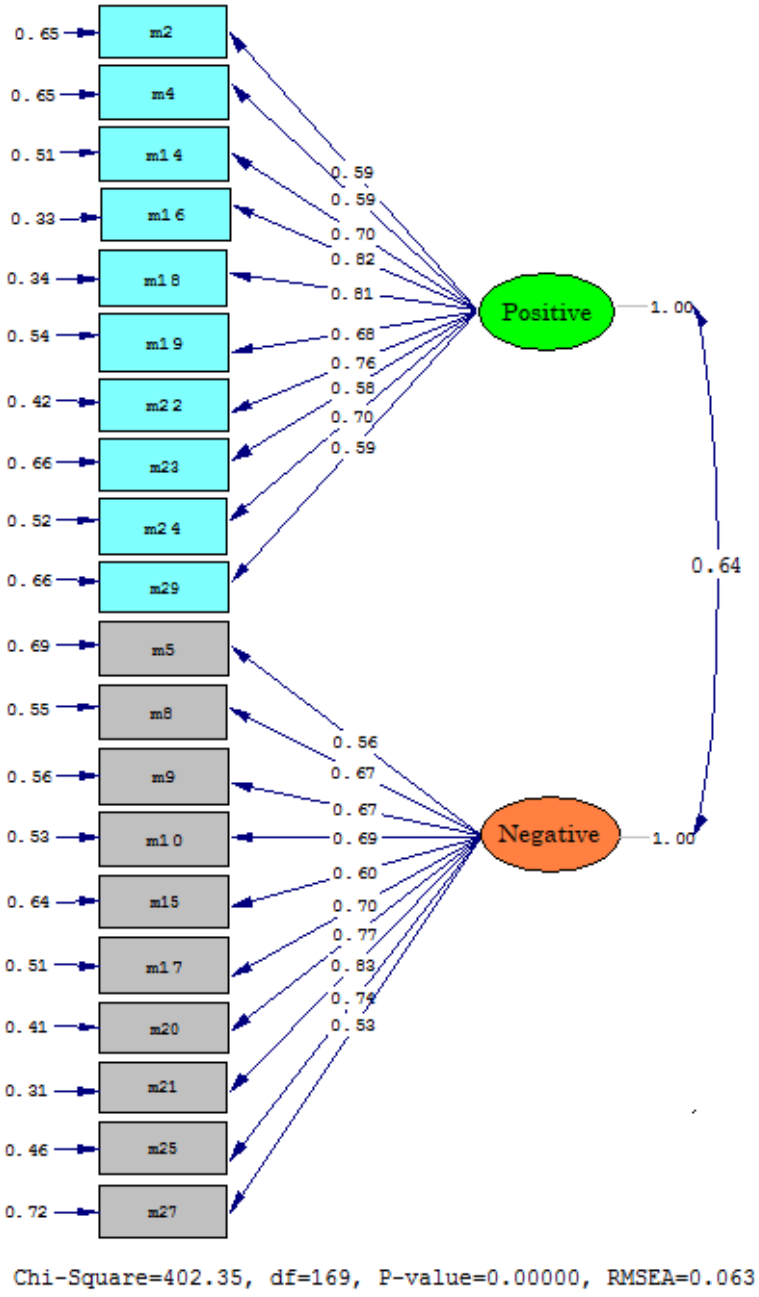

Figure 2. CFA path diagram of the scale

The CFA model shows that the load values of items and factors range between 0.53 and 0.83. CFA found that χ^2=402.35, df=169, *p*=.00, RMSEA=.063, GFI=.90, AGFI=.87, NFI=.96, NNFI=.98, CFI=.98 and IFI=.98. According to the data obtained by CFA, the correlation between the two factors was .64 and significant, which indicates that the factors are related to each other. Considering these values, it can be said that the items in the scale represent the construct of the scale; in other words, the model accords with the results presented by EFA.

Findings Related to Reliability

In order to determine the reliability of the scale, the correlations between item-total test scores were calculated for each item and the Crα coefficients were calculated for each dimension determined by EFA. The relevant data are presented in Table 5.

Table 5
Item Total Correlations for Items and Cronbach Alpha Coefficients

Items and Factors	*X*	S	Item Total Correlation	Cronbach's Alpha Coefficient When the Item was Removed
Factor 1: Positive attitude (α=.90)				
I2	2.9011	1.29451	.56	.89
I4	3.4011	1.25844	.56	.89
I14	3.7881	1.23351	.65	.89
I16	3.4096	1.32700	.76	.88
I18	3.4802	1.28883	.76	.88
I19	3.3757	1.37050	.64	.89
I22	3.2090	1.29121	.72	.88
I23	3.8842	1.14433	.56	.89
I24	3.1751	1.32008	.66	.89
I29	3.6186	1.30321	.57	.89
Factor 2: Negative Attitude (α=.89)				
I5	3.8814	1.26291	.54	.89
I8	3.8136	1.22959	.63	.88
I9	4.3927	1.06505	.65	.88
I10	4.2966	1.08799	.67	.88
I15	4.5056	1.02447	.59	.88
I17	3.9520	1.25973	.66	.88
I20	3.9802	1.23093	.69	.88
I21	4.1271	1.12565	.76	.87
I25	4.0678	1.11184	.69	.88
I27	3.8362	1.33433	.49	.89

Reliability coefficients of .70 or higher are generally considered sufficient (Nunnally, cited in Kılıç-Çakmak et al., 2014, p. 9). The α coefficients were found to be .92 for the overall scale, .90 for the first factor, and .89 for the second factor.

Table 5 presents the scale has very high reliability values. This is important because high reliability coefficients indicate that the items in a scale are consistent with each other and that the scale consists of items bearing the same characteristics (Tavşancıl, 2010). Kline (2011, p. 70) noted that a reliability coefficient of about 0.90 is excellent, 0.80 is very good, and 0.70 is sufficient. .

When the total test correlations of items in each factor were considered, the following results were obtained. The values of item total test correlations for the Positive Attitude factor range between *r*=.56 and *r*=.76. The values of item total test correlations for Negative Attitude factor range between *r*=.49 and *r*=.76. Item total correlations of .30 or higher provide the validity of the scale items (Nunnally & Bernstein, 1994). Coefficients were higher than .30 for each item in this scale, which indicates that the scale items measure what they are intended to measure.

The scale was applied again to 36 students two weeks after its first application and the TRR of the scale was calculated based upon the data obtained. The TRR was found to be .82 for the overall scale, .87 for the first factor, and .83 for the second factor. These results reveal that the scale scores are consistent (stable) over time. This indicates that the scale obtained is highly reliable.

Table 6
Test-Retest Correlation Coefficients

Dimensions	Positive Attitude	Negative Attitude
Positive Attitude	1.00	.41*
Negative Attitude		1.00

* $p<0.01$

As shown in Table 6, the correlation between the factors was .41 and significant at the .01 level.

DISCUSSION, CONCLUSION, and IMPLICATIONS

In this study, a scale was developed with the aim of measuring third- and fourth-grade primary school students' attitudes towards story writing. A 30-item draft scale was developed based on the literature and implemented with participants. Following the implementation, validity and reliability were tested in order to determine the structure of the final scale, which was identified as comprising 20 items.

Construct and content validity were measured. To test construct validity firstly, EFA was conducted, then in order to confirm the two-factor construct obtained, CFA was conducted. There are 10 items in the first factor and 10 items in the second factor. Since the items in the first factor contain positive attitudes towards story writing, this factor is called "positive attitude". When the statements in the second factor are examined, it is seen that they reflect the negative expressions towards story writing. Therefore, it was decided to call this factor "negative attitude". Between them, the two factors explained 53.06% of total variance; the first factor explained 40.73%, while the second factor explained 12.33%. CFA revealed that the model is in harmony with its data. Based on the EFA and CFA analyses, it can be stated that the two-factor scale is valid. To achieve content validity, the relevant literature was reviewed, definitions of storytelling attitude were determined, and items were formed according to these definitions. Additionally, three experts in the field were consulted about the items.

To ensure reliability, α and TRR coefficients were calculated. According to this, the α of the overall scale was .92, that of the first sub-factor was .90, and that of the second sub-factor was .89. The results of the tests show that the scale is reliable.

The results showed that "Attitude Scale Toward Story Writing" has a valid and reliable structure. In this respect, it can be stated that the scale is suitable for use to measure third- and fourth-grade students' attitudes towards story writing. This scale contributed to filling the gap in the literature.

Turkish Teaching Curricula prepared in 2005 and 2015 include story writing starting in primary school. To ensure that this work is productive, it is important for the teacher to identify students' attitudes and work on them to encourage a positive attitude towards story writing. When the literature is examined it is seen that researches and scale development studies have been done to examine the relationship between writing attitude and writing success, developing a tool to determine the writing attitude for teachers, determining the writing attitudes of the 1-3. and 4-8. grades students, influence the writing behavior of creative writing activities, comparison of reading and writing attitudes (Clark & Dugdale, 2009; Graham vd., 2007; Kear vd., 2000; Knudson, 1991; Knudson, 1992; Susar-Kırmızı, 2009; Temizkan & Sallabaş, 2009). In Gallick-Jackson's (1997) study, an instrument was used to measure the students' writing attitude to identify their story writing attitude. However, students' attitudes towards story writing may differ from their attitudes towards writing. For instance, a student may not like writing about the topics they learn at school, but s/he may like story writing on a topic of his/her own choosing. The use of tools to measure writing attitudes in determining attitudes towards story writing can lead to misleading results. For this reason, it is considered that it is necessary to develop a measurement tool to determine the story writing attitude. Since students are familiar with story texts from early ages, and in primary school writing studies are usually focused on story texts, therefore, it is considered that measuring story writing through scales which are specifically designed with a focus on this subject may provide realistic results. Story writing attitudes of third and fourth grade primary school students will be determined by the Attitude Scale Towards Story Writing developed in this research. Future studies should be examined the story writing attitudes of different sample groups. Also, the researchers recommend that new scales should be developed in persuasive, informative, and other types of writing

along with story writing. It is also recommended to analyze the validity and reliability English version of our attitude scale towards story writing developed in Turkish (Appendix 1).

Acknowledgement

This study was presented as oral presentation at 16th International Primary Teacher Education Symposium.

REFERENCES

Akyol, H. (2013). *Türkçe ilkokuma yazma öğretimi* (13th ed.). Ankara: Pegem Akademi Yayıncılık.

Ateş, S. (2011). *Evaluation of fifth-grade Turkish course learning and teaching process in terms of comprehension instruction.* (Unpublished doctoral dissertation). Gazi University Graduate School of Educational Sciences, Ankara, Turkey.

Bandura, A. (1995). Exercise of personal and collective efficacy in changing societs. In A. Bandura (Ed.), *Self-efficacy in changing societies* (pp. 1-45). Cambridge, England: Cambridge University Press.

Clark, C., & Dugdale, G. (2009). Young people's writing: attitudes, behaviour and the role of technology. *National Literacy Trust,* 1-52.

Cohen, R.J., & Swerdlik, M.E. (2015). *Psychological Testing and Assessment.* E. Tavşancıl (Translation Ed.). Ankara: Nobel Yayın.

Daly, J. (1985). Writing apprehension. In Mike Rose (Ed), *When a writer can't write studies in writer's block and other composing process problems* (pp. 43-82). New York: Guilford Press. Retrieved from https://www.researchgate.net/publication/306375000_Writing_Apprehension

DeVellis, R. F. (2014). *Scale development.* T. Totan (Translation). Ankara: Nobel Yayın.

Edwards, A. L. (1957). *Techniques of attitude scale construction*. New York: Appleton-Century-Crofts. INC.

Gallick-Jackson, S.A. (1997). *Improving narrative writing skills, composition skills, and related attitudes among second grade students by integrating word processing, graphic organizers, and art into a process approach to writing.* (Unpublished master's thesis). Nova Southeastern University, the USA. Retrieved from http://files.eric.ed.gov/fulltext/ED420064.pdf

Göçer, A. (2014a). The adaptation to Turkish of the writing attitude scale (WAS): The study of validity and reliability. *Kastamonu Education Journal*, *22*(2), 515-524.

Göçer, A. (2014b). *Yazma eğitimi*. Ankara: Pegem Akademi.

Graham, S., Berninger, V., & Fan, W. (2007). The structural relationship between writing attitude and writing achievement in first and third grade students. *Contemporary Educational Psychology*, *32*, 516–536. Retrieved from http://www.sciencedirect.com/science/article/pii/S0361476X07000057

Gürefe, N., & Kan, A. (2013). The study of validity and reliability of the attitude scale on the subject of geometric objects for the prospective teachers. *Elementary Education Online*, *12*(2), 356-366. Retrieved from http://dergipark.ulakbim.gov.tr/ilkonline/article/view/5000037781/5000036639

Kan, A., & Akbaş, A. (2005). Lise öğrencilerinin kimya dersine yönelik tutum ölçeği geliştirme çalışması. *Mersin University Journal of the Faculty of Education*, *1*(2), 227–237. Retrieved from http://chemistrynetwork.pixel-online.org/data/SMO_db/doc/58_3.pdf

Kear, D. J., Coffman, G.A., McKenna, M. C., & Ambrosio, A.L. (2000). Measuring attitude toward writing: A new tool for teachers. *The Reading Teacher*, *54*(1), 10-23.

Kılıç-Çakmak, E., Çebi, A., & Kan, A. (2014). Developing a "social presence scale" for e-learning environments. *Educational Sciences: Theory & Practice*, *14*(2), 755–768. DOI: 10.12738/estp.2014.2.1847

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York: Guilford Press.

Knudson, R. E. (1991). Development and use of a writing attitude survey in grades 4 to 8. *Psychological Reports, 68,* 807-816. Retrieved from http://journals.sagepub.com/doi/abs/10.2466/pr0.1991.68.3.807

Knudson, R. E. (1992). Development and application of a writing attitude survey for grades 1 to 3. *Psychological Reports, 70,* 711-720. Retrieved from http://journals.sagepub.com/doi/pdf/10.2466/pr0.1992.70.3.711

Krawczyk, J. (2005). *Writing attitudes: determining the effect of a community of learners project on the attitudes of composition students*. (Unpublished master's thesis). Faculty of the Graduate College of the Oklahoma State University, the USA. Retrieved from

https://shareok.org/bitstream/handle/11244/9520/Krawczyk_okstate_0664M_1567.pdf?sequence=1&isAllowed=y

Nunnally, J. C., & Bernstein, I. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.

Turkey Republic Ministry of National Education Board of Education and Discipline. (2009). *Elementary Turkish curriculum and guide (Grades 1st-5th).* Ankara: Devlet Kitapları Müdürlüğü Basım Evi.

Turkey Republic Ministry of National Education Board of Education and Discipline. (2015). *Turkish (Grades 1st-8th) curriculum.* Ankara: Devlet Kitapları Müdürlüğü Basım Evi.

Susar-Kırmızı, F. (2009). In Turkish courses the effect of creative writing efforts based on creative drama method on the writing attitude. *Creative Drama Journal, 4*(7), 51-67. Retrieved from http://yader.org/index.php/yader/article/viewFile/yader.2009.005/yader.2009.005

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics*. New York: HarperCollins.

Tavşancıl, E. (2010). *Tutumların ölçülmesi ve SPSS ile veri analizi*. Ankara: Nobel Yayın.

Temizkan, M., & Sallabaş, M. E. (2009). Compare the attitudes of teacher candidates related to reading and writing activities. *Electronic Journal of Social Sciences, 8*(2), 155-176.

Tompkins, G. E. (1982). Seven reasons why children should write stories. *Language Arts, 59*(7), 718-721. Retrieved from https://www.jstor.org/stable/pdf/41405103.pdf

Tompkins, G. E. (2006). *Literacy for the 21th century: A balanced approach*. New Jersey: Pearson Education.

Turan-Oluk, N., Kan, A., & Ekmekçi, G. (2016). The development of an attitude scale for concept mapping: the study for validity and reliability. *KEFAD, 17*(1), 95–110. Retrieved from http://kefad.ahievran.edu.tr/archieve/pdfler/Cilt17Sayi1/JKEF_17_1_2016_95-110.pdf

Williams, H. M. (2012). *Third grade students' writing attitudes, self- efficacy beliefs, and achievement.* (Unpublished master's thesis). Thesis submitted to the Faculty of the Graduate School of the University of Maryland, the USA. Retrieved from http://drum.lib.umd.edu/handle/1903/12981

Zumbrunn, S. (2010). *Nurturing students' writing knowledge, self-regulation, attitudes, and self-efficacy: The effects of self-regulated strategy development.* (Unpublished doctoral dissertation). University of Nebraska Lincoln, the USA.

APPENDIX 1. Attitude Scale Towards Story Writing in Turkish

Sevgili Öğrenciler,

Aşağıda yer alan cümleler, tek başınıza hikâye yazma ile ilgili duygu ve düşüncelerinizi belirlemek amacıyla hazırlanmıştır. Her cümlenin karşısında, cümlede anlatılanlara ne düzeyde katıldığınızı belirlemeye yönelik beş ifade yer almaktadır. Sizden, cümlelere içten bir şekilde cevaplar vererek hikâye yazma ile ilgili kendinizi en iyi anlatan ifadeye işaret koymanız istenmektedir. Lütfen tüm cümleleri yanıtlayınız. Yanıtlarınız hiçbir şekilde puan olarak değerlendirilmeyecektir.

TEŞEKKÜRLER…

Hikâye Yazmaya Yönelik Tutum Ölçeği	Kesinlikle Katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle Katılıyorum
1. Hikâye yazmaktan daha eğlenceli bir etkinlik düşünemiyorum.					
2. Hikâye yazmaya karşı güçlü bir istek duyarım.					
3. Hikâye yazmanın zaman kaybı olduğunu düşünürüm.					
4. Hikâye yazmak, yapmayı tercih edeceğim bir etkinlik değildir.					
5. Öğretmenim hikâye yazmamı istediğinde sınıftan kaçmak isterim.					
6. Hikâye yazmamak için çeşitli bahaneler bulurum.					
7. Hissettiklerimi/ düşündüklerimi hikâye yazarak anlatmayı severim.					
8. Öğretmenim hikâye yazmamı istediğinde ondan nefret ederim.					
9. Hikâye yazmak en sevdiğim etkinliktir.					
10. Hikâye yazmam gerektiğinde huzursuz olurum.					
11. Boş zamanlarımı, hikâye yazarak değerlendirmeyi severim.					
12. Ödevlerimin dışında da istediğim zaman kendi kendime hikâyeler yazarım.					
13. Hikâye yazarken sıkılırım.					
14. Hikâye yazmayı hiç sevmem.					
15. Bulduğum her fırsatta hikâye yazarım.					
16. Hikâye yazma becerimi geliştirmek için kitap ve dergiler okurum.					
17. Oyun oynamak yerine hikâye yazmayı tercih ederim.					
18. Hikâye yazmaktan çekinirim.					
19. Masamda/sıramda saatlerce oturup hiçbir şey yazmadığım olur.					
20. Hikâye yazma becerimi geliştirmek için araştırma yaparım.					

TÜRKÇE GENİŞLETİLMİŞ ÖZET

Bireyler kendilerini ifade etmek, duygu ve düşüncelerini aktarmak gibi çeşitli sebeplerle yaşamları boyunca yazma becerisini kullanmaktadır. İletişim sürecinde oldukça önemli olan yazma becerisine karşı her bireyin ilgi, istek ve tutumları aynı değildir (Göçer, 2014). Öğrencilerin okul öncesi dönemlerden itibaren hikâye türü metinlerin yapılarına aşina olmaları (Ateş, 2011), Türkçe Öğretim Programında, ilkokuldan itibaren hikâye yazma çalışmalarına yer verilmesi sebebiyle bu çalışmaların daha verimli geçmesini ve öğrencilerin hikâye yazmaya yönelik olumsuz tutumları varsa bunları belirleyip olumlu tutum haline getirmeyi sağlamak için öğrencilerin hikâye yazmaya yönelik tutumları belirlenmelidir.

Bu araştırmada ilkokul üçüncü ve dördüncü sınıf öğrencilerinin hikâye yazmaya yönelik tutumlarının belirlenmesi için geliştirilen Likert tipi bir tutum ölçeğinin geçerlik ve güvenirlik çalışmasının yapılması amaçlanmıştır. Bu araştırmanın çalışma grubunu Zonguldak ili Ereğli ilçesinde yüksek, orta ve düşük sosyo-ekonomik düzeydeki (SED) öğrencilerin devam ettiği üç farklı ilkokulda üçüncü ve dördüncü sınıfta öğrenim gören toplam 354 öğrenci oluşturmaktadır.

Ölçek geliştirme sürecinin ilk aşamasında konu ilgili çalışmalar incelenmiş, literatürde konuya ilişkin ölçek bulunup bulunmadığı araştırılmıştır. Ardından ilkokul üçüncü ve dördüncü sınıf öğrencilerinin hikâye yazmaya ilişkin tutumlarını ölçmek amacıyla bilişsel, duyuşsal ve davranışsal boyutlar göz önüne alınarak 30 madde yazılmıştır. Maddelerin ve kullanılan dilin uygunluğuna ilişkin üç alan uzmanı, bir ölçme değerlendirme uzmanı ve bir dil uzmanından görüş alınmış ve taslak ölçek oluşturulmuştur. Faktör analizi öncesinde olumsuz maddelerin puanları ters çevrilerek puanlama yapılmıştır.

Verilerin toplanması aşamasında katılımcılara çalışmanın amacı açıklanarak çalışmaya katılmak isteyenler belirlenmiştir. Taslak ölçeğin cevaplanma süresi 20-25 dakikadır. Veri toplama süreci ise test-tekrar-test ile birlikte yaklaşık bir ay sürmüştür.

Hikâye Yazmaya Yönelik Tutum Ölçeğinin güvenirlik ve geçerliğine kanıt oluşturmak amacı ile çeşitli analizler yapılmıştır. Güvenirliğe kanıtı arttırmak için test-tekrar test (TTT) güvenirliği hesaplanmıştır. TTT çalışması için her bir okuldan seçilen 12 öğrenci olmak üzere toplam 36 öğrenciden ayrıca veri toplanmıştır. Ölçeğin yapı geçerliğine kanıt oluşturmak için Açımlayıcı Faktör Analizi (AFA) ve Doğrulayıcı Faktör Analizi (DFA) yapılmıştır. Ölçeğin geliştirilmesinde iç tutarlılık için tutum ölçeğinin tümü ve onu oluşturan faktörlere ait Cronbach-Alfa değerleri hesaplanmıştır.

İlk AFA sonucunda ölçeğin maddelerinin beş faktör altında toplandığı görülmüştür. Bu beş faktörün ölçeğe ilişkin açıkladığı varyans % 56.51'dir. Fakat bazı faktörlere çok az sayıda maddenin yük verdiği, bazı maddelerin birden fazla faktöre yük verdiği ve bazı yük değerlerinin ise .30'un altında olduğu görülmüştür ve bu maddeler ölçekten tek tek çıkarılarak her seferinde AFA tekrarlanmıştır. Yapılan analizler sonucunda KMO değeri .94 olarak hesaplanmıştır. Barlett testi de anlamlı bulunmuştur ($x2=4817.85$; $p=0.00$). Uygun olmayan maddelerin ölçekten çıkarılmasının ardından geriye kalan 20 madde iki faktör altında toplanmıştır. Faktör yüklerini daha belirgin hale getirmek amacıyla varimax kullanılmıştır.

Ölçeğin ilk uygulanışından iki hafta sonra 36 öğrenciye tekrar uygulanması sonucu elde edilen veriler üzerinde ölçme sonuçlarına ilişkin TTT güvenirliği hesaplanmıştır. Ölçeğin tümüne ait TTT güvenirliği .82, birinci alt faktöre ilişkin TTT güvenirliği .87, ikinci alt faktöre ilişkin TTT güvenirliği ise .83 olarak hesaplanmıştır. Buna göre, kişilerden elde edilen ölçek puanları geçen zamana karşı tutarlılık göstermektedir. 20 maddeye ait AFA değerleri incelendiğinde birinci boyut faktör yükünün .55 ile .80 arasında değişen 10 maddeden; ikinci boyut faktör yükünün ise .50 ile .76 arasında değişen 10 maddeden oluştuğu görülmektedir. Tüm faktörlerin toplam varyansın %53,06'sını açıkladığı belirlenmiştir. Birinci

faktör toplam varyansın %40,73'ünü açıklamakta olup "Olumlu Tutum" olarak, ikinci faktör toplam varyansın %12,33'ünü açıklamakta olup, "Olumsuz Tutum" olarak isimlendirilmiştir. Faktörler arasındaki korelasyonun .38 olduğu ve .05 düzeyinde anlamlı farklılığa sahip olduğu görülmektedir.

DFA'ya ait faktör dağılımları ve yük değerleri, maddeler ile ilişkili oldukları faktörler arasındaki yük değerlerinin 0.53 ile 0.83 arasında değişiklik göstermektedir. DFA sonuçlarına göre iki faktör arasındaki korelasyon değeri .64'tür ve anlamlıdır. Buna göre, ölçekte yer alan maddelerin yapıyı temsil ettiği, modelin AFA ile ortaya konan sonuçlarla uyum gösterdiği söylenebilir.

Ölçeğin güvenirliğini belirlemek üzere; ölçekte yer alan her bir madde için madde-toplam test puanları arasındaki korelasyonlar hesaplanmış, AFA neticesinde belirlenen ölçeğin her bir boyutuna ilişkin Cronbach Alpha güvenirlik katsayıları hesaplanmıştır. Ölçeğin tümüne ait α .92; birinci alt faktöre ilişkin α .90, ikinci alt faktöre ilişkin α .89 olarak bulunmuştur. Bu verilere göre, ölçeğin oldukça yüksek güvenirlik değerlerine sahip olduğu görülmektedir.

Her bir faktörde yer alan maddelerin toplam test korelasyonlarına bakıldığında ise olumlu tutum faktöründe değerler (r=.56) ile (r=.76) arasında, olumsuz tutum faktöründe ise değerlerin (r=.49) ile (r=.76) arasında değiştiği görülmektedir. Bu ölçeğin madde toplam test korelasyonları incelendiğinde her bir maddesinin (r=.30)'un üzerinde olduğu görülmektedir. Bu durum, ölçek maddelerinin ölçülmek istenen özelliği ölçme amacına hizmet ettiğine işaret etmektedir.

