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Adaptation of The Real and Electronic Communication Skills Questionnaire to Turkish Samples: Validity and Reliability Study

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Abstract

The aim of this research is to adapt the Real and Electronic Communication Skills Scale (RECS) to Turkish samples. The study consists of two stages. In the first stage, linguistic validity, exploratory factor analysis, Cronbach's alpha coefficient, test-retest, and item analysis studies were conducted with 680 adolescents. In the second stage, confirmatory factor analysis (CFA) and concurrent validity were carried out with 409 participants. The findings obtained in the first stage indicated that the Real Communication Skills (RCS) subscale and the Electronic Communication Skills (ECS) subscale explained 60.64% and 58% of the total variance, respectively. It was determined that item factor loads varied between .62 and .89 for RCS and between .55 and .89 for ECS. The internal consistency coefficient and test-retest values were good. As a result of the CFA performed in the second stage, the goodness of fit indexes of the scale were good (χ^2=803.43; df=451; χ^2/df=1.78; p=0.00; RMSEA=.044; SRMR=.04; GFI=.90; AGFI=.85; CFI=.98; NFI=.95; IFI =.98; RFI = .95). The concurrent validity analyses indicated that it had significant relationships with the Social Skills Scale, the Communication Skills Scale, and the Shyness Scale. As a result, it can be said that the Turkish Form of RECS can be used by researchers and practitioners, validity, and reliability.

Keywords: Communication skills, validity, reliability, scale adaptation.

Gerçek ve Elektronik İletişim Becerileri Envanterinin Türk Örneklemine Uyarlaması: Geçerlik ve Güvenirlik Çalışması

Öz

Bu araştırmanın amacı, Gerçek ve Elektronik İletişim Becerileri Ölçeği'ni (GEİBÖ) Türkiye örneklemine uyarlamaktır. Araştırma iki aşamadan oluşmaktadır. İlk aşamada dil geçerliği, açımlayıcı faktör analizi, Cronbach alfa katsayısı, test-tekrar test ve madde analizi çalışmaları 680 ergen ile yapılmıştır. İkinci aşamada doğrulayıcı faktör analizi (DFA) ve uyum geçerliği çalışması 409 katılımcı ile yapılmıştır. Birinci aşamada elde edilen bulgular, Gerçek İletişim Becerileri (RCS) alt ölçeğinin ve Elektronik İletişim Becerileri (ECS) alt ölçeğinin sırasıyla toplam varyansın %60.64'ünü ve %58'ini açıkladığını göstermiştir. Madde faktör yüklerinin RCS için .62 ile .89 arasında, ECS için .55 ile .89 arasında değiştiği belirlenmiştir. İç tutarlılık katsayısı ve test-tekrar test değerleri iyi düzeyde bulgulanmıştır. İkinci aşamada yapılan DFA sonucunda ölçeğin uyum iyiliği indeksleri iyi bulunmuştur (χ^2=803.43; df=451; χ^2/df=1.78; p=0.00; RMSEA=.044; SRMR= .04; GFI=.90; AGFI=.85; CFI=.98; NFI=.95; IFI =.98; RFI = .95). Uyum geçerlik analizleri, Sosyal Beceriler Ölçeği, İletişim Becerileri Ölçeği ve Utangaçlık Ölçeği ile anlamlı ilişkileri olduğunu göstermiştir. Sonuç olarak RECS'nin Türkçe Formunun araştırmacılar ve uygulayıcılar tarafından kullanabilir geçerlik ve güvenilir olduğu söylenebilir.

Anahtar kelimeler: İletişim becerileri, geçerlik, güvenirlik, ölçek uyarlama.

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INTRODUCTION

In the last 30 years, developments in the field of technology have also led to changes in the communication and socialization styles of people. Today, face-to-face interaction and communication have been replaced by forms of communication in the electronic environment. As the environment in which people interact has shifted from real life to the electronic environment, the problems they experience have also changed.

Internet use in the fields of social media, WhatsApp, messaging, social networking, e-mail, and instant messaging is increasing rapidly among young people in Turkey as well as all over the world (Brown, 2013; DeVito et al., 2015; Jin & Park, 2012; Sampathirao, 2016). Adolescents tend to socialize in virtual environments to go beyond the boundaries of communication (Uçar, 2012), exchange ideas (Karaca, 2007), and socialize (Göker et al., 2010; Subrahmanyam et al., 2008; Yegen, 2013). One of the main reasons for intensive internet use among young people is seen as socialization (Sanchez et al., 2015). For this reason, Social Enhancement Theory and Social Compensation Theory (McKenna et al., 2002; Valkenburg et al., 2005), which explains the relationship between internet use and social skills, has emerged in recent years.

According to the Social Enhancement Theory, individuals with social competencies in real life use the Internet to further improve their social connections (Valkenburg et al., 2005). These people establish rich relationships by maintaining their real-life social networks in the electronic environment. According to the Social Compensation Theory, individuals who have difficulties in establishing and maintaining healthy interpersonal relationships in real life and with inadequate social communication networks try to compensate for these inadequacies with more comprehensive online social networks (McKenna et al., 2002; Valkenburg et al., 2005). These people, who are unable to socialize in real life, try to meet their social and emotional needs through social networks in the electronic environment. In short, although the functioning of both theories is different, they intend to meet the needs of people by strengthening their social ties in the electronic environment. Such theories increase the interest in how behaviors exhibited in real life and the electronic environment affect people. Research has shown that the happiness level of individuals who can communicate well in real life increases (Can, 1997; Karabela, 2020) and that they feel emotionally safe (Erözkan, 2009), while it is seen that individuals who cannot communicate in a healthy way experience feelings of worthlessness and inadequacy and become introverted (Erten-Sarıkaya, 2021).On the contrary, it is seen that individuals who are shy (Crapparo et al., 2014; Eldeleklioğlu & Vural, 2013), have social anxiety (Caplan, 2006), have low self-confidence (Mitchell, 1999), have weak social relationships (Sanders et al., 2000), and are anxious (Shalom et al., 2015) prefer to communicate in electronic environments rather than in face-to-face communication environments in daily life (Yiğit, 2015), and they try to establish the relationships that they cannot establish and the sociality that they cannot have in daily life on the Internet (Celkan, 2005). In short, studies supporting both theories have been found.