Özetle, ilkokul üçüncü ve dördüncü sınıf öğrencilerinin hikâye yazmaya yönelik tutumlarını ölçmeyi amaçlayan "Hikâye Yazmaya Yönelik Tutum Ölçeği"nin (EK 1) geçerli ve güvenilir bir yapıda olduğu ortaya konmuştur.

TURJE
www.turje.org

Volume:8 Issue:1

https://dx.doi.org/10.19128/turje.449100

Turkish Journal of Education

Research Article

Received 30.07.2018
Accepted 08.01.2019

Facilitating grade 11 students' conceptual understanding of fundamental acid-base models

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ABSTRACT The purpose of this study was to enhance grade 11 students' conceptual understanding of fundamental acid-base models using Predict-Observe-Explain based animated movies (POE-AM). Twelve grade 11 students participated in the study. To collect data, the students' responses to the POE-AM tasks and interview protocols were used. The findings indicated that the POE-AM tasks positively improved the students' conceptual understanding of fundamental acid-base models and remedied any deficiency identified in pre-interviews and/or the 'predict' stage of the POE strategy. The results also showed that before implementation the students stated the main parts of acids and bases as H^+ and OH^- ions, respectively. After the implementation, they indicated that the Arrhenius model had the least adequate explanation to imply features/behaviors of acids and bases whilst the Lewis model did the most adequate acid-base definition to address their features/behaviors. Moreover, the study revealed that most of the students had alternative understanding or only partial understanding at the 'predict', but showed somewhat a sound understanding of these concepts at the 'observe' and 'explain' stages. The current study suggests that chemistry teachers should integrate the POE-AM into their classes to effectively promote student learning.

Keywords: *Acid-base models, Conceptual understanding, POE-based animated movies*

11. Sınıf öğrencilerinin temel asit-baz modelleriyle ilgili kavramsal anlamalarını kolaylaştırma

ÖZ Bu çalışma, 11. sınıf öğrencilerinin temel asit-baz modelleriyle ilgili kavramsal anlamalarını Tahmin-Gözlem-Açıklama temelli animasyon filmleriyle (TGA-AF) artırmayı amaçlamaktadır. Çalışmaya 12 onbirinci sınıf öğrencisi katılmıştır. Veri toplamak için öğrencilerin TGA-AF etkinliklerine ve mülakat protokollerine verdikleri cevaplar kullanılmıştır. Elde edilen bulgular, TGA-AF etkinliklerinin öğrencilerin temel asit-baz modelleriyle ilgili kavramsal anlamalarını pozitif olarak geliştirdiğini ve ön mülakatlarda ve/veya TGA stratejisinin tahmin aşamasında belirlenen eksiklikleri giderdiğini göstermiştir. Öğrenciler uygulamadan önce asit ve bazların temel bölümlerinin sırasıyla H^+ ve OH^- iyonları olduğunu ifade etmiştir. Uygulamadan sonra ise öğrenciler asit ve bazların özelliklerini ve davranışlarını açıklamak için Arrhenius modelinin en az ve Lewis modelinin ise en çok yeterli açıklamaya sahip olduğunu belirtmişlerdir. Ayrıca, öğrencilerin çoğunluğunun TGA'nın "tahmin" aşamasında alternatif ya da kısmi anlamaya sahip olduğu; ancak, "gözlem" ve "açıklama" aşamalarında belli bir dereceye kadar tam anlamayı gösterdikleri ortaya çıkmıştır. Bu çalışma, kimya öğretmenlerinin öğrencinin öğrenmesini etkili olarak teşvik etmek için TGA-AF'yi kendi sınıflarına entegre etmelerini önermektedir.

Anahtar Kelimeler: *Asit-baz modelleri, Kavramsal anlama, TGA temelli animasyon filmleri*

Cite This Article: Yaman, F., Ayas, A. & Çalık M., (2019). Facilitating grade 11 students' conceptual understanding of fundamental acid-base models, *Turkish Journal of Education. 8*(1), 16-32. https://dx.doi.org/10.19128/turje.449100

INTRODUCTION

Studies in science education have emphasized that knowing students' pre-conceptions is a pre-requisite for improving student learning in science classes (Coştu, Ayas & Niaz, 2012; Liew, 1995; Kearney, 2004). The constructivist view of learning suggests that pre-existing knowledge affects students' subsequent learning. Therefore, it is crucial to probe students' understanding of science concepts to properly organize subsequent advanced learning (Kearney & Treagust, 2001). There have been a number of approaches to investigate students' understanding of science concepts (White & Gunstone, 1992) such as concept mapping (Novak& Gowin, 1984), Predict-Observe-Explain (POE) (Kearney, 2004; Kearney & Treagust, 2001; Liew, 1995; Liew & Treagust,1998), interviews about instances (Osborne & Cosgrove, 1983), interviews about concepts (Abdullah & Scaife, 1997), drawings (Smith & Metz, 1996), and word association tests (Bahar & Tongaç, 2009). A POE strategy identifies students' understanding of science concepts and promotes student discussion in the learning process (Kearney & Treagust, 2001; Liew & Treagust, 1998). In the POE strategy, students *predict* the outcome of an event or situation, and indicate the reasons for their predictions. Then, they *observe* the event or situation, and *explain* any discrepancy between their predictions and observations (Kearney & Treagust, 2001; Liew & Treagust,1998; White & Gunstone, 1992).

Although a few studies have sparingly used computer-based POE tasks (Acar-Şeşen, 2013; Kearney, 2004; Kearney & Treagust, 2001; Kearney, Treagust, Shelley & Zadnik, 2001), none of them have employed animated movies in the POE tasks. Kearney, Treagust, Shelley, and Zadnik (2001) investigated high school students' and their teachers' perceptions of the effectiveness of computer-based POE tasks in probing the students' conceptions and promoting students' discussions. They argued that the computer-based POE tasks gave the students an opportunity to control the POE stages. Moreover, the tasks enabled them to effectively use their learning times and to enhance their self-confidence levels to discuss their views of the phenomena. Kearney (2004) also investigated the effects of collaborative use of multimedia-based POE tasks on students' pre-conceptions and peer learning. Kearney (2004) stated that the tasks supported peer learning conversations at every stage of the POE strategy, except for the explanation stage. Moreover, Kearney and Treagust (2001) reported that computer-based POE tasks provided a rich discussion/conversation environment for high school students at every stage of the POE strategy.

Given the foregoing advantages of the POE strategy, the related literature suggests that the POE tasks are effective tools in identifying students' misconceptions (Champagne, Klopher & Anderson, 1980), pre-conceptions (Acar-Şeşen, 2013; Kearney, 2004; Kearney & Treagust, 2001; Kearney, Treagust, Shelley & Zadnik, 2001), and achieving conceptual change (Çalık & Cobern, 2017; Tao & Gunstone, 1999). In a parallel with the POE strategy, studies in science education deploy simulations and animations for describing, explaining, and predicting the scientific process/phenomenon. Further, animated movies can show scientific phenomena occurring at the sub-microscopic (i.e., molecules and atoms) or macroscopic level (e.g., acid-base indicator colors) (Barak, Ashkar & Dori, 2011; Nahleh & Krajcik, 1994). The use of animated movies in science classes has positive effects on 4th and 5th grade students' learning motivation, conceptual understanding and thinking skills of "motion and forces, the life on earth, environmental issues" topics (Barak, Ashkar & Dori, 2011). Hence, given the advantages of the POE tasks and animated movies, the present study intended to combine them within an enriched learning environment (as a POE-based animated movies) increasing students' conceptual understanding.

Because conceptual understanding plays an important role in achieving further learning and evolving students' interests/attitudes towards science/chemistry (i.e., Çalık, Ayas & Coll, 2009; Er Nas, Calik & Cepni, 2012; Kiryak & Çalik, 2018), much more studies have concentrated on students' conceptual understanding and difficulties of various chemistry topics (e.g., gases, electrochemistry, acids and bases). Earlier studies of fundamental acid-base models have shown that students have several

difficulties in understanding the acid-base chemistry and related models. For instance; Cartrette and Mayo (2011) reported that students tended to exploit the Bronsted-Lowry model in defining acids and bases, while they were unable to correctly use the Lewis model. Similarly, Tümay (2016) addressed that students predominantly employed the Arrhenius model to describe acids and bases. Further, Artdej, Ratanaroutai, Coll and Thongpanchang (2011) indicated that students had difficulties in differentiating the Arrhenius and Bronsted-Lowry models from each other. Carr (1984) pointed out that the Arrhenius and Bronsted-Lowry models were not clearly distinguished in university and high school textbooks. Therefore, Carr (1984) stated that students tended to interchangeably exploit these models. Hawkes (1992) reported that students found the Arrhenius model problematic. He suggests that the Bronsted-Lowry model, which is more basic than the Arrhenius model, should firstly be taught. Hawkes (1992) claimed that the Bronsted-Lowry model describing the proton transfer might not lead to any misunderstanding. Similarly, if acids and bases are associated with HAn (An= Cl^-, NO_3^- etc.) and MOH (M= Na^+, K^+ etc.) respectively, students may have no problems in comprehending the definitions provided by the Bronsted-Lowry model (Zoller, 1990).

In contrast, many students have difficulties in understanding the Lewis model because of such concepts as acidity, basicity, electrophilicity, and nucleophilicity. Shapperd (1997) pointed out that, even after completing general acid-base courses, high school students were unable to distinguish the acid-base models from each other. Drechsler and Schmidt (2005a) reported that students addressed the acid-base reactions at the macroscopic level, but they could not explicate them correctly at the sub-microscopic level. Further, even though students agreed that chemistry dealt with these models/levels, they did not realize why they needed several models/levels to explain the acid-base reactions (Drechsler and Schmidt, 2005). Similarly, Justi and Gilbert (2002) and Drechsler and Schmidt (2005b) implied that teachers did not effectively use different acid-base models in their classes. Also, Drechsler and Schmidt (2005b), who analyzed chemistry textbooks, found that neither the textbooks nor the teachers clarified the existence of different acid-base models. Kousathana et al. (2005) depicted that even though most of the students identified the Bronsted-Lowry model, they were unable to provide the correct explanations. Moreover, they pointed out that students were more familiar with the Arrhenius model. Tarhan and Acar Sesen (2008, 2012) found that students had deficiencies in explaining electron transfer of the Lewis model, basicity of any substance (without OH^- ions), and differences between H^+ ions and protons. Furthermore, they implied that students preferred the Bronsted-Lowry model to define acids and bases. In summary, the foregoing studies have indicated students' difficulties and alternative conceptions of the acid-base models.

Purpose of the Study

The main purpose of this study was to enhance grade 11 students' conceptual understanding of the fundamental acid-base models using animated movies embedded within a Predict-Observe-Explain (POE) strategy. For this purpose, the following research questions guided the present study:

1) What are grade 11 students' understanding levels of the fundamental acid-base models before and after the teaching intervention?

2) How do grade 11 students' understanding levels change after the teaching intervention?

METHODOLOGY

This study used the embedded design of mixed method combining qualitative data collection and analysis with a traditional quantitative research design (Creswell & Plano Clark, 2011). The embedded design suggests to collect and analyze the data before, during, and/or after the implementation (Creswell

& Plano Clark, 2011). For the current study, the authors set up a pre-experimental research design to examine the effect of the POE-AM tasks on grade 11 students' conceptual understanding, and deployed qualitative data collection instruments before (i.e., pre-interviews), during (i.e., students' responses to the POE tasks) and after (e.g., post-interviews) the teaching intervention.

Participants of the Study

The participants of this study were twelve grade 11 students (10 females and 2 males; aged 16-17 years) purposefully selected from one class. They represented *below average, average and above average* levels of achievement, which were determined via chemistry teacher's comments and their grades in previous chemistry courses. Because a typical purposeful sampling procedure (Merriam, 2009; Patton, 2002) refers to a person or makes unfamiliar situation "typical" (Merriam, 2009), the authors selected this type of sampling to reflect the average person, situation, or instance of the phenomenon under investigation. All participants voluntarily took part in the study. They were enrolled to an Anatolian high school on the northeast coast of Turkey and followed science track of the high school. They were very similar to each other (i.e., socio-economic status, income levels).

The Context of the Study

The Head Council of Education and Morality centrally prescribes all curricula in Turkey. Science at the primary school level involves three hours weekly in Grades 3 and 4, taught by primary school teachers. Science courses at the lower secondary education are taught by subject specialist teachers. Science is awarded four hours weekly in Grades 5 to 8 for the mandatory curricular components. Grade 9 science education includes three separate courses (biology, chemistry and physics) that are instructed by subject-specialist teachers. After Grade 9 in the upper secondary education, students study packages of subjects depending on their track (science-intensive, social science-intensive, or a more general programme incorporating both). The students in the science-intensive track mainly attend such courses as Mathematics, Geometry, Physics, Chemistry and Biology. Teaching hours for science courses (Chemistry, Biology and Physics) range from two hours to four hours per week given the type of school.

Students firstly encounter acids and bases in grade 8 (aged 13-14 years) in Science course (Ministry of Education-MONE, 2013a). Grade 9 students are introduced to basic ideas about acids and bases in the "acids, bases and salts" unit. All acid-base definitions in grade 9 deal with the Arrhenius model without explicitly mentioning its name (MONE, 2013b) Grade 11 students are deeply taught advanced acid-base concepts in units "chemical calculations and rate of reaction". Also, the Arrhenius, Bronsted-Lowry and Lewis models are explicitly instructed in grade 11 (MONE, 2013b).

Data Collection

Students' written responses to the POE-based Animated Movies (POE-AM) tasks and interviews were used to collect data. Their written responses to the POE-AM tasks were gathered during the teaching intervention. Moreover, the authors prepared the interview questions by taking related literature and three chemistry educators' views into consideration. Also, the interview questions were pilot-tested with twelve grade 12 students, who had attended the fundamental acid-base models at grade 11. Hence, the pilot-study ensured the validity and reliability of the interview questions. Further, the interviews were carried out before and after the teaching intervention. Each individual interview session lasted about 10-15 minutes. Later, all interviews were audio-taped and transcribed. Pre-interviews aimed to investigate the students' pre-conceptions of the acid-base models before the teaching intervention. In a similar vein, post-interviews purposed to explore at which degree the students used the acid-base models after the teaching intervention. For this purpose, pre-interviews asked the following questions; "What do you think about the main part of an acid?" and "What do you think about the main part of a base?" Post-interviews required the students to respond the subsequent questions; "In your opinion, which of the acid-base models provides the best explanation to address features / behaviors of acids and bases?" and "In your opinion, which of the acid-base models has the least adequate explanation to imply

features/behaviors of acids and bases?" Because using assessments of content directly aligned with the enacted curriculum may result in higher post-test scores or better explanations (Abraham, Grzybowski, Renner & Marek, 1992; Çalık et al. 2014), the current study preferred exploiting the underlying acid-base questions in pre- and post-interviews without directly aligning with the curriculum.

Procedure

Within the embedded design of mixed method, the POE-AM tasks on acid-base models were used as a part of the regular chemistry curriculum. The students were interviewed prior to the instruction, and then studied on the POE-AM tasks during regular classroom hours. Each POE-AM task took two class-hours (2*45 minutes). At the end of the teaching intervention, the students were exposed to post-interviews. Thus, the students' responses to the POE-AM tasks (see questions in Table 1) were handled to evaluate their conceptual growth and/or understanding.

Three POE-AM tasks were underpinned with three fundamental acid-base models suggested by grade 11 chemistry curriculum. In the development of the POE-AM tasks, the narratives were initially prepared, and then embedded into the POE strategy. A voiceover was created for the animated movies.

All POE-AM task firstly required the students to watch the general part of the story of each acid-base model, then to predict what would happen in the next section of the animated movies, and finally to write their predictions and reasons. As soon as they completed their responses to the 'predict' stage, they continued to watch the animated movies and wrote down their observations. In the 'explain' stage, they were asked to put down whether there was any discrepancy between their predictions and observations. At the beginning of each task, student worksheets were handed out. At the end of each task, they were collected to give feedbacks and analyze their written responses. The students individually worked with the animated movies and observed the Arrheniuss, Bronsted-Lowry and Lewis acid-base models respectively (see Table 1).

In the first task (Arhenius acid-base model), the students watched the story of such substances as NaOH, $Ba(OH)_2$, SO_2, CO_2, CH_3COOH, HCl, NH_3. Then, the questions "In your opinion, which of the foregoing substances are the Arrhenius acids or bases?" and "Do you think if there is any reaction between the acid and base?" were asked to them. Later, they wrote their predictions and reasons to the student worksheets. Afterwards, they observed the rest of the story including the acid-base definitions, similar characteristics of the acids and bases (donating H^+ ions and OH^- ions when dissolving in water), the limits of the Arrhenius model, and the chemical equation on the dissolution of an acid or base into water. Later, they put their observations down on the student worksheets. Finally, they were asked to depict any consistency or inconsistency between their predictions and observations and explain their reasons. The same teaching procedure was also followed for the Bronsted-Lowry and Lewis models respectively (see Table 1).

Table 1
An outline of the POE-AM tasks in the current study

POE-AM Tasks	PREDICT	OBSERVE	EXPLAIN
The Arrhenius model (Task 1)	Requested the students to watch a story related to behaviors of such substances as NaOH, $Ba(OH)_2$, SO_2, CO_2, CH_3COOH, HCl, NH_3. Then, they were asked to respond the following questions: "In your opinion, which of the foregoing substances are the Arrhenius acids or bases? Do you think if there is any reaction between the acid and base? Please write your prediction and explain your reason(s)".	Required them to watch the next section of the animated movies to observe the acid-base definitions; similar characteristics of acids and bases (donating H^+ ions and OH^- ions when dissolving in water); the limits of the Arrhenius model; and the chemical equation on the dissolution of an acid or base into water. Later, they put their observations down on the worksheet.	Asked to respond the following questions: Is there any discrepancy between your prediction and observation? Please state your reason(s).

The Bronsted-Lowry model (Task 2)	Called them to watch the animated movies on how Lowry and Bronsted found the acidity and alkalinity definitions of certain substances. Then, they were required to state their predictions and reasons via the following question: After Bronsted-Lowry's research on substances (i.e., CH_3COOH, CH_3COO^-, HCl, NaOH), do you think some substances will donate their protons to other substances or the others will accept the donated protons? Please write your prediction and explain your reason(s).	Required them to watch the next section of the animated movies to observe pairs of conjugate acid and base; acid-base definitions. Later, they wrote their observations down on the worksheet.
The Lewis model (Task 3)	Asked them to watch the animated movies on how Lewis determined the acidity or alkalinity of two substances (BF_3 and NH_3). Later, they were requested to state their predictions and reasons via the following question: After Lewis' research on substances (i.e., BF_3 and NH_3), do you think a base donates a pair of electrons to an acid? Do you think there is any reaction between the acid and base? Please write your prediction and explain your reason(s).	Required them to watch the next section of the animated movies to observe coordinate covalent bonding; accepting or donating a pair of nonbonding electrons; and acid-base definitions. Later, they put their observation down on the worksheet.

Data Analysis

The related literature generally employs five criteria (*sound understanding, partial understanding, partial understanding with specific alternative conception(s), alternative understanding and no understanding*) to classify students' responses to open-ended questions or track their conceptual understanding/growth (Abraham et al. 1992; Çalık & Cobern, 2017; Çalık et al. 2014; Kala, Yaman & Ayas, 2013). Two of the authors firstly looked over the students' responses to the POE tasks to decide whether these five criteria run well for data analysis procedure. Then, the authors came up with an agreement point excluding *'partial understanding with specific alternative conception'* from the criteria since the preliminary review of the data indicated that none of the students' responses to the questions fell into this criterion. Finally, the students' responses to the POE tasks were analyzed through the subsequent four criteria: *sound understanding* (that includes all components of the validated response), *partial understanding* (that includes at least one component of the validated responses), *alternative understanding* (that includes responses, different from scientifically accepted ones) and *no understanding* (that includes unclear responses or unrelated explanation or left blank) (see Table 2 for a sample categorizing procedure) (Abraham et al. 1992; Çalık & Cobern, 2017; Er Nas & Çalık, 2018; Kala et al. 2013). Furthermore, even though the criteria are well-known and widely used in science/chemistry education, someone may think about how to classify an unambiguously and completely wrong answer not corresponding to the scientific one. The related literature suggests 'No understanding' category if it is completely unrelated to the context of the question. However, if it is somewhat relevant with the context of the question, this response may be categorized under 'alternative understanding' category. Hence, it was intended to determine their understanding of each POE stage as well as any difference between their responses to each POE stage (from the 'predict' to the 'explain' stages). Their responses to pre- and post- interviews were firstly transcribed, and then exposed to content analysis. Hence, codes and themes appeared given their similarities and differences (Miles & Huberman, 1994).

A group of five chemistry educators, who were familiar with the aforementioned criteria and POE strategy, ensured content validity of the POE-AM tasks and appropriateness of the data analysis procedure. The authors separately classified the students' responses to the POE tasks and interview protocols. Any disagreement was resolved through negotiation. Table 2 illustrates a sample categorizing

procedure of the Arrhenius model (Task 1) for different students. For example; S1 means the first student of the sample.

Table 2
A sample categorizing procedure of the Arrhenius model (Task 1)

Level of understanding	Predict	Reason for "Predict"	Observe	Explain
Sound understanding	-	-	HCl, which is a strong acid, completely dissolves into water by releasing a H^+ ion. CH_3COOH, which is a weak electrolyte, partially dissociates into water by releasing H^+ ions. Therefore, they are viewed as the Arrhenius acids. SO_2 and CO_2 are excluded since they do not release any H^+ ion. NaOH and $Ba(OH)_2$ are seen as the Arrhenius bases since they include OH^- ions. Arrhenius cannot explain properly why NH_3 is a base. It has limitations in explaining the acidity or alkalinity of certain substances. A neutralization reaction involves the combination of hydrogen and hydroxide ions to form water (S6).	I predicted that every substance was an Arrhenius acid or base. However, I have just noticed that they were not. The substances dissolving into water to produce H^+ and OH^- ions are considered as the Arrhenius acids or bases. Some acids and bases are strong or weak electrolytes. A neutralization reaction between an acid and a base occurs while donating H^+ and OH^- ions to form water. The Arrhenius definition of the acid-base has some limitations I had not predicted (S10).
Partial Understanding	NaOH, $Ba(OH)_2$, SO_2 and CO_2 are considered as the Arrhenius acids and bases. CH_3COOH and NH_3 are not considered (S2).	Acids and bases react with each other because H^+ and OH^- ions combine to form water. Acids donate H^+ ions into water, and bases do OH^- ions into water: $H^+ + OH^- \rightarrow H_2O$ (S12)	NH_3 is not considered as an Arrhenius base because it has no OH^- ion. SO_2 and CO_2 are not considered as Arrhenius acids since they do not have any H^+ ion. The Arrhenius definition of the acid-base has some limitations in responding the question "Why is NH_3 a base?" (S5)	I thought that neither SO_2 nor CO_2 had been an acidic substance; but now I have perceived that they are acidic substances. The Arrhenius model has some pitfalls in adequately explaining some of the acid-base behaviors, e.g., NH_3. I viewed NH_3 as an Arrhenius base in that I had known NH_3 was a base; however, my view of the Arrhenius base was incorrect (S3).
Alternative Understanding	-	Since it (CH_3COOH) is a weak acid, it cannot give its H^+ ion. Similarly, it (NH_3) is a weak base and cannot give its OH^- ion (S4).	-	-
No Understanding	-	I do not know (S1).	-	-

RESULTS AND DISCUSSION

The Results from the Students' Pre- and Post-Interviews

This section presents the results from the students' pre- and post-interviews given the first research question of the study. As seen from Table 3, their responses to pre-interviews appeared four codes (H+ ions, OH^- ions, Water and No answer) under 'The main part of an acid or a base' theme. Also, the majority of their responses to pre-interviews viewed the main parts of an acid and a base as H^+ and OH^- ions, respectively.

Table 3
Themes and codes for the students' responses to pre-interviews

Themes	Codes	f	Sample Responses
The main part of an acid or base	H+ ions	10	Let me think. When we investigate chemically, it dissolves and releases H^+ ion… (S6)
	OH^- ions	10	OH^-. Because it gives OH^- ion, when it dissolves (S7).
	Water	1	Water. When I put an acid into the water, it becomes solution with an acid or a base. Namely, I say water (S2).
	No answer	1	I do not know (S3).

f: Frequency

As can be seen from Table 4, after the teaching intervention, most of them depicted the Lewis model as the best acid-base model to address features/behaviors of acids and bases while they viewed the Arrhenius model as the least adequate explanation to imply their features/behaviors. Also, for the least adequate acid-base model, two students stated the Bronsted-Lowry model, and one student implied the Lewis model. Because a student did not remember any model, she was silent for this question.

Table 4
Themes and codes for the students' responses to post-interviews

Themes	Codes	f	Sample Responses
The best acid-base model to address features/behaviors of acids and bases	The Arrhenius model	1	The Arrhenius model is the best theory for me to define the behaviors of acidic and alkali substances because it is the one I remembered (S2).
	The Bronsted-Lowry Model	3	The Bronsted-Lowry model. Because they rebut the acid-base definition of the Arrhenius model. The acid-base definition of the Bronsted-Lowry model is more comprehensive than the Arrhenius one (S3).
	The Lewis Model	7	In my opinion, the Lewis model is the best one for defining the behaviors of acidic and alkali substances. When I think about Arrhenius, he only defines the substances if they include hydrogen or hydroxide. Bronsted-Lowry defines the acidity or basicity of substances that cannot be defined by Arrhenius, but he still has deficiency. In the end, acids have empty orbitals; bases have extra electrons to donate. To remedy this deficiency, a base gives a pair of electrons to an acid and they form coordinate covalent bond. Therefore, the most appropriate model is the Lewis one for me (S6).
	No answer	1	I do not know (S1).
The least adequate explanation to imply features / behaviors of acids and bases	The Arrhenius model	8	The Arrhenius model. Because it has very simple rationale. It is the simplest one, but it has some deficiencies. For example; NH_3 includes H. If we think any substance including H as an acidic substance, we view NH_3 as an acidic substance, but it is a basic substance (S7).
	The Bronsted-Lowry Model	2	The Bronsted-Lowry model. Even though its acid-base definition is more comprehensive than the Arrhenius one, it has still some deficiencies in explaining some reactions occurring without proton transfer (S11).
	The Lewis Model	1	The Lewis model. Because his definition does not make sense to me when I compare it with the Arrhenius and Bronsted-Lowry ones (S5).
	No answer	1	I do not remember (S1).

f: Frequency

The Results from the Students' Responses to the POE Tasks

This section displays frequencies of the students' responses to the POE tasks in regard to understanding level. Further, sample responses for the Lewis Model (Task 3) are provided to illustrate their responses to each stage of the POE tasks.

As observed in Table 5, almost all of the students' responses to the 'predict' stage fell into 'partial understanding' category; except for the Bronsted-Lowry model (Task 2) in which two responses were categorized under the 'alternative understanding' category. Whilst the majority of their reasons for the 'predict' stage in Tasks 2-3 were labeled under the 'partial understanding' category, most of them were classified in the 'alternative understanding' category for Task 1. In the 'observe' stage, the majority of them demonstrated a sound understanding for all tasks. For the 'explain' stage, frequencies of the students' responses categorized under the 'sound understanding' category were 7 for Task 1, 5 for Task 2 and 7 for Task 3, whilst those for the 'partial understanding' category were 5, 7 and 5 respectively.

Table 5
Frequencies of the students' responses to the POE tasks in regard to understanding level

Stages of the POE	Understanding Levels	Task 1	Task 2	Task 3	Sample responses for the Lewis Model (Task 3)
Predict	Sound Understanding	-	-	-	-
	Partial Understanding	12	10	12	The bases will donate a pair of electron to the acids, which have empty orbitals. Besides, when the base donates a pair of electron, it will be at a steady state (S6).
	Alternative Understanding	-	2	-	-
	No Understanding	-	-	-	-
Reason for 'predict'	Sound Understanding	1	1	4	When the base donates its electron, the acids fill its empty outer orbital. Thus, the base will be at a steady state (S6). To me, there will be a reaction. The base will donate a pair of electron to the acid (S2).
	Partial Understanding	3	10	8	
	Alternative Understanding	7	1	-	-
	No Understanding	1	-	-	-
Observe	Sound Understanding	8	7	9	The Lewis model also defines any acid or base suggested by the Bronsted-Lowry and Arrhenius models. In the acid-base definition of the Lewis model, the bases donate a pair of electron to the acids; then the acid and base yield a coordinate covalent bond sharing this electron pair (S2). While an acid is an electron pair acceptor, a base is an electron-pair donor. A reaction between an acid and a base of the Lewis model results in a covalent bond (S6).
	Partial Understanding	4	5	3	
	Alternative Understanding	-	-	-	-
	No Understanding	-	-	-	-
Explain	Sound Understanding	7	5	7	In my prediction, I stated that the base would donate a pair of electron. It happened like this. According to the acid-base definition of the Lewis model, a substance donating a pair of electron is a base. If it accepts a pair of electron, it is an acid. After a reaction between an acid and a base of the Lewis model, a coordinate covalent bond emerges (S2). The bases donate a pair of electron; the acids accept the electron donated. Therefore, the bases become at a steady state with minimum energy (S6).
	Partial Understanding	5	7	5	
	Alternative Understanding	-	-	-	-
	No Understanding	-	-	-	-

Task 1: The Arrhenius model; Task 2: The Bronsted-Lowry model; Task 3: The Lewis model

As seen in Table 6, the sample student's responses to Task 1 (the Arrhenius model) were labeled under 'partial understanding' through the POE stages. The eleventh student (S11) tended to confirm his prediction through the POE strategy.

Table 6
The eleventh student's (S11) responses as a sample quotation through the POE strategy for Task 1

Stages of the POE	The student's responses
Predict	NaOH, $Ba(OH)_2$, HCl, CH_3COOH are considered as Arrhenius acids and bases.
Reason for 'predict'	Because these are acids and bases that include H^+ and OH^- ions.
Observe	NaOH and $Ba(OH)_2$ include OH^- ions; hence, they are seen as the Arrhenius bases. HCl and CH_3COOH are viewed as the Arrhenius acids since they include H^+ ions.
Explain	There was no difference between my prediction and observation. I predicted that NaOH, $Ba(OH)_2$, HCl, CH_3COOH were considered as the Arrhenius acids and bases since they included H^+ and OH^- ions. I observed what I predicted.

As seen in Table 7, the sample student's responses to Task 2 (the Bronsted-Lowry model) included alternative understanding for the 'predict and its reason' stages and sound understanding for the 'observe and explain' stages. In this example, the student tended to see negative charged ions as the Bronsted-Lowry bases. That is, she viewed the negative charges as indicators of the Bronsted-Lowry acids-bases. Further, the student's response in the 'predict' stage did not refer to the proton transfer and the concept of the conjugate acid-base. After the 'observe' stage, she realized that the Bronsted-Lowry model extended the acid-base definition depicted by the Arrhenius model and explained the acidity or alkalinity of the substances that Arrhenius model was unable to depict. In the 'explain', she clearly addressed the Bronsted-Lowry model explaining the acidity or alkalinity of any substance through proton transfer.

Table 7
The eighth student's (S8) responses as a sample quotation through the POE strategy for Task 2

Stages of the POE	The student's responses
Predict	NaOH and NH_3 will be considered as the Bronsted-Lowry bases; CH_3COO^-; CH_3COOH, HCl, SO_2 and CO_2 will not be viewed as the Bronsted-Lowry acids or bases. Moreover, I think the acids will donate their protons to the bases accepting them.
Reason for 'predict'	NaOH will be considered as the Bronsted-Lowry base because OH has a charge of 1-; NH_3 will be seen as the Bronsted-Lowry base because nitrogen has a charge of 3-. CH_3COO^- will not be viewed as the Bronsted-Lowry acid or base in that it has already a negative charge. I think the acids will donate their protons to the bases, which accept the donated protons.
Observe	Acids give its protons to bases in the following issues: *acids donate their protons to bases and then become their conjugate bases. *conjugate bases only accept the conjugate acids' protons. * since the Arrhenius model does not explain such as alkalinity of NH_3, the Bronsted-Lowry model can explain the acidity or alkalinity of all substances, which the Arrhenius model is unable to articulate.
Explain	In my prediction, I did not realize that the Bronsted-Lowry bases could only accept their conjugate acids' protons and the same issue was valid for their conjugate bases and acids. Moreover, I did not realize that the Bronsted-Lowry model could explain the acidity or alkalinity of the substances that the Arrhenius model failed to explain. In my reasons of the 'predict' stage, I tried to explain the acidity or alkalinity of the substances based on their electrical charges. However, I have just learned that the Bronsted-Lowry model explains the acidity or alkalinity of any substance through proton transfer.

As observed in Table 8, the student responses to the 'predict and its reason' stages fell into 'partial understanding' level. Also, his responses to the 'observe and explain' stages were classified under 'sound understanding' level. This proves that the 'observe and explain' stages of the POE-AM improved his responses from partial understanding to sound understanding.

Table 8
The twelfth student's (S12) responses as a sample student response matching the POE strategy with the POE-AM (Task 3)

Stages of the POE	The POE-AM (Task 3)	The student's responses
Predict	Asked them to watch the animated movies on how Lewis determined the acidity or alkalinity of two substances (BF_3 and NH_3). Later, they were requested to state their predictions and reasons via the following question: Do you think a base donates a pair of electrons to an acid? Do you think there is any reaction between the acid and base?	I think the bases will donate some pairs of electrons to the acids.
Reason for 'predict'		Because the bases donate some pairs of electrons to the acids, the acids will fill its empty outer orbitals.
Observe	Required them to watch the next section of the animated movies to observe coordinate covalent bonding; accepting or donating a pair of nonbonding electron pairs; and acid-base definitions. Later, they put their observation down on the student worksheet.	*The Lewis model suggests another acid-base definition, which is different from those of the Bronsted-Lowry and Arrhenius models. *In the acid-base definition of the Lewis model, bases donate a pair of nonbonding electrons to acids; hence, they share a pair of electrons to form a coordinate covalent bond.
Explain	Asked to respond the following questions: Is there any discrepancy between your prediction and observation? Please state your reason(s).	In my prediction, I forgot to clearly handle the electron-pair donor (the Lewis base) and electron pair acceptor (the Lewis acid) while sharing pairs of electrons.

CONCLUSIONS

The main purpose of this study was to facilitate grade 11 students' conceptual understanding of the acid-base models using POE-AM tasks. The results showed that the majority of the students thought the main parts of an acid and a base as H^+ or OH^- ions respectively before the teaching intervention. This may result from grade 8 science curriculum only referring to the Arrhenius model (Sheppard, 2006). As a matter of the fact, after the teaching intervention, the majority of them viewed the Arrhenius model as the least adequate explanation to imply the features/behaviors of the acids and bases. Given a comparison of three acid-base models, they tended to find the Arrhenius model primitive. Because they were firstly confronted with the Arrhenius model in grade 8 science curriculum, they seem to have been more familiar with the Arrhenius model (Kousathana, Demerouti & Tsaparlis, 2005). Further, this knowledge claim is consistent with Tümay's (2006) finding stating that even pre-service chemistry teachers were more familiar with the Arrhenius model as compared with the Bronsted-Lowry and Lewis models. Indeed, despite this familiarity, the students under investigation still possessed difficulties in identifying the substances as acids and bases in the 'predict' stage of the POE strategy (see Table 5). This may stem from a limited number of the acid-base samples used in grade 8. To overcome their deficiencies of the acid-base models, Hawkes (1992) suggests that the Bronsted-Lowry model, which defines the acids and bases throughout proton transfer, should be firstly taught. He also claims that the Bronsted-Lowry model, which is more student-friendly than the Arrhenius model, does not result in any misunderstanding of the acids and bases. Similarly, Paik (2015) offers that a non-sequential learning, which gives an oppurtunity for students to compare the fundamental acid-base models with one another,

will be more useful for teaching the acid-base chemistry. In contrast, Artdej, Ratanaroutai, Coll and Thongpanchang (2011) suggest to chronologically instruct the acid-base models and integrate this chronological order into the textbooks. Teaching the acid-base models with or without the chronological order has still been challenging to the current literature. However, the present study found that the students' views of the historical order of the acid-base models resulted in putting forward the Lewis model. That is, the current study, which historically argued the needs of three acid-base models, might lead the students to view the Lewis model as the best one. In a similar vein, the students might pay more attention to the historical order of three acid-base models. This seems to have triggered their understanding of the acid-base models. In fact, an improvement in their conceptions/views of the acid-base models seems to have refuted Hawkes' (1992) point of view. Even though Zoller (1990) and Tarhan and Acar Sesen (2008, 2012) reported that many students had difficulties in understanding the Lewis model involving such complex concepts as acidity and basicity, Task 3 in the current teaching intervention helped them scientifically comprehend acidity, basicity, and electron pair-transfer from a base to an acid.

Given the students' deficiencies of the acid-base models (Artdej et al., 2011; Carr, 1984; Cartrette & Mayo, 2011; Cooper, Kouyoumdjian & Underwood, 2016; Dreshler & Schmith, 2005a, b; Dreschler & Van Driel, 2008; Tarhan & Sesen, 2012; Zoller, 1990), the POE-AM positively improved their conceptual understanding from the 'predict' stage to the 'explain' one and remedied any deficiency identified in pre-interviews and/or the 'predict' stage of the POE strategy. However, minority of the students only attempted to clarify their predictions throughout the POE tasks. That is, they tended to observe what they wanted to see (Liew, 1995; White & Gunstone, 1992). This may come from poor observational skills (Liew, 1995). An increase in scientific responses from Task 1 to Task 3 means that the POE-AM enabled them to learn how to implement the POE strategy. This may be interpreted as an improvement in observational and inferential skills. Furthermore, any cognitive conflict from the 'predict' stage to the 'explain' one of the POE strategy seems to have given an opportunity for them to rebuild their understanding. Such a procedure may increase learning possibility and capacity via the POE tasks (Kearney, 2004; Kearney & Treagust, 2001; Kearney et al, 2001; Liew & Treagust, 1998). Phrased differently, because the POE-AM combined visual-pictorial (e.g., student worksheets and animated movie characters) and auditory-verbal (i.e., characters' voices) channels (Mayer, 2002), they seem to have promoted their conceptual understanding of the acid-base models.

Given frequencies of the student responses categorized under the 'sound understanding' category in the 'observe' and 'explain' stages of the POE strategy, the students were good at depicting their observations rather than their explanations. This means that the students seem to have paid more attention to their observations posed by animated movie and/or student worksheets and/or inquiry-based learning (Çalık, Kolomuç & Karagölge, 2010; Ültay & Çalık, 2016). In other words, this may stem from a lack of argumentation skills transferring observations to explanations/inferences (Bağ & Çalık, 2017; Ültay & Çalık, 2016). Inserting an explicit 'discuss' stage into the POE strategy might afford them to yield a dialogic link between the 'observe' and 'explain' stages (Çalık & Cobern, 2017; Kearney, 2004).

The current study suggests that chemistry teachers should integrate the POE-AM into their classes and/or other chemistry topics to effectively promote student learning. Further, a historical order of the acid-base models ought to be handled with their differences and discrepancies. Future study may be undertaken to test the extent to which the explicit or implicit use of the historical order of the acid-base models influences their conceptual understanding. Moreover, a balance between macroscopic and sub-microscopic levels and between theoretical (i.e., acid-base models) and practical knowledge (e.g., POE and animated videos) (named dual-situated learning) (Bağ & Çalık, 2017; Bakırcı, Çalık & Çepni, 2017; Çalık, Ayas & Coll, 2009) calls for further studies concentrating on the interlinks amongst the macroscopic, sub-microscopic and symbolic levels. To accomplish better conceptual understanding, future studies should initially probe students' pre-existing knowledge/alternative conceptions and then involve them into a teaching intervention or guide materials (Çalık, Ayas & Coll, 2009; Karslı & Çalık, 2012). Furthermore, students' difficulties of observation and explanation/inference necessities to clearly

integrate the nature of science into science/chemistry classes, which may be of interest in future studies (Bakırcı et al. 2017).

Limitations

The current study has three limitations. Since this study was conducted with a small sample size, someone may consider its applicability as the first limitation. Secondly, the present study only handled the Arrhenius, Bronsted-Lowry and Lewis models, and omitted the others. Because the POE strategy implicitly and explicitly use 'discussion' issue, the related literature contains its derivered versions (i.e., PEOE and PDEODE). Even though the current study integrated "discussion" issue into the POE-AM tasks, it preferred using its original version (i.e., POE) to its derived ones (i.e., PEOE and PDEODE). This may be seen as another limitation of the study.

Acknowledgement

This study includes a part of the first author's PhD Thesis.

REFERENCES

Abdullah, A., & Scaife, J., (1997). Using interviews to assess children's understanding of science concepts. *School Science Review*, 78, 285, 79-84.

Abraham, M. R., Grzybowski, E. B., Renner, J. W., & Marek, E. A. (1992). Understandings and misunderstandings of eighth graders of five chemistry concepts found in textbooks. *Journal of Research in Science Teaching*, 29, 105–120.

Artdej, R., Ratanaroutai, T., Coll, R. K., & Thongpanchang, T. (2011). Thai grade 11 students' alternative conceptions for acid–base chemistry. *Research in Science & Technological Education, 28*(2), 167-183.

Bağ, H. & Çalık, M. (2017). A thematic review of argumentation studies at the K-8 level. *Education and Science, 42*(190), 281-303.

Bahar, M., & Tongaç, E. (2009). The effect of teaching approaches on the pattern of pupils' cognitive structure: Some evidence from the field. *The Asia Pacific Education Researcher, 18*(1), 21-45.

Bakırcı, H., Çalık, M. & Çepni, S. (2017). The effect of the common knowledge construction model-oriented education on sixth grade pupils' views on the nature of science. *Journal of Baltic Science Education, 16*(1), 43-55.

Barak, M., Ashkar, T., & Dori, Y. J. (2011). Learning science via animated movies: Its effect on students' thinking and motivation. *Computers & Education, 56*(3), 839-846.

Çalık, M., Ayas, A. & Coll, R. K. (2007). Enhancing pre-service primary teachers' conceptual understanding of solution chemistry with conceptual change text. *International Journal of Science and Mathematics Education, 5*(1),1–28.

Çalık, M., Ayas, A. & Coll, R.K. (2009). Investigating the effectiveness of an analogy activity in improving students' conceptual change for solution chemistry concepts. *International Journal of Science and Mathematics Education, 7*(4), 651-676.

Çalık, M., Kolomuç, A. & Karagölge, Z. (2010). The effect of conceptual change pedagogy on students' conceptions of rate of reaction. *Journal of Science Education and Technology*, 19, 422–433.

Çalık, M., & Cobern, W. W. (2017). A cross-cultural study of CKCM efficacy in an undergraduate chemistry classroom. *Chemistry Education Research and Practice*, 18, 691-730.

Çalik, M., Ebenezer, J., Özsevgeç, T., Küçük, Z. & Artun, H. (2015). Improving science student teachers' self-perceptions of fluency with innovative technologies and scientific inquiry abilities. *Journal of Science Education and Technology, 24*(4), 448-460.

Çalik, M., Özsevgeç, T., Ebenezer, J., Artun, H. & Küçük, Z. (2014). Effects of 'environmental chemistry' elective course via technology embedded scientific inquiry model on some variables. *Journal of Science Education and Technology, 23*(3), 412-430.

Carr, M. (1984). Model confusion in chemistry. *Research in Science Education*, 14, 97–103.

Cartrette, D. P. & Mayo, P.M (2011). Students' understanding of acids/bases in organic chemistry contexts. *Chemistry Education Research and Practice, 12*(1), 29–39.
Cooper, M., Kouyoumdjian, H. & Underwood, S. U. (2016). Investigating students' reasoning about acid-base reactions. *Journal of Chemical Education*, 93, 1703-1713.
Coştu, B., Ayas, A., & Niaz, M. (2012). Investigating the effectiveness of a POE-based teaching activity on students' understanding of condensation. *Instructional Science*, 40,47-67.
Creswell, J. W., & Plano Clark, V. L. (2011). Designing and conducting mixed methods research. Thousand Oaks, CA: Sage Publications, Inc.
Drechsler, M., & Schmidt, H.-J. (2005a). Upper secondary school students' understanding of models used in chemistry to define acids and bases. *Science Education International*, 16, 39–54.
Drechsler, M., & Schmidt, H.-J. (2005b). Textbooks' and teachers' understanding of acid–base models used in chemistry teaching. *Chemistry Education: Research and Practice*, 6, 19–35.
Drechsler, M., & Van Driel, J. (2008). Experienced teachers' pedagogical content knowledge of teaching acid-base chemistry. *Research in Science Education, 38*(5), 611–631.
Er Nas, S., Calik, M. & Cepni, S. (2012). Effect of different conceptual change pedagogies embedded within 5E model on grade 6 students' alternative conceptions of 'heat transfer.' *Energy, Education, Science and Technology Part B Social and Educational Studies, 4*(1), 177-186.
Er Nas, S., & Çalık, M. (2018). A cross-age study of science student teachers' conceptual understanding of soil erosion. *Problems of Education in the 21st century, 76*(5), 601-619.
Hawkes, S.J. (1992). Arrhenius confuses students. *Journal of Chemical Education*, 69, 542-543.
Justi R.S, & Gilbert, J.K. (2002). Modelling, teachers' view on the nature of modeling, and implications for the education of modelers, *International Journal of Science Education, 24*(4), 369-387.
Kala, N., Yaman, F. & Ayas, A. (2013). The effectiveness of predict–observe–explain technique in probing students' understanding about acid-base chemistry: A case for the concepts of pH, pOH and strenght. *International Journal of Science and Mathematics Education,11*(3), 555-574.
Karslı, F. & Çalık, M. (2012). Can freshman science student teachers' alternative conceptions of 'electrochemical cells' be fully diminished? *Asian Journal of Chemistry, 24*(2), 485- 491.
Kearney, M. (2004). Classroom use of multimedia-supported predict–observe–explain tasks in a social constructivist learning environment. *Research in Science Education*, 34, 427–453.
Kearney, M., & Treagust, D.F. (2001). Constructivism as a referent in the design and development of a computer program which uses interactive digital video to enhance learning in physics. *Australian Journal of Educational Technology, 17*(1), 64–79.
Kearney, M., Treagust, D., Shelley Y., & Zadnik M. (2001). Student and teacher perception of the use of multimedia supported predict- observe- explain task to probe understanding. *Research in Science Teaching*, 31, 539- 615.
Kiryak, Z. & Çalik, M. (2018). Improving grade 7 students' conceptual understanding of water pollution via common knowledge construction model. *International Journal of Science and Mathematics Education, 16*(6), 1025-1046.
Kousathana M., Demerouti M., & Tsaparlis G. (2005). Instructional misconceptions in acid base equilibria: An analysis from a history and philosophy of science perspective. *Science and Education*, 14, 173-193.
Liew, C. W. (1995). A predict-observe-explain teaching sequence for learning about students' understanding of heat. *Australian Science Teachers Journal, 41*(1), 68- 72.
Liew, C. W., & Treagust, D F. (1998). The effectiveness of predict-observe-explain tasks in diagnosing students' understanding of science and in identifying their levels of achievement. Paper presented at the *Annual Meeting of the American Educational Research Association*, April 13-17, San Diago.
Mayer, R. E. (2002). Cognitive theory and the design of multimedia instruction: An example of the two-way street between cognition and instruction. In D. F. Halpern, & M. D. Hakel (Eds.), *Applying the science of learning to university teaching and beyond* (pp. 55–72). San Francisco: Jossey-Bass.
Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation.* San Francisco: Jossey-Bass.
Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: A sourcebook of new methods* (2nd ed.). Thousand Oaks, CA: Sage.
MONE (Ministry of National Education) (2013a). *Science and technology curriculum for grades 5-8*. Ankara: MEB Publishing.
MONE (Ministry of National Education) (2013b). *Chemistry curriculum for grades 9-12*. Ankara: MEB Publishing.
Novak, J. D., & Gowin, D. B. (1984). *Learning how to learn*. New York, NY: Cambridge University Press.
Osborne R.J., & Cosgrove M.M. (1983). Children's conceptions of the changes of states of water. *Journal of Research in Science Teaching*, 20, 825-838.
Patton, M. Q. (2002). *Qualitative evaluation and research methods* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Tarhan, L., & Acar-Sesen, B. (2008). *An application of jigsaw cooperative learning for understanding "acid-base theories."* Paper presented at the *XIII. IOSTE*, İzmir, Turkey.

Tarhan, L., & Acar-Sesen, B. (2012). Jigsaw cooperative learning: Acid-base theories. *Chemistry Education Research and Practice*, *13*(3), 307-313.

Ültay, N. & Çalık, M. (2016). A comparison of different teaching designs of 'acids and bases' subject. *Eurasia Journal of Mathematics, Science & Technology Education, 12*(1), 55-86.

White, R.T., & Gunstone, R.F. (1992). Probing understanding. Hong Kong: Graphicraft ltd.

Zoller, U. (1990). Students' misunderstandings and misconceptions in college freshman chemistry (general and organic). *Journal of Research in Science Teaching*, *27*(10), 1053-1065.

TÜRKÇE GENİŞLETİLMİŞ ÖZET

Bu çalışma, 11. sınıf öğrencilerinin temel asit-baz modelleriyle ilgili kavramsal anlamalarını Tahmin-Gözlem-Açıklama temelli animasyon filmleriyle (TGA-AF) artırmayı amaçlamaktadır.

Bu çalışmada şu araştırma sorularına cevap aranmıştır:

(1) 11. sınıf öğrencilerinin uygulama öncesi ve sonrası temel asit-baz modelleriyle ilgili anlama seviyeleri nasıldır?

(2) 11. sınıf öğrencilerinin uygulama sonrasında anlama seviyeleri nasıl değişmiştir?

Bu çalışmaya alt, orta ve üst başarı seviyelerinden seçilen toplam 12 onbirinci sınıf öğrencisi katılmıştır. Veri toplamak için öğrencilerin TGA çalışma yapraklarındaki cevapları ve yarı yapılandırılmış mülakatlar kullanılmıştır. Yarı yapılandırılmış mülakatlar müdahale öncesi ve sonrası olarak uygulanırken, TGA çalışma yaprakları ise müdahale süreci içerisinde kulanılmıştır. Çalışmada karma yöntemin gömülü (embedded) deseni kullanılmıştır. Tahmin-Gözlem-Açıklama temelli animasyon filmleri (TGA-AF) mevcut öğretim programının bir parçası olarak öğretim sürecine dahil edilmiştir. Bu çalışmada, Arrhenius, Bronsted-Lowry ve Lewis asit-baz modelleriyle ilgili toplamda üç etkinlik kullanılmış olup her bir etkinlik iki ders saati içerisinde gerçekleştirilmiştir.

Çalışmada kullanılan TGA-AF'nin hazırlanmasında, öncelikle her bir asit-baz modeline yönelik hikaye oluşturulmuş ve sonrasında da TGA yönteminin içerisine yerleştirilmiştir. Öğrencilerin bireysel olarak çalışmasının planlandığı TGA- AF etkinliklerinin başında ilgili çalışma kağıtları dağıtılmıştır. Böylece, TGA-AF etkinlikleri esnasında, öğrenciler öncelikle hikayenin genel kısmını izlemiş ve sonrasında da hikayenin geri kalan kısmında ne olacağını tahmin etmişlerdir. Öğrenciler tahminlerini gerekçeleriyle birlikte açıkladıktan ve çalışma kağıdına yazdıktan sonra ise hikayenin geri kalan kısmını izlemiş ve bununla ilgili gözlem notlarını çalışma kağıtlarına yazmışlardır. Öğrencilerin tahminleri ve gözlemleri arasında herhangi bir farklılık olup olmadığı ise açıklama kısmında sorgulanmış ve tartışılmıştır. Her bir etkinlikten sonra öğrencilerin çalışma kağıtları toplanmış ve analiz edilmiştir.

Yarı yapılandırılmış mülakatların analizinde, öğrenci mülakatları transkript edilmiş ve içerik analizine tabii tutulmuştur. Böylece, açık kodlama yapılarak, benzerlik ve farklılıklara göre kategori ve temalar oluşturulmuştur. Öğrencilerin TGA-AF etkinliklerine verdikleri cevaplar ise tam anlama, kısmi anlama, alternatif anlama ve anlamama kategorilerine göre analiz edilmiştir. Tam anlama kategorisi, bilimsel olarak geçerli olan cevabın bütün bileşenlerini içerirken, kısmi anlama kategorisi bilimsel olarak geçerli olan cevabın en az bir bileşenini içermektedir. Alternatif anlama kategorisi, bilimsel olarak kabul edilenden farklı bilgileri ele alırken, anlamama kategorisi ise ilgisiz ve/veya boş bırakılan cevapları içermektedir.

TGA stratejisine ve veri analizi kategorilerine aşina olan 5 kimya eğitimcisi TGA-AF etkinliklerinin kapsam geçerliğini ve veri analiz sürecinin uygunluğunu kontrol etmiş ve doğrulamıştır. Aynı zamanda, araştırmacılar öğrencilerin TGA etkinliklerine ve mülakat protokollerine verdikleri cevapları ayrı ayrı sınıflandırılmıştır. Araştırmacılar arasındaki herhangi bir farklılık veya uyuşmazlık müzakereyle çözülmüştür.

Çalışmanın ilk araştırma sorusuna cevap bulabilmek için öğrencilerin ön ve son mülakat bulguları incelenmiştir. Bu incelemede, uygulama öncesinde öğrencilerin çoğunluğunun (10 öğrenci) bir asidin temel parçasının H^+ iyonu olduğunu ve bir bazın temel parçasının ise OH^- iyonu olduğunu düşündükleri ortaya çıkmıştır (Bakınız Tablo 3). Ayrıca, uygulama sonunda öğrencilerin çoğunluğu (7 öğrenci), temel asit-baz modelleri arasında asit-baz özelliklerini ve davranışlarını en iyi açıklayan model olarak Lewis

asit-baz modelini ifade etmiştir (Bakınız Tablo 4). Buna karşın, öğrencilerin çoğunluğu (8 öğrenci) asit-baz modelleri arasında Arrhenius asit-baz tanımını yeterliği en az olan model olarak belirtmişlerdir.

Çalışmanın ikinci araştırma sorusuna cevap bulabilmek için öğrencilerin Arrhenius, Bronsted-Lowry ve Lewis asit-baz modelleriyle ilgili TGA-AF etkinliklerine verdiği cevaplar irdelenmiştir. Bu incelemede, tahmin aşamasında öğrencilerin çoğunluğunun verdiği cevapların kısmi anlama kategorisinde olduğu ortaya çıkmıştır. Bu bağlamda, öğrencilerin tamamının (12 öğrenci) Arhenius ve Lewis asit-baz modellerinde, çoğunluğunun ise (10 öğrenci) Bronsted-Lowry asit-baz modelinde kısmi anlama kategorisinde cevaplar verdiği görülmektedir. Öğrenci tahminlerinin sebepleri incelendiğinde ise, Bronsted-Lowry ve Lewis asit-baz modelleriyle ilgili etkinliklerde öğrencilerin çoğunluğunun kısmi anlama (Bronsted-Lowry modelinde 10 ve Lewis asit-baz modelinde 8 öğrenci) kategorisinde cevaplar verirken, Arrhenius asit-baz modeliyle ilgili etkinlikde ise verdikleri cevapların alternatif anlama (Arrhenius asit-baz modeli için 7 öğrenci) kategorisinde olduğu ortaya çıkmıştır. Öğrencilerin Arrhenius, Bronsted-Lowry ve Lewis asit-baz modelleriyle ilgili etkinliklerin gözlem aşamasında verdiği cevaplardan tam anlama kategorisinde olanların frekansları sırasıyla 8, 7 ve 9 tespit edilirken, açıklama aşamasında ise tam anlama kategorisindeki cevapların frekansının aynı asit-baz modeli sırası için 7, 5 ve 7 olduğu görülmektedir (Bakınız Tablo 5).

Çalışmada ortaya çıkan sonuçlar göz önünde bulundurulduğunda, kimya öğretmenlerinin TGA-AF etkinliklerini kendi sınıflarına ya da başka kimya konularına uyarlamaları önerilmektedir. Ayrıca, asit-baz modellerinin öğretiminde tarihsel sırayla birlikte modellerin benzerlik ve farklılıklarının vurgulanmasının kavramsal öğrenmeyi kolaylaştıracağı düşünülmektedir.

TURJE
www.turje.org

Volume:8 Issue:1

https://dx.doi.org/10.19128/turje.454138

Turkish Journal of Education

Research Article

Received 16.08.2018
Accepted 13.01.2019

Resilience among Syrian university students in Turkey

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ABSTRACT The purpose of this research is to deeply examine the resilience in war victim immigrants based on risk and protective factors. The sample of the research, which is structured as a phenomenological study, a type of qualitative research, constitute of 5 women, 5 men and 10 university students. A semi-structured Immigrant University Students Resilience Interview Form, created by the researchers, was used as a data collection tool. According to the results, while the risk factors of the participants were mainly societal, the protective factors were mainly individual. Additionally, the risk factors are distrust in others, anger management, pessimism, financial difficulty, media effect, witnessing to death, interruption of education, social prejudice and unsupportive, new settlement, language problem, change of living space, death of family member, living apart to family. The protective factors are; social contribution, career goals, patience, self-confidence, desire for learning, grit, spirituality, financial situation, host society support, immıgrant support, family members support. Furthermore, it was found that the percentage of the participants who consider themselves as happy and standing individuals which is a sign of resilience was high.

Keywords: *Resilience, Immigrants, Risk factors, Protective factors*

Türkiye'deki Suriyeli üniversite öğrencilerinde yılmazlık

ÖZ Bu araştırmanın amacı savaş mağduru göçmenlerde risk ve koruyucu faktörler temelinde yılmazlık kaynaklarını derinlemesine incelemektir. Nitel araştırmaların bir türü olan "olgubilim (fenomenoloji) çalışması" olarak yapılan araştırmanın örneklemini savaştan dolayı Türkiye'ye göç etmek zorunda kalmış 5 kadın, 5 erkek 10 üniversite eğitimi gören öğrenci oluşturmuştur. Veri toplama aracı olarak araştırmacılar tarafından geliştirilen yarı yapılandırılmış Göçmen Üniversite Öğrencilerinde Yılmazlık Görüşme Formu kullanılmıştır. Araştırma sonuçlarına göre risk farktörleri daha çok sosyal kaynaklı iken, bireysel faktörler bireysel kaynaklıdır. Ayrıca beliritlen risk faktörleri şu şekildedir: Başkalarına güvensizlik, öfke kontrolü, olumsuz bakış açısı, finansal zorluklar, medya etkisi, ölüme şahit olmak, eğitimin sekteye uğraması, sosyal önyargı ve dışlanma, yeni yerleşim yeri ile ilgili sorunlar, dil problemi, yaşam alanı değişimi, aile üyelerinden birinin ölümü ve aile üyelerinden ayrı yaşamak. Koruyucu faktörler ise şu şekildedir: Sosyal destek, kariyer amaçlılığı, sabır, özgüven, öğrenmeye istekli olmak, azim, maneviyat, finansal destek, ev sahibi topum desteği, göçmen desteği ve aile üyelerinin desteği. Bunun yanında katılımcıların yılmazlığın bir göstergesi olarak, kendilerini mutlu ve ayakta kalmış/güçlü olarak nitelendirme yoğunluklarının fazla olduğu belirlenmiştir.

Anahtar Kelimeler: *Yılmazlık, Göçmenler, Risk faktörleri, Koruyucu faktörler*

Cite This Article: Demir, Ö.O. & Aliyev, R., (2019). Resilience among Syrian university students in Turkey, *Turkish Journal of Education. 8*(1), 33-51. https://dx.doi.org/10.19128/turje.454138

INTRODUCTION

Positive psychology has investigated the lives of 'normal people' instead of human figurines in the pathological structure studied up to now. Positive psychology, aiming to reveal the forces that exist within people, is seeking to make the sources of environmental support recognized by emphasizing the strengths of individuals (Seligman & Csikszentmihalyi, 2014). In this sense, there are many issues that positive psychology has emphasized. Resilience is one of these issues.

Although there is no clear unanimity in definitions and processes, there are many common points about the concept of resilience in research. Considering that, resilience can be described as having developable characteristics which make individuals remain standing, overcome difficulties and show a better development than expected despite the negative and stressful life experiences (Gürgan, 2006). Three important conditions are necessary for resilience processes. These are risk factors, protective factors and positive results. There is no definite criteria that can be used for any variable to be identified as risk factor or protective factor. Therefore, individual, familial and social variables are taken into consideration when identifying the possible risk and protective factors (Gordon & Song, 1994). Risk factors increase the likelihood of a negative situation or cause a problem to continue (Terzi, 2008). Low birthrate, domestic violence, low socio-economic level, divorce, strict or inattentive parenting, natural disasters, terrorism, cognitive difficulties, poor nutrition, poverty, homelessness and displacing the family are all considered as risk factors (Masten, 2014). Protective factors prevent the negative consequences of risk factors (Rutter, 1999), reduce the effects of risk factors and serve to meet the individual's developmental needs (Sipahioğlu, 2008). Concepts such as positive interactions within the family, social support, having self-confidence, hope, having a particular interest or hobby, mentoring, familial support and events that can be considered as milestones constitute protective factors (Masten & Reed, 2002; Öğülmüş, 2001). Risk factors and protective factors have a dynamic structure. A situation that is a risk for a person can be protective factor for someone else. Moreover, a situation which has been a risk factor for the same person can become a protective factor (Kiernan & Mensah, 2011).

Under normal circumstances, the usage of the term "refugee" seems to be descriptively appropriate for the individuals who come from Syria. However, the national and international obligations that the term brings are such that the countries, like Syria, that face the problem of migration due to extraordinary problems would not want to take responsibility. Thus, the term 'guest' is often used especially for the Syrians who came to Turkey (Gürcanlı, 2012). Accordingly, the lack of a general definition of the term "immigrant" within the international law framework creates further confusion in the literature. This confusion especially manifests itself in the academic studies in Turkey. When the studies are examined, it is seen that the definitions of 'asylum seeker', 'refugee' and 'migrant' are made for the people coming from Syria (İlbay, 2017; Keklik, 2016; Unat, 2015). In this regard, the concept which is referred as 'refugee' for individuals, who escaped from the Syrian war and took shelter in other countries, is expressed as 'immigrant' within the scope of this study.

UNHCR (United Nations High Commissioner for Refugees) and many researchers have shown that immigrants who have been forced to migrate due to war go through different experiences than the immigrants who have migrated due to other reasons. Most war victim immigrants are ten times more exposed to post-traumatic stress disorder than the people in the community because of the long-term armed conflicts, violence, loss of family members or mass death (Fazel, Wheeler, & Danesh, 2005; Wenzel, Kastrup, & Eisenman, 2007). Yakushko and Morgan (2012) classify the problems that immigrants experience as follows: difficulties in orientating into a new culture, challenges with the language, relational conflicts (domestic violence, intergenerational conflicts), economic pressures, discrimination, loss of social connections and social status. Although immigrants have many risk factors, their individual, familial and social support systems enable them to pass these risks without being affected or with a slight impact with cultural codes (Mawani, 2014; Pickren, 2014). For immigrants,

language is the most important structure in which the culture is protected. Some studies show that immigrant families encourage their children to speak their own language at home. Religious ceremonies and rituals are also protective factors of cultural protection for immigrants (Inman, Howard, Beaumont, & Walker, 2007). Besides, immigrants tend to gather in certain neighborhoods in countries where they are settled. This is important for the protection of their mental health (Mawani, 2014).

Yakushko and Morgan (2012), emphasized the lack of study regarding the immigration resilience processes and underlined the necessity of conducting qualitative studies for future research on this subject in terms of showing sensitivity towards the cultural values. The experiences of the immigrants, who have come from diverse backgrounds and have gone to different host countries are quite varied. Therefore, in-depth qualitative analyses will contribute to create a clearer picture of the process. This research has great importance since it is the first resilience study on the immigrants in Turkey. The results of the research also carry another importance since it brings a better understanding of the immigrant's lives and increase the social integration by improving the empathy in society. Based on the current literature, in order to bridge the research gap, the present study was intended to deeply examine the sources of resilience in Syrian immigrant university students based on risk and protective factors.

METHODOLOGY

Model

This research is designed as a phenomenological study, a type of qualitative research, in order to examine the resilience process of immigrants in detail. Phenomenological study aims to deeply investigate the phenomena that are not entirely unfamiliar to us, but we cannot fully understand (Fraenkel, Wallen, & Hyun, 2012; Yıldırım & Şimşek, 2013).

Sample

The research sample consists of immigrant university students, between the ages of 21-28, who migrated to Turkey because of the war in their country. The size of the sample in qualitative research is related to the data reaching the saturation point. When the obtained concepts begin to repeat themselves, it can be decided that the data has reached the saturation point (Yıldırım & Şimşek, 2013). In this context, the data reached the saturation point with 5 females and 5 male individuals who participated in the study, and these participants formed the sample.

The individuals who involved in the research have been residing in Turkey between 2.5 and 5 years since the migration. Individuals who participated in the research have been forced to migrate to Turkey from Aleppo, Baghdad, Latakia and Damascus because of the war.

Within the scope of the study, the sample was determined by the 'criterion sampling' method. Criteria sampling is a sampling method in which a unit is selected if it meets certain criteria in cases where the observation unit is composed of individuals, events or objects with specific qualities (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2016). In this context, the criteria for participating in the research are as follows: being emigrated from Syria to Turkey, to be a university student, have been living in Turkey for at least one year.

Within the scope of the research, 'interview' was used for collecting data. Interview is a method in which a number of questions are addressed to the interviewee (Christensen, Johnson, & Turner 2014). The interviews were performed by using the 'Immigrant University Students Resilience Interview Form', developed by the researchers. The interviews were conducted in February-March 2017. Detailed information related to the interview form is given below.

Data Collection Tools

Interview form of the resilience among immigrant university students: It is an interview form consisting of open ended questions to determine the processes of resilience that the individuals experience in host countries they migrated to. During the preparation of the interview form, the resilience and migration literature was reviewed, and the scale items in the area were examined and questions were prepared in a manner appropriate to the nature of the qualitative research. The questions were finalized through a pilot study and three revisions with the contributions of two field experts (Professor and Assistant Professor) and an Assessment and Evaluation specialist (Professor). The interview form providing detailed information on the risk factors, protective factors and positive results that have a role in the resilience process of immigrants consists of 10 questions. Two sample questions are as follows: "Can you tell us about the three important factors that make you strong and make you feel good in this process?", "Have you encountered an individual, familial or social obstacle that changed your life in this process? Can you explain them in detail? Can you give examples?" (Demir, 2017).

Process

The individual interviews conducted as a part of the research were performed in a room where physical conditions were appropriate. Water and napkin were available for the participants during the interviews. Interviews were paused when the participants started to cry and continued as they felt better. While the 7 of the interviews were conducted individually with the participants, there was a translator in 3 of them due to language difficulties of the participants. Translation languages were Turkish and Arabic. The errors caused by translation tried to be minimized by having the same translator in 3 interviews and providing the translator detailed information about the subject before the interview.

In qualitative research, reliability requires detailed explanations of the process by the researcher and consistency with different researchers (Gibbs, 2007). Moreover, in order to increase credibility in qualitative research, it is necessary to have the reliability of the researcher and the theoretical basis of the research (Çelik, 2014). In the scope of the research, transmitting the process and the findings clearly, receiving feedback by different experts who were following the process and evaluating the findings in the light of literature are the factors that increase the reliability. In addition, 'participant confirmation' was taken after each interview to prevent the inclusion of false or incomplete information in the research.

Validity of qualitative research is a status in which the authenticity of the documents can be proven by the researcher (Gibbs, 2007). Researcher's eluding from his prejudice, the research having descriptive validity, checking the data and coding with more than one researcher and the direct citation of the participants are the conditions which increase validity (Christensen et al., 2014). Within the scope of the research, the practices were carried out with the principle of impartiality and everything told by the participants was recorded and examined.

In the data coding stage, the opinions of two course experts in the field were taken and the concordance between the coders was observed. Besides, the words used frequently by the participants were referred in the findings section. These conditions increase the validity of the research. The meanings of the codes in the findings section are given in Table 1.

Table 1.
The meanings of the codes

Protective Factors		Risk Factors	
Social contribution	Willingness to contribute to the society they live in.	Distrust in others	The feeling of insecurity to all people due to the experienced events.
Career goals	Having goals related to future professional life.	Anger management	Inability to control anger in most situations in daily life.
Patience	Staying calm despite the negativity.	Pessimism	Having a negative attitude towards life.
Self-confidence	Feeling adequate.	Financial difficulty	Any financial difficulties experienced.
Desire for learning	Indulging in learning something new.	Media effect	Reading or seeing the news about the region in different media, even if you are away from home.
Grit	Not giving up despite negative situations.	Witnessing to death	To witness death in the process.
Spirituality	Interpreting the events without using the five senses.	Interruption of education	Interruption of education.
Financial situation	Being in a good financial situation	Social prejudice and unsupportive	To be excluded by the members of the host community.
Host society support	Support provided by the residents of the country.	New settlement	Difficulties in adapting to new rules and regulations.
Immıgrant support	Support from immigrant communities that have already settled in the country.	Language problem	Not knowing the language that the immigrated society is using.
Family members support	Financial and moral support provided by family members (even if they are physically distant).	Change of living space	Moving to new places frequently after the migration process.
		Death of family member	Losing someone in the family.
		Living apart	Family members living in different cities.

The interviews with the participants were recorded with the voice recorder with the permission of the participants. Recorded interviews were transferred to the computer without data loss. Transferred data was analyzed with content analysis by MAXQDA 12, a computer-assisted qualitative data analysis program. Content analysis reveals the hidden facts with identification of data and the gathering data together within the framework of similar themes (Yıldırım & Şimşek, 2013).

The measurement instruments used in the research and the details of the research (sample, method, etc.) have been reviewed and approved by Hasan Kalyoncu University Ethics Committee.

FINDINGS

Distribution of Risk Factors

The classification of the risks which individuals have as a result of the interviews is shown in Figure 1. According to Figure 1, participants were exposed to social risk factors more. It is followed by familial and individual risk factors.

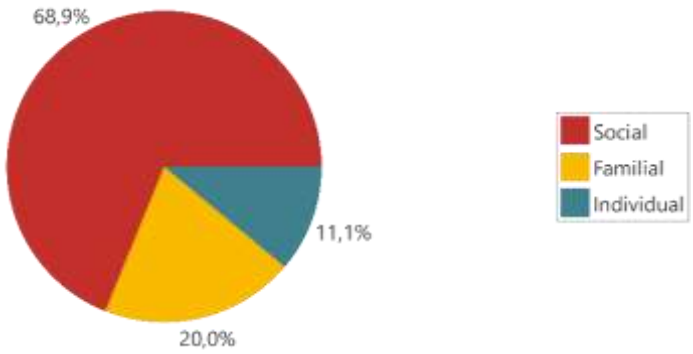

Figure 1. Distribution of Risk Factors

Resources of Risk Factors

The risk factors of the participants are shown in Figure 2 according to individual, familial and social resources, number of people and intensity of experience. Accordingly, mistrust in others, negative perspective on life and difficulty in anger control are the individual risks that participants have. When the intensity of the individual risks within itself is taken into consideration, it is seen that the negative perspective on life and anger control are more intense than the rest.

The familial risk factors that participants have are grouped under two main categories. The loss of a family member and the family members' being in different countries and cities are some of the indicated familial risk factors. When the responses are examined, being away from family members is a highly stated familial risk factor.

When the social risk factors of the participants are examined, eight main sources are named: the difficulties experienced by being moved to a new settlement, social prejudice and unsupportive society, interruption of education processes, being forced to witness any death, the negative effect of the media, the constant change of life space, the language problems and financial inadequacies. When the responses of the participants are examined, the language problems they are experiencing because of not knowing Turkish is considered as the biggest social risk factor. The second most important risk factor is social prejudice/ being unsupportive. Not being accepted to the new society and being observed with prejudice are important risk sources for these people. Another important social risk for these people, many of whom lost their financial resources because of the war, is their financial difficulties. Apart from financial difficulties, leaving their country despite studying at a university there or extended duration of transition to university after high school is a significant risk factor for these people. Moreover, constant change of settlement before and after coming to Turkey is another risk factor for the participants. Apart from these, according to the intensity level: adapting the social and cultural environment in Turkey, the news they receive through the social media about the countries they came from and witnessing a death are social risk sources for these people.

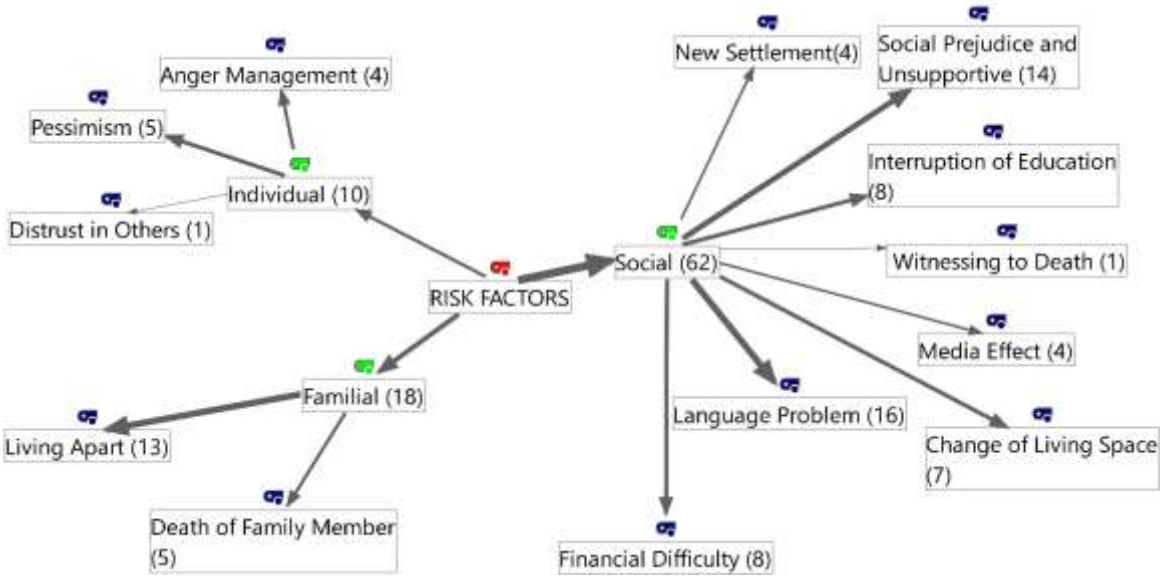

Figure 2. Code-Theory Model for Risk Factors

Distribution of Protective Factors

The classification of the protective factors of the individuals as a result of the interviews with the participants is given in Figure 3. Thus, it is seen that among the participants the primary protective factor is the individual related factor and has intensity more than half of the protective factors. Individual protective factors are followed by familial and social factors, respectively.

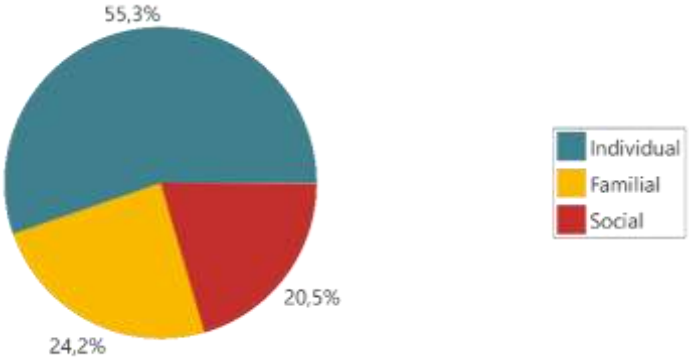

Figure 3. Distribution of Protective Factors

Resources of Protective Factors

The individual, familial and social resources of the risk factors are shown in the Code-Theory Model in Figure 4. According to this, the social protection factors of the individuals are the social support they receive from the host community, the support they receive from the immigrants like themselves and the effect of financial situation. When the social protective factors are examined according to intensity, it is seen that the support of the host community is the biggest social protective resource for the participants. Furthermore, the support they receive from the immigrants like themselves are also being observed. Although it is only one response, the case of having a good financial situation is also a protective social resource for the participants.

The emphasis made by the participants for the support of one or more of the family members is presented as intensity in Figure 4. The support of family members is a very important familial protection factor for these people.

The individual protective factors as a result of the interviews with the participants are as follows: determination, desire for learning, self-confidence, spirituality, career goals, patience, desire for social contribution and hope. When the intensity of the responses is investigated, it is seen that the most important individual protective factor for the participants is spirituality. The religious/spiritual beliefs of these individuals are an effective protective factor for resilience. Secondly, the hope of the participants related to life seems to be an important protective factor. Another important individual protective factor is that these people have career goals. Professional and educational goals are important protective factors for these people in becoming resilient individuals. Following the career goals, another important factor is determination. The things people do for the purpose of their goal have been an effective source of their resilience. The desire to constantly learn new things, being patient in the face of the events, desire to contribute to the society they live in and having self-confidence are other individual protective factors, respectively.

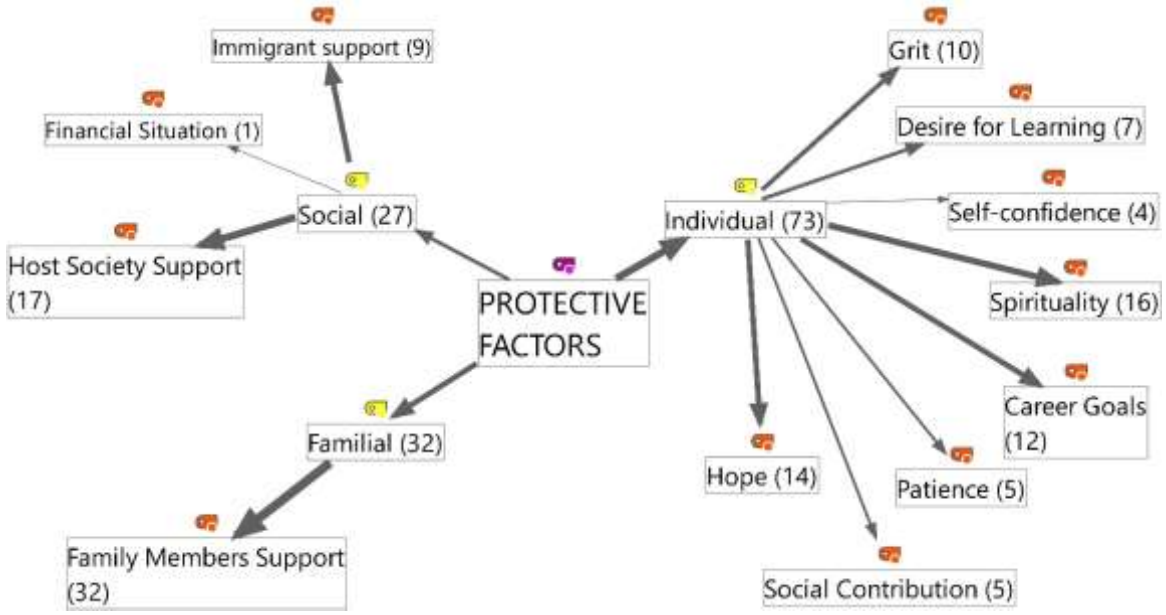

Figure 4. Code-Theory Model for Protective Factors

Being Happy and Strong

Many of the participants identified themselves as strong and standing after these processes (Figure 5).

M2: ‘*’I feel strong, I have changed a lot of cities and this requires strength*.’’

F5: ‘*’I am very strong. I am not afraid of anything*.’’

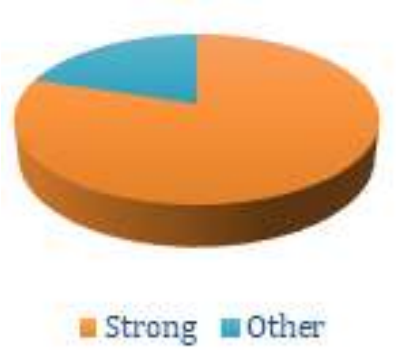

Figure 5. Rates of Participants Expressing Their Strength

In addition to being strong, participants emphasized that they are happy and content with their current lives despite everything (Figure 6).

M4: ‘*’I am happy because I can buy my bread comfortably; I am with my friends and I can go wherever I want*.’’

F1: ‘*’I’m happy because my family is here*.’’

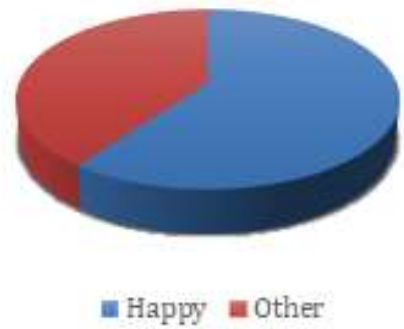

Figure 6. Rate of Participants Expressing Their Happiness

When the figures 5 and 6 are examined, it is observed that the ratio of the participants to express themselves as happy and strong, which are the signs of resilience, is high.

Protective and Risk Factors of the Participants

The distribution of the risk and protective factors of the participants are given in Figure 7 (round shapes in the figures indicate intensity). Accordingly, when the stories of the participants are taken into consideration one by one, the following results emerge:

M1 underlined seven cases from the risk factors. It seems that *language* is the most intense factor among the risks he has experienced. M1 described the issue as follows: ‘*’Not knowing the language was the biggest problem.’’*

It appears that there are four protective factors for M1 against the risk factors he had experienced. M1 highlighted that the most intensive protective factor among these four was the support of family members. M1 stated this as follows: “*my mother was always supporting me”*.

M2 emphasized eight cases among the risk factors. For M2, the most intense one among these factors is *the constant change of the environment they live in.* One of the sentences he used to describe this situation is: *"The place where the first war started was where my university was. The state called me to war, and from there I came to my hometown. After that I came to Turkey to study. After a few places in Turkey, I came to Gaziantep.''*

In addition to these risk factors he experienced, M2 emphasized protective factors in eight cases. Among these protective factors, the most intense one for M2 is *the support of the family members*, as in the case with M1. M2 expressed this situation as follows: ‘*'All my family members supported me, especially my brother in Arabia.''*

When the risk factors in M3's life are examined, risks factors of five areas are observed. Among these risks, the most frequently given answers are social risk factors related to *the language problem*. One of the sentencesM3 used to express this situation is as follows: *"Everyone does not speak English here; I do not speak Turkish. This became very problematic. For example, my brother was sick. He was using a medicine, and stayed in the hospital. I needed to wait two months for a report. How can a patient wait 2 months for a report? We cannot express ourselves clearly. It is difficult for me since I cannot communicate for these.''*

Besides these risk factors, M3 has seven protective factors, and the most intensive factor is *the support of the family members.* One of the sentences he used to express this situation is as follows: '' *I have my parents and I am strong*.''

The most intensive risk factor that M4 experienced, among four major risk factors, is *familial*. One of the things M4 said about the risk factors in his life is as follows: *"losing my brother and my mother was the greatest difficulty in my life, there were only my brother and my mother and they are no longer here. In difficult times we can hug, kiss, we are family, we can wait our father together, we dine and travel together but they are gone.''*

In addition to these risk factors that M4 experienced, there are ten protective factors among which *support from the host community* is the most intense one. One of the phrases he used when expressing this situation is as follows: ‘*'I have a really good friend, he is from Trabzon and he helped me a lot. Last summer I went to Bursa; they have a construction company there. His father said to me 'you are my son as well'. His father is also very good.''*

Among seven risk factors he had, the risk factor that M5 emphasized most is *the financial crisis and interruption of his education process***.** M5 expressed these situations as follows: *''Sometimes our situation becomes very bad. We could not pay the rent four months ago. I left the university in the second grade.''*

In addition to the risk factors, the most intensive one among ten protective factors is the *support of family members* for M5. He said *"My father always trusts and supports us. My sister and my brother are also supportive. My mother always says stay away from unlawful things. Thank god they all support me.''*

For F1, among eight risk factors the most intense one is *no support from social environment.* F1 expressed this situation as follows: *"At first they didn't welcome kindly. They said that we were entering the university easily.''*

When the protective factors of F1 are examined, it is observed that the same risk factors appear as protective factors**.** *The support given by the host community* has become the most intensive protective factor for F1 in the following periods. One of the phrases that K1 used to express this situation is as follows: *"They all came to me and they helped me. Then we really all became friends in our class slowly.''*

When the risk factors of F2 are examined, it is found that *the lack of social support/prejudice* is the most intense one among eight risk factors. One of the phrases that K2 used to express this situation is as follows: *''I was marginalized in Gaziantep*.''

When the protective factors of F2 are examined, the most intensive one among seven protective factors are found to be *career goals, support of the host community and family members*. F2 expressed this situation as follows: *"In my life after coming to Turkey I always wanted to open a private school, boarding school I mean. The Turks supported me most. I got support from my husband and my sister.''*

Among six risk factors that F3 have, the most intensive ones are *lack of social support/prejudice and family members separated from each other*. F3 explained these situations as follows: *"For example, my father, who took me to school every morning, is not here with me now. When somebody misbehaves against me I cannot talk about it. I'm a guest; after all, I cannot say anything. Things I hear from around strains me.''*

When the protective factors of F3 are examined, it is found that the most intense one among nine protective factors *is support of the family members.* F3 expressed this situation as follows: *"Everybody in the family support each other financially and morally. My father and my mother provide financial support, but spiritually we all support each other.''*

When the risk factors of F4 are examined, it is found that *language problem and financial difficulties* are the most intense ones among eight risk factors. F4 expressed this as follows*: "My problem was with the language most. Financial situation forces us most. Such as house rent and bills.''*

When the protective factors of F4 are investigated, it is found that the most intense one among seven protective factors *was spirituality*. F4 explained this situation as follows: *"God will never abandon us, if we pray.''*

When the risk factors of F5 are examined, it is found that there are four risk factors and their intensity are all the same. *Anger control, social prejudice/lack of social support, living problems related to the new habitat and family members being apart from each other* are the risk factors F5 experiencing. F5 expressed these risk factors as follows: *''I am so angry.''*

When six protective factors of F5 are examined, it is found that the most intense one is *familial support.* F5 expressed this situation as follows: *"It makes me feels so good to be with my family.''*

Figure 7. Risk and Protective Factors of Individuals

DISCUSSION

Immigrants usually cannot choose the place where they settle because of many factors such as economic, social or political factors (Mawani, 2014). The risks are inevitable for immigrants who cannot choose their living space. In a country they do not know at all, the problems that they experience in distinguishing between right and wrong will carry them to new social risks. As Masten (2014) stated, the risks in the living space will always trigger other risks since one risk will bring another. This situation will lead them to experience the existing social risks intensively.

Language-related risks are one of the most intensified risk factors for participants. Language is one of the most important risks that immigrant group experiences (Beiser, Simich, Pandalangat, Nowakowski, & Tian, 2011; Nwadiora & Mcadoo, 1996; Stewart, Anderson, Beiser, Makwarimba, Yeh, Kim, Pituc, & Atkins, 2008; Stewart, Simich, Shiza, Makumbe, & Makwarimba, 2012). This makes it difficult for them to reach adequate resources (Guerin, Abdi, & Guerin, 2003). Participants stated that they have difficulty when buying bread from the grocery store, in official documents, in hospitals, on the bus, and in many other occasions where language is used. This has also led them away from the social network, which is a protective factor.

The existence of social support is vital for the resilience of the immigrant group (Pieloch, McCullough, & Marks, 2016). However, immigrants often face various prejudices such as ethnocentrisms, racism and economic discrimination (Ellis, MacDonald, Klunk-Gillis, Lincoln, Strunin, & Cabral, 2010; Yakushko & Morgan, 2012). Social exclusion of immigrants affects their soul and body health negatively by limiting the opportunities for education, employment, housing and reducing self-esteem (Dunn & Dyck 2000; Mawani, 2014; Reynolds, 2004). Prejudice and lack of support stated by the participants seem to be the risk factors that immigrants are generally exposed to. This risk factor is of great importance as it also directly affects mental health.

It appears that the reason for the interruption of the participants' education process is due to the destruction of their schools because of the war in the country where they came from. The fact that the war physically destroys the schools is one of the first risk factor for education. As stated earlier, experienced language-related problems and the situation of migration prevent the immediate availability of the education in the process. In addition, it can be said that the frequent change of the living areas, which participants indicated among the risk factors, made it difficult to provide an environment for education.

Immigrants usually have to leave their country without a chance to get money because of the war (Mawani, 2014). This causes changes in their financial situation in the countries where they have newly settled (Bennett, Boshoff, & Colleen, 1997). Many of the participants have narrated this case by giving examples from their lives. Doctors, a famous journalist, an important farm owner, and the ones whose family is a holding owner became to put together finances to pay the rent after migrating to Turkey. Moreover, immigrants are experiencing employment problems in new countries where they settled (Aycan & Berry, 1996). Immigrants, who are seen as cheap labor force in the countries where they settle, have to work at very low wages as it is in our country. As supported by research, working with low wages is a serious risk factor for immigrants who have already come to the country without any money (Stewart, et.al. 2012).

Studies on immigrants indicated that individuals often have to leave family members (Bennett, et.al., 1997; Jaranson, Butcher, Halcon, Johnson, Robertson, Savik, Spring, & Westermeyer, 2004). This may be related to the death of a family member (Wenzel et al., 2007), or to be physically in different geographies (Stewart et al., 2008). As the participants have emphasized, familial risks continue after the process of breaking away from the family. Individuals, who have migrated, worry about the well-being of their loved ones whom they have left behind (Mawani, 2001). The distance and the communication that cannot be established afterwards is an important risk for immigrants (Stewart et al., 2012).

There are many individuals, familial and social protective factors that make the participants become resilient individuals, despite many risks they have experienced. One of the intensively mentioned factor is that they have spirituality, that is, they have religious beliefs. It is clearly stated in the literature that the religious/spiritual tendencies of immigrants are one of the most important protective factors in the resilience process (Alessi, 2016; Greeff & Human 2004; Stewart et al., 2008; Xu, 2016). When it is considered that the participants come from the cultural background of the Middle East, the effect of religion becomes even more explicable. Spirituality provides an individual protective factor, while at the same time it strengthens the cultural support systems of immigrants in the settled society (Inman et al., 2007). In addition, in recent years there is also increasing evidence that spirituality is an important factor in terms of mental health protection (Collins & Guruge, 2008). It is expected that individuals with spirituality assign a meaning to the situation that they experience and it helps them to have hope in this world and in the other world (hereafter) that they think exists.

Hope is another important protective factor as indicated by the participants. Research show that a positive perspective on life and the feeling of hope it brings is an important protective factor in ensuring resilience of immigrants (Alessi, 2016; Pieloch et al., 2016). The most significant indicators of hope are the participants' use of similar statements like "I have had the worst situations and I am here, it will be better tomorrow". When the participant profile is considered, some research findings are also important.

In Stewart et al. (2012) research and as Kumpfer (1999) stated, young immigrants are more hopeful and positive than middle-aged immigrants. One of the reasons for this situation can be the young people's feeling of more responsibility towards their families (Shakya, Guruge, Hynie, Htoo, Akbari, Jandu, Murtaza, Spasevski, Berhane & Forster, 2014). This responsibility is an indispensable aspect of hope that keeps them standing. The hope, which serves as a protective factor, is also confronted as a demonstration of resilience.

One of the most striking protective factors mentioned by the participants is the emphasis on the career goals of the individual. Within the scope of the research, the most important finding to explore in accordance with the nature of qualitative research (Yıldırım & Şimşek, 2013) is career orientation. This is because there is no adequate research on immigrants' career processes. However, clearer career studies should be undertaken for immigrants experiencing employment and training problems (Yakushko & Morgan, 2012). In addition, Maree and Molepo (2006) emphasize that career stories have a very important place in people's development. A recent study has shown that the purpose of a career is an important protective factor in increasing immigrants' resilience (Pieloch et al., 2016).

Another protective factor indicated by participants in the scope of the research is grit. Grit has an important influence on individuals' resilience. It is an expected situation that young immigrants show resilience with grit despite difficulties (Marshall, Butler, Roche, Cumming, & Taknint, 2016). Alessi (2016), in his research describes immigrant youth as "individuals who are determined at any cost". In another study, Magro (2009) shows that war weary young people are enthusiastic with their hard work and determinant.

Within the scope of the research, the participants referred to two social support systems. The support of the country that they come, that is the host community's support, is on the first place and the support of the immigrant group who are forced to migrate is on the second place. Research shows that social support is important for immigrants' resilience (Alessi, 2016). This is because the provided social support has an important role in reducing loneliness and increasing self-esteem (Bhui, Craig, Mohamud, Warfa, Stansfeld, Thornicroft, Curtis, & McCrone, 2006; Turner, Lloyd, & Roszell, 1999). Therefore, for the immigrant who breaks out of his / her family and friends, the support given by the host community is an extremely important protective factor (Simich, Beiser, & Mawani, 2003). In addition, immigrants are influenced by government policies and political situations in the countries where they settled (Mawani, 2014). This effect has exhibited a positive structure for immigrants in Turkey so far. The current state policy and the similar rituals and daily life of two cultures are some of the factors facilitating the establishment of the support system according to the participants. In addition to the support they receive from the host community, their immigrant groups also have an important protective influence for the participants. Indeed, research shows that individuals who settled in a country as an immigrant have a greater tendency to co-exist with people from their own country, and that this is a source of relief for them (Mawani, 2001; Stewart et al., 2012). This support system is run better in associations and organizations founded by immigrant groups in Turkey.

Another protective factor that participants strongly emphasized is the support that they receive from family members. Within this context, a good bond established with one or more of the family members nearby or in another country is an important contribution to resilience. The negativities in a new country can provide the possibility of strengthening their rapport and ties for families. Thus, the established strong familial support system is of utmost importance for immigrants (Carranza, 2007).

In the context of the research, it is seen that the participants expressed themselves as standing, strong, self-confident and happy. Having self-confidence in immigrants is a protective factor, but at the same time it is an indicator of resilience (Magro, 2009; Stewart, et. al. 2008). It is also known that the young immigrants who constitute the study group also have more indicators of resilience because of their nature (Marshall et al., 2016; Shakya et al., 2014). Furthermore, it is observed that young people described themselves as happy individuals (Kumpfer, 1999).

CONCLUSIONS

The results obtained in this study can be summarized as follows: It is found that the participants who migrated to Turkey because of war were exposed to social risk factors more intensively in risk factors within the context of resilience. This is followed by familial and individual risk factors, respectively. When the risk factors of the participants were examined according to their frequencies; the risks associated with language, not being supported socially and being exposed to prejudice, financial difficulties, and interruption of education processes are the social risk factors that are highly mentioned. The fact that family members are separated from each other is the most common risk factor for familial risk factors, whereas having a negative perspective is the most frequently expressed individual risk factor. Among the protective factors of the participants, it is observed that they have individual factors more. This is followed by familial and social risk factors, respectively. When the protective factors of the participants were examined according to their frequency; having spirituality, career goals, hope, and grit are the most highly expressed individual protective factors. Host society support and immigrant support have been extensively expressed as social protective factors that provide social support. Support from family members is a familial protective factor, which is mentioned by the participants as one of the most important sources. Also, as a sign of resilience of the participants, they have identified themselves mostly as happy, strong and standing.

Suggestions

Based on the results of the research, it can be suggested that immigrants should be concentrated on career services; social support areas for immigrant students should be established and immigrants should be supported by mentor Turkish families. In terms of method, it can be suggested to use different data collection methods by data triangulation.

Acknowledgement

This study has been produced from the master's thesis of the first author supervised by the second author and some findings of this paper was presented at the 20th International Congress on Psychological Counseling and Guidance in Samsun (Turkey), 25-27 October, 2018.

REFERENCES

Alessi, E. J. (2016). Resilience in sexual and gender minority forced migrants: A qualitative exploration. *Traumatology*, *22*(3), 203-213. http://dx.doi.org/10.1037/trm0000077

Aycan, Z., & Berry, J.W. (1996). Impact of employment-related experiences on immigrants' psychological well-being and adaptation to Canada. Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement, 28(3), 240-251. http://dx.doi.org/10.1037/0008-400X.28.3.240

Beiser, M., Simich, L., Pandalangat, N., Nowakowski, M., & Tian, F. (2011). Stresses of passage, balms of resettlement, and posttraumatic stress disorder among Sri Lankan Tamils in Canada. *The Canadian Journal of Psychiatry*, *56*(6), 333-340.

Bennett, H., Boshoff, A., & Rigby, C. (1997). The relationship between tenure, stress and coping strategies of South African immigrants to New Zealand. *South African Journal of Psychology*, *27*(3), 160-165.

Bhui, K., Craig, T., Mohamud, S., Warfa, N., Stansfeld, S.A., Thornicroft, G., Curtis, S., & McCrone, P. (2006). Mental disorders among Somali refugees. *Social Psychiatry and Psychiatric Epidemiology*, *41*(5), 400-408.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş. & Demirel, F. (2016). *Bilimsel Araştırma Yöntemleri.* Ankara: AnıYayıncılık.

Carranza, M. E. (2007). Building resilience and resistance against racism and discrimination among Salvadorian female youth in Canada. *Child & Family Social Work*, *12*(4), 390-398.
Collins, E. M., & Guruge, S. (2008). *Theoretical perspectives and conceptual frameworks.* In S. Guruge & E. M. Collins (Eds.), Toronto: Centre for Addiction and Mental Health.
Christensen, L. B., Johnson, R. B., & Turner, L. A. (2014). *Research methods design and analysis.* Edinburgh: Pearson Education.
Çelik, S. (2014). Nitel analizin kalitesinin ve inanırlığının arttırılması. Bütün, M. ve Demir, S. B. (Ed.), *Nitel araştırma ve değerlendirme yöntemleri.* Ankara: Pegem.
Demir, (2017). Suriyeli göçmen üniversite öğrencilerinde yılmazlığın incelenmesi (Unpublished Master Thesis). Hasan Kalyoncu University, Gaziantep.
Dunn, J. R., & Dyck, I. (2000). Social determinants of health in Canada's immigrant population: results from the National Population Health Survey. *Social science & medicine*, *51*(11), 1573-1593.
Ellis, B. H., MacDonald, H. Z., Klunk Gillis, J., Lincoln, A., Strunin, L., & Cabral, H. J. (2010). Discrimination and mental health among Somali refugee adolescents: the role of acculturation and gender. *American Journal of Orthopsychiatry*, *80*(4).
Fazel, M., Wheeler, J., & Danesh, J. (2005). Prevalence of serious mental disorder in 7000 refugees resettled in western countries: a systematic review. *The Lancet*, *365*(9467), 1309-1314.
Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). How to design and evaluate research ineducation (8th ed.). New York: Mc GrawHIll.
Gibbs, G. R. (2007). Thematic Coding and Categorizing, Analyzing Qualitative Data. SAGE Publications Ltd., London. http://dx.doi.org/10.4135/9781849208574
Gordon, E. W., & Song, L. D. (1994). Variations in the experience of resilience. In M. C. Wang & E. W. Gordon (Eds.), *Educational resilience in inner-city America: Challenges and prospects* (pp. 27-43). Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.
Greeff, A. P., & Human, B. (2004). Resilience in families in which a parent has died. *The American Journal of Family Therapy*, *32*(1), 27-42.
Guerin, B., Abdi, A., & Guerin, P. B. (2003). Experiences with the medical and health systems of Somali refugees living in Hamilton. *New Zealand Journal of Psychology*, *32*, 27-32.
Gürcanlı, Z. (2012, 30 Kasım). Suriyeliye ikamet izni. *Hürriyet.* Erişim adresi: http://www.hurriyet.com.tr/suriyeliye-ikamet-izni-22043791.
Gürgan, U. (2006). Grupla psikolojik danışmanın üniversite öğrencilerinin yılmazlık düzeylerine etkisi. (Unpublished doctoral dissertation). Ankara University, Ankara.
Inman, A. G., Howard, E. E., Beaumont, R. L., & Walker, J. A. (2007). Cultural transmission: Influence of contextual factors in asian indian immigrant parents' experiences. *Journal of Counseling Psychology*, *54*(1), 93-100. http://dx.doi.org/10.1037/0022-0167.54.1.93
İlbay, N. (2017). *Hatay'daki Suriyeli mültecilerin sosyalyaşama adaptasyonu: Sorunlar ve çözüm önerileri* (Unpublished doctoral dissertation). Mustafa Kemal University, Hatay.
Jaranson, J. M., Butcher, J., Halcon, L., Johnson, D. R., Robertson, C., Savik, K., Spring, M., & Westermeyer, J. (2004). Somali and Oromo refugees: correlates of torture and trauma history. *American Journal of Public Health*, *94*(4), 591-598.
Keklik, A. Z. (2016). *Suriyeli sığınmacılarda hepatit B ve C hastalık sıklığı ile bu hastalıklarla ilgili bilgi ve riskli davranış düzeyleri* (Unpublished doctoral dissertation). Harran University, Urfa.
Kiernan, K. E., & Mensah, F. K. (2011). Poverty, family resources and children's early educational attainment: the mediating role of parenting. *British Educational Research Journal*, *37*(2), 317-336.
Kumpfer, K. L. (1999). Factors and processes contributing to resilience: the resilience framework. In M. D. Glantz J. L. Johnson, (Eds), *Resilience and development: Positive life adaptations* (pp. 179-224). New York: Kluwer Academic/Plenum Publishers.
Magro, K. (2009). Expanding conceptions of intelligence: Lessons learned from refugees and newcomers to Canada. *Gifted and Talented International*, *24*(1), 79-92.
Maree, K., & Molepo, M. (2006). The use of narratives in cross-cultural career counselling. In M. Macmahon & W. Patton (Ed.). *Career Counselling.* Routledge: New York
Marshall, E. A., Butler, K., Roche, T., Cumming, J., & Taknint, J. T. (2016). Refugee youth: A review of mental health counselling issues and practices. *Canadian Psychology/Psychologie canadienne*, *57*(4), 308-319. http://dx.doi.org/10.1037/cap0000068
Masten, A. S. (2014). Ordinary magic: Resilience in development. New York: The Gullford Press.
Masten, A. S., & Reed, M. J. (2002). Resilience in development. In C. R. Snyder & S. J. Lopez (Ed.). *The Hadbook of Positive Psychology.* Oxford: Oxfort University Pres.
Mawani, F. N. (2001). *Sharing attachment across cultures: Learning from immigrants and refugees*. Ottawa: Health Canada.

Mawani, F. N. (2014). Social determinants of refugee mental health. In L. Smitch and L. Andermann (Ed). *Refuge and resilience (27-51).* New York: Springer.

Nwadiora, E., & McAdoo, H. (1996). Acculturative stress among Amerasian refugees: Gender and racial differences. *Adolescence*, *31*(122), 477-488.

Öğülmüş, S. (2001). Bir kişilik özelliği olarak yılmazlık. *I. Ulusal Çocuk ve Suç Sempozyumu: Nedenler ve Önleme Çalışmaları,* Ankara (29-30 Mart).

Pickren, W. E. (2014). What is resilience and how does it relate to the refugee experience? Historical and theoretical perspectives. In L. Simich & L. Andermann (Eds.), *International perspectives on migration: Vol. 7. Refuge and resilience: Promoting resilience and mental health among resettled refugees and forced migrants* (pp. 7-26). New York, NY, US: Springer Science + Business Media. http://dx.doi.org/10.1007/978-94-007-7923-5_2

Pieloch, K. A., McCullough, M. B., & Marks, A. K. (2016). Resilience of children with refugee statuses: A research review. *Canadian Psychology/Psychologie canadienne*, *57*(4), 330-339. http://dx.doi.org/10.1037/cap0000073

Reynolds, R.R. (2004). "We Are Not Surviving; We Are Managing": the constitution of a Nigerian diaspora along the contours of the global economy. *City & Society*, *16*(1), 15-37.

Rutter, M. (1999). Resilience concepts and findings: implications for family therapy. *Journal of Family Therapy*, *21*(2), 119-144.

Seligman, M.E., & Csikszentmihalyi, M. (2014). *Positive psychology: An introduction*. Springer Netherlands.

Shakya, Y.B., Guruge, S., Hynie, M., Htoo, S., Akbari, A., Jandu, B.B., Murtaza, R., Spasevski, M., Berhane, N., & Forster, J. (2014). Refugee youth as "resettlement champions" for their families: Resilience, empowerment and vulnerabilities. In Laura Simich & Lisa Anderman (Eds.), *Refuge and resilience* (pp.131-154). New York: Springer.

Simich, L., Beiser, M., & Mawani, F.N. (2003). Social support and the significance of shared experience in refugee migration and resettlement. *Western Journal of Nursing Research*, *25*(7), 872-891.

Sipahioğlu, Ö. (2008). *Farklı risk gruplarındaki ergenlerin psikolojik sağlamlıklarının incelenmesi* (Unpublished Master Thesis). Selcuk University, Konya.

Stewart, M., Anderson, J., Beiser, M., Mwakarimba, E., Neufeld, A., Simich, L., & Spitzer, D. (2008). Multicultural meanings of social support among immigrants and refugees. *International Migration*, *46*(3), 123-159.

Stewart, M., Simich, L., Shizha, E., Makumbe, K., & Makwarimba, E. (2012). Supporting African refugees in Canada: insights from a support intervention. *Health & social care in the community*, *20*(5), 516-527.

Terzi, Ş. (2008). Üniversite Öğrencilerinde Kendini Toparlama Gücünün İçsel Koruyucu Faktörlerle İlişkisi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi,* 297-306.

Turner, R.J., Lloyd, D.A., & Roszell, P. (1999). Personal resources and the social distribution of depression. *American journal of community psychology*, *27*(5), 643-672.

Unat, D. B. (2015). *Türkiye'de yaşayan Suriyeli göçmenlerin gündelik yaşam pratikleri: Mardin örneği* (Unpublished Master Thesis). Mugla Sitki Kocman University, Mugla.

Wenzel, T., Kastrup, M., & Eisenman, D. (2007). Survivors of torture: A hidden population. In P. Walker & E. Barnett (Eds.), *Immigrant medicine*. Philadelphia: Saunders.

Xu, Q. (2017). How resilient a refugee community could be: The Vietnamese of New Orleans. *Traumatology*, *23*(1), 56-67. http://dx.doi.org/10.1037/trm0000091.

Yakushko, O., & Morgan M.L. (2012). Immıgration. In R. A. Young, J. F. Domeneve L. Valach (Ed.). *Counseling and Action.* New York: Springer.

Yeh, C. J., Kim, A. B., Pituc, S. T., & Atkins, M. (2008). Poverty, loss, and resilience: The story of Chinese immigrant youth. *Journal of Counseling Psychology*, *55*(1), 34-48. http://dx.doi.org/10.1037/0022-0167.55.1.34

Yıldırım, A., & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri.* Ankara: Seçkin Yayıncılık.

TÜRKÇE GENİŞLETİLMİŞ ÖZET

Göçmenler, yaşamak zorunda kaldıkları durumlardan dolayı bazı risk faktörlerine maruz kalmaya daha açıktırlar ve içinde bulundukları topluma oranla daha fazla travma sonrası stres bozukluğuna maruz kalmaktadırlar. Kendi ülkelerinde birçok travmatik olaya maruz kalan göçmenler, yerleştikleri ülkelerde ise genellikle yeni yerleşim yerine uyum ile ilgili süreçlerde zorluk çekerler. UNHCR (Birleşmiş Milletler Mülteciler Yüksek Komiserliği Bürosu'nun) ve birçok araştırmacı savaştan dolayı göç etmek zorunda kalmış olan göçmenlerin diğer göç eden bireylere göre daha farklı deneyimler yaşadığını göstermektedir. Çoğu savaş mağduru göçmenler uzun süreli silahlı çatışmalara, şiddete, aile üyelerinin kaybına veya toplu bir şekilde ölümleri izlemeye maruz kalmıştır. Göç eden kişilerin yerleştikleri ülkelerdeki en önemli sosyal faktörler sosyal içerme/dışlanma ve resmi sosyal destektir. Ancak çok az araştırma sosyal dışlanma konusunu vurgulamaktadır. Bu durum yaş, cinsiyet, ırk, etnik köken, sosyal sınıf, göç durumu, cinsel yönelim gibi durumlardan kaynaklanabilmektedir. Göçmenler, tüm bu faktörlere dayalı olarak bireysel veya sistemsel (kurumsal) düzeyde dışlanma riski altındadır. Sosyal dışlanma; eğitim, istihdam, konut vb. fırsatları sınırlandırarak benlik saygısını düşürmekte ve ruh sağlığını olumsuz bir biçimde etkilemektedir. Yaşanılan bu tür risklere rağmen göçmenlerin bu süreçlerde, nasıl yılmadan ayakta durdukları ve nasıl baş ettikleriyle, dolayısıyla nasıl yılmaz bireyler olabileceği ile ilgili daha fazla bilgiye ihtiyaç vardır. Bu nedenlerden dolayı araştırma kapsamında savaş mağduru göçmenlerin yılmazlık kaynakları incelenmiştir. Araştırmanın amacı Suriyeli göçmen üniversite öğrencilerinde risk ve koruyucu faktörler temelinde yılmazlık kaynaklarını derinlemesine incelemektir. Bu kapsamda; Suriyeli göçmen üniversite öğrencilerinin hangi risk faktörlerine, hangi koruyucu faktörlere ve bunların yanında yılmazlık sonucu olarak hangi göstergelere sahip oldukları araştırılmıştır.

Son yıllarda çeşitli bölgelerde yaşanan savaş ve terör olayları birçok insanın hayatında önemli değişikliklere neden olmuştur. Savaştan dolayı insanlar evlerini, arkadaşlarını, okullarını, ailelerini bırakmak zorunda kalmışlardır. Birçok insan çareyi kendi ülkelerini terk ederek başka ülkelere sığınmakta bulmuştur. Böylece kendi ruh ve beden sağlıklarını koruyarak kalan aile üyelerine yardımcı olabilecek yapıyı oluşturmaya çalışmışlardır. İnsanların kendilerini ve yakınlarını korumak için çıktıkları bu yol, beraberinde tarihin en önemli göç dalgalarından birini oluşturmuştur. Dünya'nın tamamının etkilendiği bu durumdan en çok etkilenen ülkelerden birisi de coğrafi konumundan dolayı Türkiye'dir. Bu kişilere verilecek olan temel yardımların yanı sıra ruh sağlığı hizmeti de bir zorunluluktur. Çünkü göç sonrasında bireylerde çok önemli ruh sağlığı sorunları yaşanmaktadır. Dünyanın birçok farklı yerinden, farklı ev sahibi ülkelere giden göçmenlerin yaşadıkları süreç birbirinden çok farklıdır. Bu sebeple derinlemesine yapılan nitel analizler sürecin daha net bir biçimde ortaya çıkmasına katkıda bulunacaktır. Özellikle Türkiye'de göçmen sayısının fazla olması ve bu göçmenlerin eğitim sistemine uyum sürecine ilişkin algıları ve yaşadıkları zorluklara ışık tutacak olması araştırmanın önemini ve güncelliğini göstermektedir.

Araştırma kapsamında nitel araştırmaların bir türü olan "olgubilim (fenomenoloji) çalışması" kullanılmıştır. Olgubilim çalışması, bize tümüyle yabancı olmayan ancak tam olarak kavrayamadığımız olguların derinlemesine ve ayrıntılı bir biçimde incelenmesidir. Araştırmanın çalışma grubu Türkiye'ye kendi ülkelerindeki savaştan dolayı göç etmiş 21-28 yaş aralığındaki genç göçmenden oluşmaktadır. Nitel araştırmalarda örneklemin büyüklüğü verilerin doyum noktasına ulaşması ile ilgilidir. Doyum noktasına ulaşıldıktan sonra bilgiler tekrar edeceğinden yeni veriye ihtiyaç duyulmamaktadır. Bu kapsamda araştırmaya katılan 5 kadın, 5 erkek birey olmak üzere toplamda 10 kişi ile veriler doyum noktasına ulaşmış ve bu kişiler araştırmanın çalışma grubunu oluşturmuştur. Katılımcıların yaş aralığı 21 ve 28 arasında değişmektedir. Türkiye'de bulunma sürelerine bakıldığında katılımcıların en az 2.5 yıl boyunca burada yaşadıkları (ortalama 4.1 yıl) gözlemlenmektedir. Öğrenciler; mimarlık, sağlık bilimleri ve mühendislik fakültelerinde öğrenimlerine devam etmektedirler. Katılımcıların Türkiye'ye göç etmek zorunda kalmadan önceki eğitim durumları incelendiğinde altı katılımcının üniversitelerini

bırakmak zorunda kaldıkları, diğerlerinin ise liseden sonra üniversite yaşantısını Türkiye'de devam ettirdikleri görülmektedir. Araştırmacı tarafından geliştirilen yarı yapılandırılmış "Göçmen Üniversite Öğrencilerinde Yılmazlık Görüşme Formu" veri toplama aracı olarak kullanılmıştır. Katılımcılar ile yapılan görüşmeler, katılımcıların izinleri dahilinde sadece bu araştırma kapsamında kullanılmak üzere ses kayıt cihazı ile kayıt altına alınmıştır. Kaydedilen görüşmeler, veri kaybı olmadan bilgisayar ortamına (Word Office) aktarılmıştır. Aktarılan bu verilerde bilgisayar destekli bir nitel veri analizi programı olan MAXQDA 12 ile içerik analizi yapılmıştır. İçerik analizi, verilerin tanımlanmasıyla birlikte saklı olan gerçeklerin ortaya çıkarılması ve verilerin birbirine benzeyen temalar çerçevesinde bir araya getirilmesidir. Yapılan içerik analizi sonuçlarına göre katılımcıların risk faktörlerinin daha yoğun olarak toplumsal olduğu görülürken, koruyucu faktörler daha yoğun olarak bireysel yapıya sahiptir. Ayrıca beliritlen risk faktörleri şu şekildedir: Başkalarına güvensizlik, öfke kontrolü, olumsuz bakış açısı, finansal zorluklar, medya etkisi, ölüme şahit olmak, eğitimin sekteye uğraması, sosyal önyargı ve dışlanma, yeni yerleşim yeri ile ilgili sorunlar, dil problemi, yaşam alanı değişimi, aile üyelerinden birinin ölümü ve aile üyelerinden ayrı yaşamak. Koruyucu faktörler ise şu şekildedir: Sosyal destek, kariyer amaçlılığı, sabır, özgüven, öğrenmeye istekli olmak, azim, maneviyat, finansal destek, ev sahibi topum desteği, göçmen desteği ve aile üyelerinin desteği. Ayrıca katılımcıların yılmazlığın bir göstergesi olarak, kendilerini mutlu ve ayakta kalmış/güçlü olarak nitelendirme yoğunluklarının fazla olduğu belirlenmiştir. Araştırma sonuçlarından yola çıkarak; göçmenlerde kariyer hizmetlerine yoğunlaşılması, göçmen öğrencilere sosyal destek alanları oluşturulması ve göçmenlere mentör Türk aileler tarafından destek verilmesi önerilerinde bulunulabilir.

TURJE
www.turje.org

Volume:8 Issue:1

https://dx.doi.org/10.19128/turje.459678

Turkish Journal of Education

Research Article

Received 13.09.2018
Accepted 05.01.2019

The adaptation of the pedagogical knowledge and skills survey into Turkish: Validity and reliability study

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ABSTRACT This research aims to adapt the Pedagogical Knowledge and Skills in Teaching (PKST) survey developed by Wong, Chong, Choy and Lim (2012) to Turkish. The participants of the study are 830 4th year students of education faculty studying at two different public universities. Explanatory Factor Analysis (EFA) was conducted with total 205 pre-service teachers in which 110 (53. 6%) of female and 95 (46,4 %) of male. Confirmatory Factor Analysis (CFA) was also carried out with total 625 preservice teachers in which 330 (52. 8 %) of them are female, 295 (47. 2 %) of them are male. Back translation was used to ensure language validity. EFA and CFA were conducted for the construct validity and to ensure psychometric characteristics of measurement tool. EFA show that survey has six factors and 37 items. Coefficient was 0.94 for the survey whereas it ranged between 0.70 and 0.88 for its factors. The analyses and findings show that the survey is a valid and reliable data collection tool.

Keywords: *Pedagogical knowledge and skills, Pre-service teachers, Reliability, Validity, Survey adaptation*

Pedagojik bilgi ve beceri ölçeğinin Türkçe'ye uyarlanması: Geçerlik ve güvenirlik çalışması

ÖZ Araştırmada Wong, Chong, Choy ve Lim (2012) tarafından geliştirilerek, geçerlik ve güvenirlik çalışması yapılan öğretmen adaylarının Öğretimde Pedagojik Bilgi ve Beceri (ÖPBB) ölçeğinin Türkçeye uyarlanması amaçlanmıştır. Çalışma grubunu iki farklı devlet üniversitesinin eğitim fakültesinin son sınıfında öğrenim gören 830 öğretmen adayı oluşturmuştur. Açımlayıcı Faktör Analizi (AFA), 110 (53,6%)'u kadın ve 95 (46,4 %)''i erkek olmak üzere toplam 205 öğretmen adayından elde edilen verilerle gerçekleştirilmiştir. Doğrulayıcı Faktör Analizi (DFA), 330 (52,8 %) 'u kadın ve 295 (47,2 %)'i erkek toplam 625 öğretmen adayı üzerinde gerçekleştirilmiştir. Dil eşdeğerliğini test etmek için İngilizce-Türkçe; Türkçe-İngilizce geri çeviriler uygulanmıştır. Yapı geçerliği kapsamında AFA ve DFA'dan yararlanılmıştır. AFA sonucunda ölçeğin altı boyut ve 37 maddeden oluştuğu tespit edilmiştir. DFA sonucunda AFA'da elde edilen yapı doğrulanmıştır. Ölçme aracının güvenirliği için Cronbach Alpha güvenirlik katsayı ölçeğin tümünde 0.94 iken alt boyutlarında 0.70 ile 0.88 arasında değerler almıştır. Ölçme aracının geçerli ve güvenilir ölçüm yapabilen bir veri toplama aracı olduğu söylenebilir.

Anahtar Kelimeler: *Pedagojik bilgi ve beceri, Öğretmen adayları, Geçerlik, Güvenirlik, Ölçek uyarlama*

Cite This Article: Gökçek, T. & Yılmaz, A. (2019). The adaptation of the pedagogical knowledge and skills survey into Turkish: Validity and reliability study, *Turkish Journal of Education. 8*(1), 52-70. https://dx.doi.org/10.19128/turje.459678

INTRODUCTION

Research on the development of teacher competence had of great interest in the last decade. Therefore, standardized instruments have been developed to measure the knowledge and skills of pre- and in-service teachers (Hill, 2010; Kersting, Givvin, Thompson, Santagata & Stigler, 2012; König, Blömeke, Klein, Suhl, Busse, Kaiser, 2014). Pedagogical knowledge is about teaching and involves knowledge of how to teach content as a condition for teacher effectiveness (Hill, Rowan & Ball, 2005). Pedagogical knowledge and skill are related to instructional techniques and strategies which enable learning to take place and encourage teachers to take on the roles of facilitators, coaches, models, evaluators, managers, and advocates. It helps teachers employ appropriate evaluation schemes. Effective pedagogy helps teachers display skills that could enable them to design curricula to build on learners' present knowledge and understanding and move those learners to more sophisticated and in-depth abilities, knowledge, concepts, and performances (Amosun & Kolawole, 2015).

Many teacher education programs around the world aim to provide professional pedagogical knowledge and skills for future teachers (Tatto et al., 2008). According to König, Blömeke and Kaiser (2015), teacher competence is regarded as "a multidimensional construct, consisting of content knowledge (CK), pedagogical content knowledge (PCK) and general pedagogical knowledge (GPK) as well as of perception, interpretation and decision-making skills" (p.332). Also, Shulman (1986) proposed some categories which have been useful to conceptualize the kind of knowledge that teachers require. These categories are Subject Matter Knowledge (SMK), Pedagogical Knowledge (PK), and Pedagogical Content Knowledge (PCK). According to Ponte and Chapman (2006), the notion of PCK was introduced in the 1990s into the field. Since then, this one and the rest of the categories proposed by Shulman have influenced the research on mathematics teachers' knowledge (Sánchez, 2011; p.137). Many researchers have been inspired by Shulman's (1986, 1987) pedagogical content knowledge conceptions in mathematics education (Baumert, et al., 2010; Hill, Ball & Schiling, 2008; König, et.al., 2014, 2015). Shulman (1986) used the term pedagogical content knowledge (PCK) and specific content knowledge in teaching to argue that content knowledge itself is not sufficient for teachers to be successful. Pedagogical content knowledge refers to the ability of the teacher to transform content into forms that are "pedagogically powerful and yet adaptive to the variations in ability and background presented by the students" (Shulman, 1987). An, Kulm and Wu (2004) also indicated that pedagogical content knowledge (PCK) addresses "how to teach mathematics content and how to understand students' thinking. This includes, taking into consideration both the cultural background of the students as well as their preferences for various teaching and learning styles" (p.146).

According to Shulman (1987) GPK involves "broad principles and strategies of classroom management and organization that appear to transcend subject matter" (p.8) as well as knowledge about learners, learning and assessment. König et al. (2015) argued that pre-service as well as in-service teachers are forced to reflect on tasks such as structuring lessons, motivating students prior, during and after the teaching process, and thus to activate their general pedagogical knowledge (GPK). Since the last decade, empirical tests have been developed to assess teachers' GPK. For instance, König, Blömeke, Paine, Schmidt and Hsieh (2011) revealed the multidimensional structure of GPK putting forward four factors; classroom structure, motivation and classroom management, students' heterogeneity and classroom assessment. Later König, Ligtvoet, Klemenz and Rothland (2017) worked with a sample of 573 pre-service teachers in Austria to further validate the test in different countries, and positive intercorrelations were found between

Related Literature

This section presents the research on the concepts of CK, PCK and GPK and explains how these concepts are employed. Thus, we summarize the literature and assess the pre-service teachers and in-service teachers' content knowledge, pedagogical content knowledge, general pedagogical knowledge and skills.

Koirala et.al (2008) developed a performance assessment task and rubric designed to assess secondary school mathematics pre-service teachers' pedagogical content knowledge and skills. The assessment task and rubric are well aligned with local, state, and national standards and provide insight into teacher candidates' pedagogical content knowledge and skills. Also, the project materials and outcomes have the potential to benefit other higher education institutions offering teacher education programs.

Karp (2010) analyses the experiences of secondary school mathematics teacher candidates during a teaching methods course offered prior to their micro teaching experience at school which involves reflexive analysis of the teaching. The study focuses on pedagogical challenges that arose in situations where prospective teachers lack the pedagogical content knowledge and skills during their teaching. The method used to process the data was the constant comparative method of analysis. As a result, author identified several sets of typical situations in which teacher candidates experienced difficulties.

Kleickman, et.al. (2015) examine whether the two-dimensional structure of teachers' content matter knowledge is cross-culturally invariant and whether the differences in teacher education are reflected in their content matter knowledge by comparing content knowledge (CK) and pedagogical content knowledge (PCK) of Taiwanese and German in-service mathematics teachers. They used paper and pencil tests to assess CK and PCK. Results confirmed that CK and PCK represent two distinct, but correlated dimensions. Also, Taiwanese teachers showed considerably higher CK and PCK scores than German teachers.

König et.al. (2011) discussed the TEDS-M (Teacher Education and Development Study in Mathematics) study which was taken by representative samples of future secondary school teachers in three countries, conceptualised a theoretical framework and developed a standardized test of GPK. The TEDS-M test measuring GPK of future secondary school teachers in the United States, Germany, and Taiwan. The test consisted of 77 test items which were equally distributed across the four content sub-dimensions and the three cognitive sub-dimensions. The data revealed that U.S. teacher candidates were outperformed by German or Taiwanese teachers. Also, US teachers showed a relative strength in one of the cognitive sub-dimensions, generating strategies to perform in the classroom, indicating that they had acquired procedural GPK during teacher education.

König et.al. (2014) examine how the declarative-conceptual general pedagogical knowledge assessed via a paper-pencil test can be understood as a premise for early career teachers' ability to notice and interpret classroom situations assessed via video-vignettes. As a conclusion, researchers found that GPK at the end of teacher education does not predict noticing or interpreting, which suggests that teachers' cognitions are reorganized during the transition into teaching.

König et.al. (2015) examined general pedagogical knowledge and skills of early career mathematics teachers, asking how they are associated with characteristics of teacher education, teaching experience, and working conditions. Data were collected from a sample of 278 early career secondary school mathematics teachers by using the follow-up study of TEDS-M Germany in 2012. Different competence profiles of pedagogical knowledge and skills are identified via latent-class analysis. Besides teaching experience, profiles are associated with generic teaching challenges such as motivating students, disruptive student behaviour perceived by the teachers.

Depaepe and König (2018) investigated the relationship between the GPK, self-efficacy (SE) and reported instructional practice based on a sample of 342 pre-service teachers. They found no significant

difference between GPK and SE. On the other hand, SE significantly predicted all instructional practices, although GPK only predicted reported instructional practices related to student support.

When the research presented above is reviewed, it could be seen that pre-service teachers' pedagogical knowledge and skills are usually assessed by qualitative methods (such as interviews or observations). The research on teacher education particularly focuses on comparative TEDS-M data (Depaepe & König, 2018; König, et. al., 2017). In this research, General Pedagogical Knowledge (GPK) was assessed with a paper-pencil test instrument which was developed and applied in the context of TEDS-M. Adaptivity, structure, classroom management/motivation and assessment were identified in the test instrument as generic teaching dimensions.

Recently, there are some research looking at the pedagogical skills and knowledge of teacher candidates and early career teachers, and such research developed quantitative measurement tools. For instance, Chong, Choy and Wong (2008) examined the perceptions of pedagogical knowledge and skills in teaching held by pre-service teachers of the Postgraduate Diploma in Education programme in Singapore. The authors presented these findings at AARE conference in 2008. The longitudinal study collected data on why pre-service teachers wanted to become teachers, their attitudes, and perceived knowledge and skill levels towards teaching at the beginning and at the end of the teacher preparation programme. The survey instrument has 34 items with five factors; Facilitation; Assessment; Management; Preparation; and Care and concern. Findings showed that at the beginning, pre-service teachers already perceived that they had some pre-requisite pedagogical knowledge and skills. At the end of the programme, pre-service teachers displayed a significantly higher level of pedagogical knowledge and skills. Besides, pre-service teachers' perception of pedagogical knowledge was significantly higher for all five factors. As for perceptions of pedagogical skills, there were significant differences in all factors except for care and concern factor. This research was followed by another work of Choy, Chong, Wong and Wong (2011). They investigated changes in early career teachers' self-perceptions of their pedagogical knowledge and skills at the end of their initial teacher preparation and at the end of their first year of teaching. Factor analysis was used to extract factors from the 38 out of a total of 50 items in the survey. Using Principal Component Analysis, six factors with eigenvalues above 1.2 were extracted from 38 items and four items were dropped from the analysis. The six factors were: "Student Learning, Lesson Planning, Instructional Support, Accommodating Diversity, Classroom Management and Non-Teaching Duties". Surveys were administered to 322 final year students at the end of their initial teacher preparation programme and at the end of their first year of teaching to compare if there were any differences in their self-perceptions. The results showed significant increases in their perceptions of pedagogical knowledge and skills in three factors: Instructional Support, Accommodating Diversity and Classroom Management.

Later, Choy, Lim, Chong and Wong (2012) reported the cross-validation of the factor pattern of the Perceptions of Knowledge and Skills in Teaching (PKST) survey. The sample consisted of 323 primary and secondary pre-service teachers who were enrolled in the Postgraduate Diploma in Education (PGDE) initial teacher preparation program at the National Institute of Education in Singapore. The survey was distributed across six factors namely: student learning, lesson planning, instructional support, accommodating diversity, classroom management, and care and concern. A confirmatory factor analysis (CFA) was used to cross-validate the survey's factor pattern. The results showed that the model was an acceptable fit to the data. Following Wong, Chong, Choy & Lim (2012) examined the levels of pedagogical knowledge and skills as perceived by 812 student teachers who were enrolled in the Post Graduate Diploma in Education program in Singapore. Their perceptions were assessed using the PKST survey which comprised six factors. Results showed that there were significant increases in participants' pedagogical knowledge and skills in all six factors from the start of their initial teacher preparation program until the end of their first year of teaching. However, during this phase, their perceived level of pedagogical knowledge in classroom management, and care and concern continued to increase significantly. Lastly, Choy, Wong, Lim and Chong (2013) investigated the early career teachers' perceptions of pedagogical knowledge and skills in teaching in Singapore. This study adopted part of the PKST survey (Choy et al., 2012) to measure the early career teachers' pedagogical knowledge and

skills in teaching. The focus of this three-year study was to examine the early career teachers' perceptions of their own development in the following teaching related three factors: *lesson planning, classroom management and instructional strategies*. The results showed that early career teachers' pedagogical knowledge and skills increased significantly, but at different rates, in all three factors at the end of their third year of teaching.

As the literature suggests there are several research on CK, PCK, GPK and they mostly use paper-pencil tests. However, there is no quantitative survey or research tool that comprehensively looks at pedagogical knowledge and skill of teacher candidates or early careers teachers. Wong et al. (2012) developed this tool and used it with the teacher candidates in Singapur. In Turkey, recent research generally focused on content knowledge (Sıvacı, 2017), PCK (pedagogical content knowledge) (Bukova-Güzel, Cantürk-Günhan, Kula, Özgür & Elçi, 2013; Köse & Selvi, 2016; Özel, Timur, Timur & Bilen, 2013) and TPCK (technological pedagogical content knowledge) (Aydeniz & Kirbulut, 2014; Balçın & Ergün, 2016; Canbazoğlu-Bilici, Yamak, Kavak & Guzey, 2013; Kabakçı-Yurdakul, et.al., 2012; Kaya & Dağ, 2013; Kaya, Kaya & Emre, 2013; Öztürk & Horzum, 2011; Şahin, 2011; Timur & Taşar, 2011) of teacher candidates and teachers and carried out survey development or adaptation studies. Yet, there is no research on pedagogical knowledge and skills. Therefore, this research aims to adapt the survey of Wong et al., (2012) to Turkish culture.

METHODOLOGY

This section includes the participants, the collection of data and the process of adapting the survey to Turkish.

Participants

This research aims to adapt Pedagogical Knowledge and Skills in Teaching (PKST) survey to Turkish and the participants of this research were final year education faculty students studying at two public universities in the Central Anatolia and Black Sea region of Turkey. The participants were studying in following departments: Science Education, Social Science Education, Elementary School Education, Physical Education, Mathematics Education. The research was carried out on two different sample groups. Explanatory Factor Analysis (EFA) was conducted with total 205 preservice teachers in which 110 (53,6%) of female and 95 (46,4 %) of male. To test the structure resulting from EFA, Confirmatory Factor Analysis (CFA) was performed on different groups. CFA was carried out from the data taken from 625 preservice teachers in which 330 (52,8 %) of them are female, 295 (47,2 %) of them are male.

Pedagogical Knowledge and Skills Survey

This research aims to adapt the survey, which measures the pedagogical knowledge and skill levels of the Teacher Candidates and early career teachers, to Turkish culture. The validity and reliability of the survey was conducted by Wong, Chong, Choy and Lim (2012). The Survey has 38 items and 6 factors; Student Learning (7 items), Lesson planning (7 items), Instructional support (7 items), accommodating diversity (7 items), Classroom management (4 items), and Care and concern (6 items). The $\chi 2$ of the initial hypothesized model was 1,114.6 with 603 degrees of freedom ($p < .01$). The ratio of $\chi 2$ to its degrees of freedom was 1.85, lower than the recommended indictor (3.0) of an acceptable fit between

the hypothetical model and the sample data (Carmines & McIver, 1981). Both TLI and CFI were 0.91, indicating an acceptable fit. The value of RMSEA was at 0.05, indicating an acceptable fit, as it was lower than 0.07. The results showed that the hypothesized model is acceptable. Finally, the Cronbach alpha reliability coefficient for the modified model was .95. Cronbach's alphas for the six latent constructs were: Student Learning (0.83), Lesson Planning (0.82), Instructional Support (0.77), Accommodating Diversity (0.71), Classroom Management (0.80), and Care and Concern of Students (0.81). The survey is a five-point Likert scale, the scores change between 1 (strongly disagree) and 5 (Strongly agree). All items of the survey are positive and no item is scored as reverse. The lowest and highest scores for the survey are 38 and 190, respectively.

The categories, descriptions, indicators, and some sample items of the Pedagogical Knowledge and Skill Survey are provided in Table1.

Table 1
Teacher candidates' characteristics related to pedagogical knowledge and skill levels

Factors	Description	Indicators
Student Learning	Using different strategies to capture students' interest and stimulate their thinking	Encouraging, Attracting attention, Critical and creative thinking, Motivation
Lesson planning	Writing lesson plans and preparing appropriate Resources	Considering different skills, Teaching according to the curriculum, Determining the appropriate method for the content
Instructional support	Selecting appropriate resources and assessment modes to support instruction	Developing Materials, Using various assessment and evaluation tools, Using Technology
Accommodating diversity	Catering to students' different needs	Considering students' needs and interests, Responding to individual needs, Monitoring student progress and performance
Classroom management	Managing student behaviors and discipline	Using techniques of appropriate class management, Ensuring Discipline
Care and concern	Providing care and helping students with problems	Paying attention to students' needs, Coping with stress

*While preparing Table 1, Wong, Chong, Choy and Lim (2012)'s study has been used.

Ensuring Language Validity in Adaptation

Firstly, we contacted Dorish Choy & Angela F.L. Wong who are the corresponding authors of the survey to get permission to adapt the survey into Turkish. The authors emailed the latest version of the survey. Back-translation was done during the adaptation process, as suggested by Brislin (1986). Three different academics in the field of Mathematics Education, Pre-school education and Educational Research separately translated the survey items. These three translations were compared with each other to understand the consistency and to discuss the items and then Turkish translation form was prepared. A linguist was asked to have a look at the Turkish translation form and the original survey. The necessary corrections have been made and the form has been given to a language expert for the translation of the articles in Turkish form into English. The purpose of this translation is to provide evidence of language validity between the original scale items and the items translated into English. After the necessary amendments, a translator translated the survey items in the form to ensure language validity in the back translation. Thus, the scale form which was adapted to Turkish was finalized.

Data Collection and Analysis

Researchers informed the teacher candidates and ensured that they completed the form accurately. The data was collected during the Spring term of 2016-2017 academic year in two public universities in

Trabzon and Kırıkkale with students of Elementary School teaching, Mathematics teaching, Physcial education teaching and Social sciences education. In total, 642 teacher candidates participated in the research.

Seventeen forms had missing information and were filled incorrectly. Therefore, they were left out of the analysis. 625 forms were analyzed, 330 (52,8 %) of them were women, and 295 (47,2 %) of them were men. SPSS 22 and Lisrel 8.8 were used in data analysis. In the study, firstly, the factor analysis was carried out. Afterwards, Confirmatory Factor analysis was used to identify whether the survey was appropriately adapted to Turkish culture. Then, item analysis, item total test correlation and 27% subgroup analysis were conducted. Then, Cronbach Alpha Coefficient was calculated.

FINDINGS

This section presents the findings of validity and reliability analyses.

Validity Analysis

According to Seçer (2015), the theoretical structure of the measurement tool shows the level of the relationship between each item. To adapt the original survey to the Turkish culture, firstly EFA was conducted. After, CFA is used to test the construct validity (Kline, 2005). CFA is commonly used in adaptation studies to test whether the survey is appropriately fit to a different culture. In this research, CFA was used to test whether the structure with six factors and 38 items showed the same structure on different groups with similar characteristics.

Exploratory Factor Analysis

In order to provide evidence for the construct validity of the survey, statistical technique Exploratory Factor Analysis (EFA) was used to gather variables (items) that measure the same structure together with a smaller number of variables. Kaiser-Mayer-Olkin (KMO) coefficient and Bartlett test results were examined for the suitability of the study group for factor analysis. KMO sample suitability value was found as 0.92 and Barlet-Sphericity test chi square value was found as 4214,773 ($p < 0.01$). These values indicate that the data from the study group is perfectly suited to factor analysis.

"Principal Component Analysis" was used in the study. In the Principal Component Analysis, contribution of each factor to the total variance and implicit variables with an eigenvalue is greater than 1. So, the Kaiser-Guttman principle was considered when deciding the number of factors (Kline, 2005). In the present study, varimax rotation technique was used.

Tavşancıl (2014) recommends that the item factor load values of the items should be greater than 0.30. In the present study, the item factor load value was determined as 0.35. In the removal of items that do not measure the same structure in EFA, attention was paid to the fact that the item loadings were not higher than 0.35. In addition, common factor variances showing the relationship power of factors with the factor should be higher than 0.40. Common variance values of the items in the survey were between 0.41 and 0.71. Factor load factor values that explain the factors and factors obtained as a result of exploratory factor analysis are shown in Table 2.

Table 2.
PKST items and item factor load values

	Items	Common Variances	1. D	2.D	3.D	4. D	5. D	6. D*
Student Learning	1. Developing students' interest in learning.	,702	,782					
	2. Arousing students' interest in my subject area.	,709	,758					
	3. Infusing critical thinking appropriately in the lessons.	,622	,666					
	4. Infusing creative thinking appropriately in the lessons.	,584	,650					
	5. Facilitating and stimulating thinking among students.	,574	,661					
	6. Using student-centred teaching and learning activities.	,514	,552					
	7. Motivating students to work hard.	,484	,591					
	Explained Variances	%17,46						
Lesson planning	8. Choosing appropriate teaching strategies for teaching particular topics.	,666		,754				
	9. Choosing teaching strategies that match students' different ability levels.	,527		,603				
	10. Asking students the right questions to facilitate their learning.	,484		,532				
	11. Translating the syllabus into lessons for instruction.	,425		,472				
	12. Planning lessons that take into consideration the different abilities of students.	,649		,669				
	13. Determining appropriate teaching methods.	,652		,536				
	14. Planning student centred lessons.	,613		,599				
	Explained Variances	% 16,047						
Instructional support	15. Producing my own teaching materials	,712			,769			
	16. Acquiring appropriate teaching materials for my lessons	,700			,587			
	17.Incorporating information and communication technology (ICT) effectively in the classroom.	,640			,605			
	18. Designing assessment tools (e.g., written tests, oral tests, science practical, etc.)	,682			,686			
	20. Using appropriate forms of assessment.	,587			,484			
	21. Acquiring relevant subject matter content for instruction.	,435			,566			
	Explained Variances	% 7.297						
Accommodating diversity	22.Using evaluative feedback to assist students in their progress.	,537				,479		
	23. Teaching according to students' pace.	,530				,581		
	24. Diagnosing students' learning difficulties.	,593				,587		
	25.Responding sensitively to different student needs.	,638				,597		
	26. Managing student learning-groups effectively.	,531				,456		
	27.Managing individual students' learning effectively.	,580				,690		
	28.Monitoring students' learning and performance during lessons.	,514				,391		
	Explained Variances	%6,377						
Classroom management	29. Applying appropriate classroom management techniques.	,410					,453	
	30.Managing students with behavioral and learning problems.	,601					,522	
	31.Using appropriate strategies to monitor student behavior.	,509					,513	
	32. Managing student discipline.	,635					,711	
	Explained Variances	%6,079						
Care and concern	33. Managing co-curricular activities.	,598						,658
	34. Managing time effectively.	,592						,506
	35. Having coping skills	,702						,711
	36. Managing stress.	,575						,707
	37. Showing concern for the holistic development of students.	,671						,654
	38. Showing care and concern for students.	,676						,748
	Explained Variances	%5,539						
	Explained Total Variances	%59,063						

Table 2 presents the items and their factor load values. The original survey has six factors. When it was adapted to Turkish culture, the original survey did not lose any of its factors. However, only item 19 in `Instructional support` was removed as it was not sufficiently explained. When the item factor load values are taken into consideration, it is seen that the error variance of the item factor load value of item 19 in the "Instructional support" is 0.09. According to many researchers, the factor load factor of the factors should be greater than 0.30 (De Vellis, 2014; Seçer, 2013; Tavşancıl, 2014). Ferguson and Takane (1989) stated that the lower cut-off point should be taken as 0.40 for the item factor load value to ensure factor pattern. When this criterion was taken into consideration, the item 19, 'I assess students' performance based on the exam scores' was removed as it's factor load was 0.09. Thus, the EFA was conducted without subtracting item 19 from the survey and the item factor loadings of the item in "Instructional support" varied between 0.09 and 0.71. It was found that the item factor load value was between 0.43 and 0.71 after the EFA upon subtracting the item whose factor load value was below 0.30.

Lastly, the adapted survey has 6 factors and 37 items. These six factors explain 59,063% of the total variance of the feature. Considering that the variance rates varying from 40% to 60% are considered adequate in the analysis in social sciences (Tavşancıl, 2014), it can be argued that the amount of variance explained is sufficient.

Confirmatory Factor Analysis

The factor structure in the original survey needs to be confirmed to adapt Pedagogical Knowledge and Skills Survey to Turkish, and therefore CFA was employed. To demonstrate the adequacy of the model tested in CFA, several adaptation indices were used (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz & Demirel, 2012). * Table 3 presents acceptable and well-considered value ranges for the fit indices in accordance with the relevant literature and the values obtained in the study.

Table 3.
Results of confirmatory factor analysis

Compliance Index Model X^2/sd	*Optimum range $0<X^2/sd<2$	Acceptable Range $2<X^2/sd<3$	**PKST 3.00
RMSEA	0.00<RMSEA<0.05	0.05<RMSEA<0.10	0.05
PGFI	0.95<PGFI<1.00	0.50<PGFI<0.95	0.75
PNFI	0.95<PNFI<1.00	0.50<PNFI<0.95	0.89
GFI	0.90<GFI<1.00	0.85<GFI<0.90	0.87
AGFI	0.90<AGFI<1.00	0.85<AGFI<0.90	0.85
IFI	0.95<IFI<1.00	0.90<IFI<0.95	0.98
NFI	0.95<NFI<1.00	0.90<NFI<0.95	0.97
CFI	0.95<CFI<1.00	0.90<CFI<0.95	0.98

*Sümer, 2000; Schermelleh-Engel & Moosbrugger, 2003; Kline, 2005; Tabachnick & Fidell, 2007; Thompson, 2004; Jöreskog & Sörbom, 1993; Schumacher & Lomax, 1996; Hooper, Coughlan & Mullen, 2008; Brown, 2006. ** PKSS: Pedagogical Knowledge and Skills Survey

Fit indices in Table 3 are as follows; x2/sd=3.00, RMSEA=0.05, PGFI=0.75, GFI=0.87, AGFI=0.85, PNFI=0.89, IFI=0.98, NFI=0.97 and CFI=0.98. Taking these fit indices into consideration, it can be argued that the data confirms 6-dimensional theoretical construction. The study reveals that x2/sd=3.00. As $\chi 2$ is sensitive to the size of the sample, the $\chi 2$ value increases as the sample increases (Çokluk, Şekercioğlu & Büyüköztürk, 2012). The t values of the items in the six-factor structure are given in Table 4.

Table 4.
T values obtained from confirmatory factor analysis

Item	t	Item	T	Item	T	Item	T
1	21.31**	11	15.27**	22	19.03**	32	12.40**
2	21.40**	12	16.46**	23	19.60**	33	15.04**
3	22.94**	13	21.37**	24	18.00**	34	17.82**
4	22.60**	14	16.46**	25	19.07**	35	19.20**
5	20.51**	15	16.59**	26	18.77**	36	15.70**
6	17.96**	16	19.29**	27	19.16**	37	21.80**
7	15.19**	17	17.19**	28	18.66**	38	19.16**
8	20.15**	18	13.96**	29	19.05**		
9	19.07**	20	13.21**	30	18.83**		
10	17.36**	21	15.64**	31	18.57**		

Table 4 shows the t-test values for the model with six factors and 38 items. These values range between 15.19 and 22.94 in the "Student Learning"; 15.27 and 21.37 in the "Lesson planning"; 13.21 and 19.29 in the “Instructional support”; 18.66 and 19.60 in the `Accommodating diversity`, 12.40 and 19.05 in the “Classroom management” and 15.04 and 21.80 in "Care and concern". The literature suggests that the value of t should be higher than 1.96 and significant at the level of .05 and higher than 2.58 and significant at the level of .001 (Jöreskog & Sörbom, 1993; Kline, 2011). According to this, all t values in CFA, show significant difference at the level of .001except for item 19 (Byrne, 2010). Also, the values of t in this factor were between 13.21 and 22.94. The "Pedagogical Knowledge and Skill Survey” composed of 6 factors and 37 items was confirmed as a result of CFA.

Item Analyses

Item-total test correlation was used to determine if each item could measure what they should measure and to what extent each item was sufficient in distinguishing between the characteristics of measurement (Büyüköztürk et al., 2012). The item total test correlation describes the relationship between scores from test items and the total score of the test. If the correlation of an item with the total score is low, it indicates that the item measures a different quality than the other items in the scale (Karasar, 2014). Item-total test correlations have good distinguishing characteristics if items have a score of 0.30 or higher (Büyüköztürk, 2014; Erkuş, 2014). Table 5 shows the values of item analyses.

Table 5.
Results of item analysis of pedagogical knowledge and skill survey

Dimensions	No	% 27 Top group (n=168)		% 27 bottom group (n=168)				Item Total Test
		x	ss	X	ss	t	p	Correlation
Student learning	1	4,71	0,47	3,65	0,81	14,47	0,00	,605
	2	4,71	0,47	3,68	0,84	13,78	0,00	,629
	3	4,64	0,49	3,56	0,85	14,27	0,00	,654
	4	4,73	0,44	3,66	0,77	15,40	0,00	,627
	5	4,71	0,45	3,75	0,73	14,51	0,00	,622
	6	4,70	0,58	3,66	0,87	12,92	0,00	,627
	7	4,47	0,72	3,38	0,87	12,43	0,00	,536
Lesson planning	8	4,68	0,49	3,70	0,72	14,39	0,00	,655
	9	4,60	0,55	3,31	0,91	15,60	0,00	,601
	10	4,69	0,51	3,74	0,81	12,69	0,00	,580
	11	4,50	0,62	3,48	0,86	12,30	0,00	,546
	12	4,53	0,59	3,25	0,95	14,67	0,00	,571
	13	4,70	0,47	3,61	0,75	15,75	0,00	,671
	14	4,66	0,54	3,62	0,82	13,67	0,00	,585
Instructional support	15	4,50	0,63	3,37	0,99	12,40	0,00	,545
	16	4,64	0,58	3,50	0,84	14,41	0,00	,596
	17	4,64	0,51	3,36	0,88	16,18	0,00	,579
	18	4,40	0,91	3,42	0,95	9,57	0,00	,456

	20	4,33	0,78	3,29	0,92	11,18	0,00	,461
	21	4,64	0,53	3,66	0,85	12,69	0,00	,584
Accommodating diversity	22	4,70	0,45	3,67	0,77	14,89	0,00	,665
	23	4,59	0,56	3,46	0,82	14,69	0,00	,628
	24	4,50	0,62	3,39	0,86	13,37	0,00	,586
	25	4,53	0,54	3,53	0,72	14,27	0,00	,612
	26	4,59	0,53	3,51	0,77	14,89	0,00	,612
	27	4,53	0,53	3,50	0,75	14,38	0,00	,608
	28	4,63	0,50	3,62	0,77	14,21	0,00	,660
Classroom management	29	4,61	0,51	3,58	0,87	13,13	0,00	,637
	30	4,58	0,58	3,55	0,83	14,06	0,00	,588
	31	4,49	0,65	3,52	0,83	11,85	0,00	,594
	32	4,34	0,68	3,28	0,94	11,74	0,00	,458
Care and concern	33	4,54	0,68	3,47	0,90	12,15	0,00	,569
	34	4,59	0,64	3,58	0,83	12,31	0,00	,579
	35	4,53	0,60	3,47	0,81	13,46	0,00	,559
	36	4,35	0,78	3,34	0,90	10,87	0,00	,453
	37	4,77	0,44	3,57	0,84	16,23	0,00	,671
	38	4,78	0,45	3,78	0,93	12,49	0,00	,622

p<0.01

When the findings in Table 5 are considered, the item-total test correlation is between 0.45 and 0.67. This indicates that each item on the survey is compatible with the pedagogical knowledge and skills. Differences between top and bottom group mean scores of 27% were examined to determine whether the items with the desired characteristics where distinguished from those that did not have (Kılıç Çakmak, Çebi & Kan, 2014). Therefore, an independent t-test was used to determine the difference between the groups. The results show that t values changed between 9.57 (sd: 337, p <0.01) and 16.23 (sd: 337, p <0.01). According to Erkuş (2014), the significance of the t values for the differences between the top and bottom groups provides evidence for the distinctiveness of the item.

Findings Related to Reliability

Reliability is the ability of a measurement tool to produce consistent results (sensitive to random faults) (Tezbaşaran, 1996). In this study, the Cronbach Alpha internal consistency coefficient for the survey and its factors was calculated. The results are presented in Table 6.

Table 6.
Reliability results of PKST survey

Dimensions	**Cronbach Alpha**
Student Learning	0.88
Lesson planning	0.83
Instructional support	0.70
Accommodating diversity	0.86
Classroom management	0.73
Care and concern	0.83
Pedagogical Knowledge and Skill Survey	0.94

Table 6 presents the reliability coefficient for the Pedagogical Knowledge and Skill Survey and its factors. Cronbach Alfa reliability coefficient was used in reliability analysis. This coefficient was 0.88 for Student Learning;0.83 for "Lesson planning"; 0.70 for "Instructional support"; 0.86 for "Accommodating diversity"; 0.73 for "Classroom management"; and 0.83 for "Care and concern." Reliability analysis value should be at least 0.70 (Anderson, 1988; Kline, 1994; Nunnaly, 1978; Peers, 1996). Reliability analysis results indicate that the factors are highly reliable.

The relationship between the Survey and its dimensions

Pearson Correlation Analysis is used to identify the level of relationship between the survey and its factors. The results are presented in Table 7.

Table 7.
Pearson correlation analysis results

Dimensions	Pedagogical Knowledge and Skill Survey (PKSS)		
	N	r	p
Student Learning	625	0.82	0.00**
Lesson planning	625	0.87	0.00**
Instructional support	625	0.79	0.00**
Accommodating diversity	625	0.87	0.00**
Classroom management	625	0.79	0.00**
Care and concern	625	0.81	0.00**

p<0.01

When Table 7 is examined, it is seen that there is a high level of positive correlation between the survey and the factor (P <0.01). It can be said that the factors are highly correlated with the overall survey, indicating that a total score can be taken from the survey.

DISCUSSION and CONCLUSION

This research aims to provide a tool to measure the pedagogical knowledge and skill levels of teacher candidates and early career teachers and contribute to the Turkish literature. Different measurement tools have been developed to measure pedagogical knowledge and skills (Chong, et.al., 2008; Choy, et.al., 2011; Choy, et.al., 2012). The first of these tools was developed by Chong, et.al. (2008) and it included factors of facilitation, assessment, management, preparation, care and concern. Choy, et.al. (2011) built upon their previous work and conducted a longitudinal research to investigate the perception of pedagogical knowledge and skills of early career teachers. They used a measurement tool that has 6 factors (Student Learning, Lesson Planning, Instructional Support, Accommodating Diversity Classroom Management and Non-Teaching Duties) and 38 items. Later on, Choy, et.al. (2012) developed a measurement tool with a structure consisting of 37 items and six factors (student learning, lesson planning, instructional support, accommodating diversity, classroom management, and care and concern). When the studies on pedagogical knowledge and skill were examined, it was seen that the number of factors changed between four and six and items ranged between 34 and 38. Finally, the Pedagogical Knowledge and Skill Survey, consisting of 38 factors and six factors, was used by Wong et.al (2012) to measure pedagogical knowledge and skill. This research adapts this instrument to Turkish culture.

While adapting the survey to Turkish, the necessary permission was obtained via e-mail from the leading author. First, measures to ensure language reliability were taken. The standard back- translation technique proposed by Brislin (1986) was used to translate the survey. Lecturers with good English language skills translated the survey. Then, the consistency of the translation was examined by comparing the translations with each other. Later, a translation form was prepared, and Turkish translation form and original survey items were presented to language experts. The necessary corrections were made and the form was given to a language expert so that the materials in Turkish form can be translated into English again. The aim in this translation was to provide linguistic validity between the original survey items and its back translations.

CFA was used to determine whether six factors (student learning, lesson planning, instructional support, accommodating diversity, classroom management, care and concern) and the measurement model consisting of 38 items were verified by the data. Prior to confirmatory factor analysis, item analyses were conducted, and item-total test correlation was calculated. The high item-total correlation suggests that the items exemplify similar behaviors (Büyüköztürk et al., 2012). In this study, the item-total test correlation values changed between 0.45 and 0.67. This indicates that each item on the survey is completely coherent with the survey. In the study, a t-test was conducted to determine the significance of the difference between the item scores of the top 27% and bottom 27% groups. The values were found to be between 10.01 (sd: 337, $p < 0.01$) and 16.50 (sd: 337, $p < 0.01$). The significance of t values is an evidence of the distinctiveness of the material (Erkuş, 2014).

CFA was conducted after the item analyses. The CFA analysis showed that the item factor load value of item 19 was lower than 0.30 and the error variance was high. Therefore, this item was removed, and the analyses were repeated. The fit index of the survey are as follows; x2/sd=3.00, RMSEA=0.05, PGFI=0.75, GFI=0.87, AGFI=0.85, PNFI=0.89, IFI=0.98, NFI=0.97 and CFI=0.98. CFA fit indices verify psychological construct of six factors. T values of the subscale ranged between 15.19 and 22.94 for student learning, 15.27 and 21.37 for lesson planning, 13.21 and 19.29 for instructional support, 18.66 and 19.60 for accommodating diversity, 12.40 and 19.05 for classroom management, 15.04 and 21.80 for care and concern. CFA factor loads ranged between 0.74 and 0.70 for student learning, 0.58 and 0.75 for lesson planning, 0.49 and 0.70 for instructional support, 0.67 and 0.71 for accommodating diversity, 0.50 and 0.72 for classroom management, and 0.57 and 0.77 for care and concern. As a matter of fact, it can be said that the factor loads reflect the large effect sizes. Findings of CFA show that the survey is valid.

The reliability coefficient of the survey is 0.94. This coefficient is 0.88 for student learning, 0.83 for lesson planning, 0.70 for instructional support, 0.86 for accommodating diversity, 0.73 for classroom management and 0.83 for care and concern. This shows that the survey is reliable. The survey is a 5-point Likert scale. The lowest score one can get is 37 and the highest is 185. The results of analyses show that the survey is valid and reliable, and it has been successfully adapted to Turkish culture.

REFERENCES

Alkan, S., Korkmaz, E., Korkmaz, C., & Gelici, Ö. (2017). Determination of the relationship between pedagogical field knowledge in teaching mathematics of classroom teacher candidates. *Mustafa Kemal University Journal of the Faculty of Education, 1* (1), 15-25.

Amosun, M.D., & Kolawole, O. A. (2015). Pedagogical knowledge and skill competencies of pre-school teachers in Ibadan Metropolis, Oyo State, Nigeria. *Journal of the International Society for Teacher Education, 19* (2), 6-14.

An, S., Kulm, G., & Wu, Z. (2004). The pedagogical content knowledge of middle school, mathematics teachers in China and the U.S. *Journal of Mathematics Teacher Education, 7*(2), 145-172.

Anderson, L.W. (1988). Attitudes and their measurement. In J. P. Keeves (Ed.), Educational research, methodology and measurement: An international handbook (pp. 885-895). New York: Pergamon Press.

Aydeniz, M., & Kirbulut, Z.D. (2014). Exploring challenges of assessing pre-service science teachers' pedagogical content knowledge (PCK). *Asia-Pacific Journal of Teacher Education, 42*(2), 147–166. doi.org/10.1080/1359866X.2014.890696

Baumert, J., Kunter, M., Blum, W., Brunner, M., Voss, T. Jordan A et al. (2010). Teachers' mathematical knowledge, cognitive activation in the classroom, and student progress. *American Educational Research Journal, 47*(1), 133–180. doi: 10.3102/0002831209345157.

Balçın, M.D., & Ergün, A. (2016). Technological pedagogical content knowledge (TPCK) self-efficacy scale for pre-service science teachers on material development: Development, reliability and validity study. *Turkish Journal of Education, 5* (3), 130-143.

Brislin, R.W. (1986). The wording and translation of research instrument. In W. J. Lonner & J. W. Berry (Eds.), Field methods in cross-cultural research (pp. 137-164). Beverly Hills, CA: Sage.

Bukova-Güzel, E., Cantürk-Günhan, B., Kula, S., Özgür, Z., & Elçi, A.N. (2013). Scale development for pre-service mathematics teachers' perceptions related to their pedagogical content knowledge. *South African Journal of Education, 33* (2), 1-21.

Büyüköztürk, Ş., Kılıç-Çakmak, E., Akgün, Ö.E. Karadeniz, Ş., & Demirel, F. (2012). *Bilimsel araştırma yöntemleri* (Improved 11. Print). Ankara: Pegem Akademi Publishing.

Büyüköztürk, Ş. (2014). *Sosyal bilimler için veri analizi el kitabı: İstatistik, araştırma deseni spss uygulamaları ve yorum* (Expanded 20. Print). Ankara: Pegem Akademi Publishing.

Byrne, B.M. (2013). *Structural equation modeling with Mplus: Basic concepts, applications, and programming.* Routledge.

Canbazoğlu-Bilici, S., Yamak, H., Kavak, N., & Guzey, S.S. (2013). Technological pedagogical content knowledge self-efficacy scale (TPACK-SeS) for preservice science teachers: Construction, validation and reliability. *Eurasian Journal of Educational Research, 52*, 37-60.

Chong, S., Choy, D., & Wong, F.L. (2008, March). Pedagogical knowledge and skills of pre-service primary school teachers. Paper presented at the AARE Conference, Brisbane, Australia. Retrieved 15 October, 2015, from https://www.aare.edu.au/data/publications/2008/cho08307.pdf

Choy, Doris, Sylvia Chong, Angela F. L. Wong, & Isabella Y.-F. Wong. (2011). Beginning Teachers' Perceptions of Their Levels of Pedagogical Knowledge and Skills: Did They Change since Their Graduation from Initial Teacher Preparation? *Asia Pacific Education Review 12* (1), 79–87.

Choy, D., Lim, K.M., Chong, S., & Wong, Angela F.L. (2012). A confirmatory factor analytic approach on perceptions of knowledge and Skills in teaching (PKST). *Psychological Reports, 110* (2), 589-597. doi.org/10.2466/03.11.PR0.110.2.589-597.

Choy, D., Wong Angela, F.L., Lim, K.M., & Chong, S. (2013). Beginning teachers' perceptions of their pedagogical knowledge and skills in teaching: A three-year study. *Australian Journal of Teacher Education, 38*(5), 68-79. doi.org/10.14221/ajte.2013v38n5.6.

Çokluk, Ö., Şekercioğlu, G., & Büyüköztürk, Ş. (2012). *Sosyal bilimler için çok değişkenli istatistik spss ve lisrel uygulamaları* (2. Print). Ankara: Pegem Akademi Publishing.

De Vellis, R.F. (2014). *Ölçek geliştirme: Kuram ve uygulamalar* (Ed. Tarık Totan). Ankara: Nobel Publishing.

Erkuş, A. (2014). *Psikolojide ölçme ve ölçek geliştirme-I: Temel kavramlar ve işlemler* (2. Ed). Ankara: Pegem Publishing.

Ferguson, G. A., & Takane, Y. (1989). *Statistical analysis in psychology and education* (6th ed.). New York: McGraw-Hill.

Hill, H.C. (2010). The nature and predictors of elementary teachers' mathematical knowledge for teaching. *Journal for Research in Mathematics Education, 41 (5)*, 513–545. doi:10.2307/41110412.

Hill, H.C., Ball, D.L., & Schilling, S.G. (2008). Unpacking pedagogical content knowledge: conceptualizing and measuring teachers' topic-specific knowledge of students. *Journal for Research in Mathematics Education, 39*(4),372-400.

Hill, H.C., Rowan, B., & Ball, D.L. (2005). Effects of teachers' mathematical knowledge on student achievement. *American Educational Research Journal, 4*(2), 371–406. doi: 10.3102/00028312042002371

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural Equation Modelling: Guidelines for Determining Model Fit. *Electronic Journal of Business Research Methods*, 6(1), 53-60.

Jöreskog, K.G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the simple's command language*. Lincolnwood: Scientific Software International, Inc.

Kabakçı-Yurdakul, I., Odabaşı, H.F., Kılıçer, K., Coklar, A.N., Birinci, G., & Kurt, A.A. (2012). The development, validity and reliability of TPACK-deep: A Technological Pedagogical Content Knowledge Scale. *Computers and Education, 58* (3), 964-977. doi.org/10.1016/j.compedu.2011.10.012.

Karasar, N. (2014). *Bilimsel araştırma yöntemleri: kavramlar, teknikler ve ilkeler* (27. Print). Ankara: Nobel Publishing.

Karp, A. (2010). Analyzing and attempting to overcome prospective teachers' difficulties during problem solving instruction. *Journal of Mathematics Teacher Education, 13*(2), 121-139.

Kaya, S., & Dağ, F. (2013). Turkish Adaptation of Technological Pedagogical Content Knowledge Survey for Elementary Teachers. *Educational Sciences: Theory & Practice, 13*(1), 302-306.

Kaya, Z., Kaya, O.N. & Emre, İ. (2013). Adaptation of Technological Pedagogical Content Knowledge Scale to Turkish. *Educational Sciences: Theory & Practice, 13* (4), 2367-2375.

Kersting, N.B., & Givvin, K.B., Thompson, B.J., Santagata, R., & Stigler, J.W. (2012). Measuring usable knowledge teachers' analyses of mathematics classroom videos predict teaching quality and student learning. *American Educational Research Journal, 49*(3), 568–589. doi.org/10.3102/0002831212437853.

Kılıç Çakmak, E., Çebi, A., & Kan, A. (2014). Developing a social presence scale for e learning environments. *Educational Sciences: Theory& Practice, 14* (2), 764-768.

Kleickman, T., Richter, D., Kunter, M., Elsner, J., Besser, M., Krauss, S., Cheo, M., & Baumert, J. (2015). Content Knowledge and Pedagogical Content Knowledge in Taiwanese and German mathematics teachers? *Teaching and Teacher Education, 46*, 115-126.

Kline, R.B. (1994). [*Review of Handbook of psychological assessment*, Goldstein and Herson (Eds., 1990).] *Journal of Psycho Educational Assessment, 12*, 180-185.

Kline, R.B. (2011). *Convergence of structural equation modeling and multilevel modeling.* In M. Williams & W. P. Vogt (Eds.), Handbook of methodological innovation in social research methods (pp. 562-589). London: Sage.

Koirala, H.P., Davis, M., & Johnson, P. (2008). Development of a performance assessment task and rubric to measure prospective secondary school mathematics teachers' pedagogical content knowledge and skills. *Journal of Mathematics Teacher Education*, 11, 127–138.

König, J., Blömeke, S., Klein, P., Suhl, U., Busse, A., & Kaiser, G. (2014). Is Teachers' General Pedagogical Knowledge a premise for noticing and interpreting classroom situations? A video-based assessment approach. *Teaching and Teacher Education*, 38, 76-88. doi.org/10.1016/j.tate.2013.11.004.

König, J., Blömeke, S., & Kaiser, G. (2015). Early Career Mathematics Teachers' General Pedagogical Knowledge and Skills: Do Teacher Education, Teaching Experience, and Working Conditions Make a Difference? *International Journal of Science and Mathematics Education*, 13; 331-350. https://doi.org/10.1007/s10763-015-9618-5

König, J., Blömeke, S., Paine, L., Schmidt, W.H., Hsieh, F.J. (2011). General Pedagogical Knowledge of Future Middle School Teachers: On the Complex Ecology of Teacher Education in the United States, Germany, and Taiwan. *Journal of Teacher Education, 62* (2),188-201. doi.org/10.1177/0022487110388664.

König, J., Ligtvoet, R., Klemenza, S., & Rothland, M. (2017). Effects of opportunities to learn in teacher preparation on future teachers' general pedagogical knowledge: Analyzing program characteristics and outcomes. *Studies in Educational Evaluation*, 53, 122-133. doi.org/10.1016/j.stueduc.2017.03.001.

Köse, M., & Selvi, M. (2016). A valid and reliable pedagogical content knowledge scale developing research: Example of cell divisions topic. *Electronic Turkish Studies, 11* (9), 559-578. 10.7827/TurkishStudies.9508.

Nunnaly, J. (1978). *Psychometric theory*. New York: McGraw-Hill

Özel, M., Timur, B., Timur, S., & Bilen, K. (2013). The adaptation of students' perceptions of college teachers' pedagogical content knowledge questionnaire into Turkish. *Journal of Kırşehir Faculty of Education, 14* (1), 407-428.

Öztürk, E., & Horzum, M.B. (2011). Teknolojik pedagojik içerik bilgisi ölçeğinin Türkçe'ye uyarlaması. *Journal of Kırşehir Faculty of Education, 12* (3), 255-278.

Peers, I. (1996). *Statistical analysis for education and psychology researchers: Tools for researchers in education and psychology*. London: Falmer Press.

Ponte, J.P., & Chapman, O. (2006). *Mathematics teachers' knowledge and practices*. In A. Gutierrez & P. Boero (Eds.), Handbook of research on the psychology of mathematics education: Past, present and future (pp. 461–494). Roterdham: Sense Publishers.

Sánchez, M. (2011). A review of research trends in mathematics teacher education. *PNA*, 5(4), 129-145.

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of- fit measures. *Methods of psychological research* Pedagog_cal knowledge and sk_ll, *8*(2), 23-74.

Seçer, İ. (2015). *SPSS ve Lisrel ile pratik veri analizi: Analiz ve raporlaştırma*. Ankara: Anı Publishing.

Schumacher, R.E., & Lomax, R.G. (1996). *A beginner's guide to SEM*. New Jersey: Mahwah.

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

Shulman, L.S. (1987). Knowledge and the Teaching: Foundations of the new reform. *Harvard Educational Review*, 57, 1-22. doi.org/10.17763/haer.57.1.j463w79r56455411.

Sıvacı, S.Y. (2017). Examining Primary Education Senior Students' Field Knowledge Competence and Attitudes Towards Mathematic: A Comparative Research. *International Journal of Eurasia Social Sciences, 8*(26), 244-255.

Silverman, J., & Thompson, P.W. (2008). Toward a framework for the development of mathematical knowledge for teaching. *Journal of Mathematics Teacher Education, 11* (6), 499-511.

Sümer, N. (2000). Yapısal eşitlik modelleri: Temel kavramlar ve örnek uygulamalar. *Türk Psikoloji Yazıları, 3*(6), 49-74.

Şahin, İ. (2011). Development of survey of technological pedagogical and content knowledge (TPACK). *Turkish Online Journal of Educational Technology, 10* (1), 97-105.

Tabachnick, B.G., & Fidell, L.S. (2007). *Multivariate analysis of variance and covariance. Using multivariate statistics*, 3, 402-407.

Tatto, M.T., Schwille, J., Senk, S., Ingvarson, L., Peck, R., & Rowley, G. (2008). Teacher Education and Development Study in Mathematics (TEDS-M): Conceptual framework. East Lansing: Michigan State University

Tavşancıl, E. (2014). *Tutumların ölçülmesi ve spss ile veri analizi*. Ankara: Nobel Publishing.

Tezbaşaran, A. A. (1996). *Likert tipi ölcek gelistirme kılavuzu* [Guide for Likert type scale development]. Ankara: Türk Psikologlar Derneği.

Thompson, B. (2004). *Exploratory and confirmatory factor analysis: Understanding concepts and applications.* American Psychological Association.

Timur, B., & Taşar, M.F. (2011). The Adaptation of the Technological Pedagogical Content Knowledge Confidence Survey into Turkish. *Gaziantep University Social Sciences Journal, 10* (2), 839-856.

Wong, A. F. L., Chong, S., Choy, D., Wong, I. Y-F., & Goh, K. C. (2008). A comparison of perceptions of knowledge and skills held by primary and secondary teachers: from the entry to exit of their preservice program. *Australian Journal of Teacher Education, 33*(3), 77-93. doi.org/10.14221/ajte.2008v33n3.6.

Wong, A., Chong, S., Choy, D., & Lim, K.M. (2012). Investigating changes in pedagogical knowledge and skills from pre-service to the initial year of teaching. *Educational Research for Policy and Practice, 11*,105–117. Doi:10.1007/s10671-011-9108-7

Yılmaz, Z., & Haser, Ç. (2018). Pre-Service teachers' restructuring of mathematical content knowledge in a learning trajectories based instruction. *Elementary Education Online, 17* (1), 187-206.

APPENDIX 1. Pedagogical Knowledge and Skills Survey in Turkish

Pedagojik Bilgi ve Beceri Anketi					
1. Öğretim sırasında öğrencilerin öğrenmeye olan ilgilerini artırırım.					
2. Kendi konu alanıma öğrencilerin ilgisini çekerim.					
3. Derslerimde yeri geldikçe eleştirel düşünmeye yer veririm.					
4. Derslerimde yeri geldikçe yaratıcı düşünmeye yer veririm.					
5. Öğrenciler arasında düşünmeyi özendirir ve bu konuda gereken kolaylığı sağlarım.					
6. Öğrenci merkezli öğrenme ve öğretme etkinlikleri kullanırım.					
7. Öğrencileri çok çalışmaları için motive ederim.					
8. Öğrettiğim konuya uygun öğretim yöntemlerini seçerim.					
9. Öğrencilerin farklı yetenek seviyeleriyle uyuşacak öğretim yöntemleri seçerim.					
10. Öğrencilere öğrenmelerini kolaylaştırmak için uygun sorular sorarım.					
11. Öğretim içeriğini-müfredatı derslere bölerek işlerim.					
12. Öğrencilerin farklı yeteneklerini dikkate alarak derslerimi planlarım.					
13. Dersin içeriğine uygun öğretim yöntemlerini belirlerim.					
14. Derslerimi öğrenci merkezli olarak hazırlarım.					
15. Kendi öğretim materyallerimi hazırlayabilirim.					
16. erslerim için uygun öğretim materyalleri edinirim.					
17. Derslerimde öğretim teknolojilerinden en etkili şekilde yararlanırım.					
18. lçme-Değerlendirme araçlarımı (yazılı sınavlar, sözlü sınavlar, testler vb.) hazırlarım.					
19. Öğretim boyunca uygun değerlendirme formlarını kullanırım.					
20. Öğretimim için içerikle ilgili konuları içeren kaynaklar edinirim.					
21. Öğrencilerimin gelişimlerine yardımcı olmak için değerlendirme amaçlı dönütler veririm.					
22. Öğrencilerin öğrenme hızına göre öğretimimi gerçekleştiririm.					
23. Öğrencilerimin öğrenme güçlüklerini tespit ederim.					
24. Öğrencilerin farklı ihtiyaçlarına hassasiyetle karşılık veririm.					
25. Öğrencilerin grup çalışmalarını etkili biçimde kontrol ederim.					
26. Öğrencilerin bireysel öğrenmelerini etkili biçimde kontrol ederim.					
27. Ders sırasında öğrencilerin öğrenme ve performanslarını gözlemlerim.					
28. Ders içinde uygun sınıf yönetimi tekniklerini kullanırım.					
29. Davranış ve öğrenme problemi olan öğrencileri kontrol ederim.					
30. Öğrenci davranışlarını gözlemlemek için uygun stratejiler kullanırım.					
31. Öğrencileri disipline ederim.					
32. Müfredata yardımcı etkinlikler düzenlerim.					
33. Zamanı etkili şekilde kullanırım.					
34. Güçlüklerle başa çıkma becerisine sahibimdir.					
35. Stresle başa çıkarım.					
36. Öğrencilerimin her açıdan gelişimi için gerekli ilgiyi gösteririm.					
37. Öğrencilerime her konuda gerekli ilgi ve özeni gösteririm.					

TÜRKÇE GENİŞLETİLMİŞ ÖZET

Öğretmen yeterliliği, içerik bilgisi (CK), pedagojik içerik bilgisi (PCK) ve genel pedagojik bilginin (GPK) yanı sıra algılama, yorumlama ve karar verme becerilerinden oluşan çok boyutlu bir yapı olarak kabul edilir (König, Blömeke & Kaiser, 2015). Pedagojik bilgi, öğretme bilgisi olarak öğretmen etkililiği için bir koşul olarak içeriğin nasıl öğretileceğini bilmeyi içerir (Hill, Rowan & Ball, 2005). Pedagojik bilgi ve beceri, öğrenmenin gerçekleşmesini sağlayan öğretimsel teknikler ve stratejilerle ilgilidir ve öğretmenleri öğrenmeyi kolaylaştırıcıların, koçların, modellerin, değerlendiricilerin, yöneticilerin ve savunucuların rollerini üstlenmeye teşvik eder.

Son yıllarda öğretmen adayları ve göreve yeni başlayan öğretmenlerin pedagojik bilgi ve becerilerini değerlendiren ölçme araçları geliştiren araştırmalar yapılmaktadır. Bunlardan Chong, Choy ve Wong (2008) hizmet öncesi eğitim programlarının giriş ve çıkışında, Singapurda Eğitimde Yüksek Lisans Diploması programındaki öğretmen adaylarının öğretmenlik alanındaki pedagojik bilgi ve beceri algılarını incelemişlerdir. Kullanılan ölçme aracı, beş faktörlü 34 maddeye sahiptir. Bunlar Kolaylaştırma; Değerlendirme; Yönetim; Hazırlık ve Bakım ve Endişe'dir. Bu araştırmayı Choy, Chong, Wong ve Wong'ın (2011) bir başka çalışması izlemiştir. Yazarlar kariyerlerinin başındaki öğretmenlerin, bir yıllık hazırlık programının sonunnda ve bir yıllık öğretimlerinden sonraki pedagojik bilgi ve becerilerine ilişkin algılarındaki değişiklikleri araştırmışlardır. Anketin orjinaji 50 maddeden oluşmakla birlikte araştırma amacı doğrultusunda yalnızca 38 maddeye verilen cevaplar analize dahil edilmiştir. Faktor analizi sonucunda 38 maddelik anketin 6 faktörden oluştuğu görülmüş ve anketten 4 madde çıkarılmıştır. Ortaya çıkan faktörler sırasıyla "Öğrenci Öğrenimi; Dersi Planlama; Öğretim Desteği, Çeşitliliğe Alışma; Sınıf Yönetimi ve Öğretim Dışı Görevler"dir. Bu araştırmadan sonra Choy, Lim, Chong ve Wong (2012) doğrulayıcı faktör analizi kullanarak Öğretimde Pedagojik Bilgi ve Beceri Algısı (Perceptions of Knowledge and Skills in Teaching: PKST) anketinin faktör geçerliliğini sunmuşlardır. Araştırmacılar, PKST'nin boyutluluğuna dair bir bakış açısı elde edebilmek için daha önceki bir veri setindeki açımlayıcı faktör analizini (AFA) kullanmışlardır (Wong, Chong, Choy, Wong, & Goh, 2008). AFA''dan çıkarılan boyutlarla, faktör modelini çapraz doğrulamak için sonraki veri setlerinde doğrulayıcı faktör analizi (DFA) yapılmıştır. Bununla birlikte, değişiklik göstergelerine daha yakından bakıldığında, Öğrenci Öğreniminde 7. madde ile Bakım ve Endişe boyutundaki 6. madde arasında güçlü bir kovaryans olduğu görülmüş ve araştırmacılar model uyumunu iyileştirmek için SL7 nolu maddeyi ölçekten çıkarmışlardır. Aynı yıl Wong, Chong, Choy ve Lim (2012), 38 maddelik 6 faktörlü PKST anketini kullanarak Singapur Ulusal Eğitim Enstitüsü'nün Yüksek Lisans Diploması programına kayıtlı olan öğretmen adaylarının pedagojik bilgi ve beceri algılarını değerlendirmiştir.

Literatürden anlaşıldığı gibi öğretmen eğitimi programlarına devam eden veya mezun olup göreve başlayan öğretmenlerin pedagojik bilgi ve becerilerini kapsamlı bir şekilde ölçen bir ölçme aracı geliştiren Wong, vd. (2012) Singapur'daki öğretmen adayları ve görevlerinin ilk üç yılında olan öğretmenlere geliştirdikleri ölçeği uygulamışlardır. Ülkemizde ise son yıllarda öğretmen adayları ve öğretmenlerle yapılan araştırmalarda PCK (pedagogical content knowledge) (Bukova-Güzel., vd., 2013; Köse & Selvi, 2016; Özel, vd., 2013) ve özellikle de TPCK (technological pedagogical content knowledge) (Aydeniz & Kirbulut, 2014; Balçın & Ergün, 2016; Canbazoğlu-Bilici, vd.,2013; Kabakçı-Yurdakul, vd., 2012; Kaya & Dağ, 2013; Kaya, Kaya & Emre, 2013; Öztürk & Horzum, 2011; Şahin, 2011; Timur & Taşar, 2011) bilgilerinin ölçümüne yönelik olarak ölçek uyarlama ve geliştirme araştırmaları yapılsa da genel pedagojik bilgi ve becerileri ölçen araçların eksikliği göze çarpmaktadır. Bu nedenle, mevcut çalışma söz konusu ihtiyacı karşılamak üzere Wong, vd. (2012) tarafından geliştirilen PKST'nin ülkemizde kullanılması için uyarlanması amacıyla yürütülmüştür.

38 madde ve 6 faktörden oluşan "Pedagojik Bilgi ve Beceri" ölçeğinin Türkçe'ye uyarlanması amacıyla sorumlu yazar olan Dorish Choy & Angela F.L.'den gerekli izin alınmıştır. Ölçme aracının dil geçerliği için Brislin (1986) tarafından önerilen standart çeviri-geri çeviri yöntemi kullanılmıştır. Maddeler

İngilizceden Türkçeye, sonrasında Türkçe'den İngilizce'ye çevrilmiştir. Çevrilen maddeler birbirleriyle karşılaştırılmıştır. Farklı olan maddeler tekrar İngilizceye çevirilerek original ölçeğe en yakın çeviriler belirlenerek Türkçe deneme formu oluşturulmuştur. Oluşturulan deneme formu iki farklı üniversitenin (Kırıkkale Üniversitesi ve Karadeniz Teknik Üniversitesi) farklı öğretmenlik bölümlerindeki (Fen Bilgisi, Sosyal Bilgiler, İlköğretim Matematik, Beden Eğitimi ve Ortaöğretim Matematik) iki farklı gruba uygulanmıştır. Birinci grup (110'u kadın ve 95'i erkek) toplam 205 öğretmen adayından oluşmuştur. Bu çalışma grubu üzerinde Açımlayıcı Faktör Analizi (AFA) yapılmıştır. İkinci çalışma grubuna (330'u kadın ve 295'i erkek) toplam 625 öğretmen adayı dahil edilmiştir. Çalışma toplam 830 öğretmen adayı üzerinde gerçekleştirilmiştir.

Veriler elde edildikten sonra cevaplamada herhangi bir hata ve eksik bulunan kağıtlar çıkartılmış, veriler böylece değerlendirmeye alınmıştır. Bu amaçla ilk olarak madde analizleri (Madde toplam test korelasyonu ve %27 alt-üst grup karşılatırması) gerçekleştirilmiştir. Ardından yapı geçerliği için analizler uygulanmıştır. Bu amaçla ilk olarak aynı yapıyı ölçen değişkenleri (maddeleri) bir araya toplayarak daha az sayıda değişken ile açıklamayı amaçlayan istatistiksel teknik olan Açımlayıcı Faktör Analizi (AFA) kullanılmıştır. Altı boyut ve 37 maddeden oluşan bir yapı tespit edilmiştir. Bu yapı orjinal ölçek ile benzer göstermekte olup, sadece ölçeğin 3. boyutunda yer alan 19. maddenin madde faktör yük değerinin düşük olması ve birden fazla faktöre yük vermesinden (binişik olması) dolayı ölçekten çıkartılmıştır. Ölçekte yer alan madde faktör yük değerleri 0.39 ile 0.81 arasında yer almaktadır. Ölçeğin birinci boyutunda bu değerler 0.55 ile 0.78 arasındadır. Ikinci boyutta 0.47 ile 0.75 arasında değerler almaktadır. Üçüncü boyuttaki madde faktör yük değerleri 0.48 ile 0.76 arasında değerleri içermektedir. Ölçeğin dördüncü boyutuna ise bu değerler 0.39 ile 0.69 arasındadır. Beşinci boyutta yer alan madde faktör yük değerleri 0.45 ile 0.71 arasındadır. Ölçeğin son boyutundaki madde faktör yük değerleri 0.50 ile 0.74 arasındadır. Bir çok araştırmacıya göre madde faktör yük değerinin 0.30'dan yüksek olması gerekmektedir (De Vellis, 2014; Seçer, 2013; Tavşancıl, 2014). Mevcut bulgular dikkate alınırsa, ölçekte yer alan maddelerin mevcut faktörleri açıklama düzeyinin iyi olduğu söylenebilir. Ardından mevcut yapının farklı örneklem ya da farklı kültürel yapıda benzer yapıyı gösterip göstermediğini test etmek amacıyla Doğrulayıcı Faktör Analizi (DFA) yapılmıştır. Elde edilen fit indeks değerleri (x2/sd=3.00, RMSEA=0.056, PGFI=0.75, GFI=0.87, AGFI=0.85, PNFI=0.89, IFI=0.98, NFI=0.97 ve CFI=0.98) altı boyuttan oluşan yapının Türkçeye uyduğunu göstermiştir. Ölçme aracının güvenirliğine yönelik olarak Cronbach Alpha katsayısı hesaplanmıştır. Bu değer ölçeğin geneli için 0.94'tür. Ölçeğin alt boyutları için güvenirlik değerleri ise 0.70 ile 0.88 arasında bulunmuştur. Bu değerler ölçme aracının güvenilir ölçüm yaptığını göstermektedir. Ölçme aracının geneli ve alt boyutları arasındaki ilişkinin de yüksek olduğu ve bu değerlerin 0.79 ile 0.87 arasında değiştiği saptanmıştır.

Sonuç olarak, yapılan geçerlik ve güvenirlik analizleri doğrultusunda; PKST ölçeği için 6 boyut ve 37 maddeden oluşan bir yapı elde edilmiştir. Bu ölçme aracı 5'li likert tipinde olup, ölçekten alınabilecek en düşük ve en yüksek puanlar sırasıyla 37 ile 185'tir. Ölçme aracının tüm maddeleri olumlu olup, tersten puanlanması gereken madde bulunmamaktadır. Analizler sonucunda elde edilen bulgular dikkate alındığında; "Pedagojik Bilgi ve Beceri" ölçeğinin Türk kültürüne uygun bir ölçme aracı olduğu söylenebilir.