It is seen that individuals who communicate in a healthy way through electronic means can use their rights effectively, criticize others or ideas, face the consequences of their behaviors, are determined to cooperate with others, display a constructive attitude in their sharing, and are extroverted and open to new experiences (Çubukcu & Bayzan, 2013; Konuk, 2019). Individuals who cannot communicate in a healthy way in the electronic environment prefer to criticize and argue with the other person instead of understanding them, resort to lies, use bad words (swearing, slang, etc.) and expressions during communication (Karaca, 2007; Utma, 2019). In addition, it is stated that these individuals give false information about themselves, are far from ethical rules, have a violent and aggressive attitude, and tend to harm others (Ceyhan & Ceyhan, 2008). It is seen that individuals who cannot use their electronic communication skills in a healthy way are alienated from people by moving away from the purpose of socialization (Orta, 2009). Moreover, it is stated that these individuals experience negative emotional states, such as fear, depression, anxiety, and loneliness (Ceyhan, 2011; Konuk, 2019; Şahin & Gülnar, 2016; Yang &Tung, 2007).

In summary, the results of the research show that having healthy communication skills, both in real life and in the electronic environment, is the most basic element for meeting the socialization needs of individuals. Emotions, thoughts, and behaviors that affect individuals' ability to take a place in society, exhibit behaviors appropriate to the social environment, and communicate positively with other individuals are called social skills (Samancı & Uçan, 2017). Mutual sincerity, active listening, effective feedback, empathy, respect, and transparency stand out as important skills in connecting with others (Altay, 2012; Barnett, 1990; Erdem, 2013; Kaya, 2014; Mckay et al. 2012; Sabuncuoğlu & Gümüş, 2008; Voltan-Acar, 1995; Yuksel, 2004). In short, sociability, self-disclosure, emotion decoding, and acting effectively are the core of social skills.

With technological development, studies on socialization and social skills tend to reveal the behaviors exhibited both in real life and in the electronic environment. These studies generally focus on evaluating

individuals' real-life social skills and how they affect internet use. In other words, only real-life social skills have been equated to electronic social skills in most studies. Due to the characteristics of real life and the electronic environment, there can be differences in the forms of social skills exhibited by individuals. So far, no tool has been found to measure social skills by separating them according to real-life and electronic contexts. As a matter of fact, existing scales related to social skills are intended to measure social skills in real life (Aksoy & Baran, 2020; Durualp, 2009; Kılıç & Güngör-Aytar, 2017; Kortut Owen & Bugay, 2014; Tepeli & Arı, 2011). Today, individuals spend a lot of time in electronic environments, and they meet their needs such as communication and socialization in these environments. Therefore, measuring communication skills in both real life and virtual environments simultaneously can facilitate the understanding of individuals' behaviors in both.

Purpose of the Research

In this research, it is aimed to adapt the Real and Electronic Communication Skills Scale (Mantzouranis et al. 2019) to Turkish. The research was carried out in two studies. The research was conducted in two stages. The stages of the research are given in order below.

METHOD

Study 1

Linguistic Validity

The standard procedure was followed in adapting the scale to Turkish (Beaton et al., 2000). Firstly, permission was obtained from the first author who developed the scale before the research was conducted. The language of the original version of the scale is English. The English-Turkish translation of the scale was done by two bilingual experts in psychology. Turkish-English back translation was done by two different bilingual experts in psychology. Finally, after the Turkish and English forms completed by two different field experts were compared and the translation conformity of the items was checked, the final form of the scale to be applied in the study was determined.

Participants

At this stage, the sample consisted of 680 volunteer high school students (50.1% females [n=341], 49.9% males [n=339]). The ages of the participants ranged from 15 to 18 (16.23±1.03). Of the high school students, 211 (31.0%) were 9th-grade, 193 (28.4%) were 10th-grade, 186 (27.4%) were 11th-grade, and 90 (13.2%) were 12th-grade students.

Data Collection

Real and Electronic Communication Skills Questionnaire (RECS). RECS was developed by Mantzouranis et al. (2019) to determine the social skills levels that adolescents have in daily life and on social platforms. The questionnaire consists of two sub-scales: Real Communication Skills (RCS), comprising 18 items and four sub-dimensions (sociability, self-disclosure, emotion decoding, and assertiveness), and Electronic Communication Skills (ECS,) comprising 18 items and four sub-dimensions (sociability, self-disclosure, emotion decoding, and assertiveness). The questionnaire is rated on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree) with the total scale score ranging from 36 to 180. The higher the score on the scale is, the higher the level of social skills is.

As a result of the analysis for the validity of the English version of the scale, item factor loads varied between .50 and .78 for the RCS and between .32 and .80 for the ECS, respectively. The total explained variance was calculated 51.23% for RCS and 48.45% for ECS. As a result of CFA, the fit indices were calculated for RCS (CFI=0.947; RMSEA=0.037; SRMR=0.047 and χ^2/df=1.36) and for ECS (CFI=0.924; RMSEA=0.052; SRMR=0.057 and χ^2/df=1.63) and for RECS (CFI=0.819; RMSEA=0.053; SRMR=0.071 and χ^2/df=1.60). Cronbach's alpha internal consistency coefficients for RCS (a=.75) and ECS (a=.78) were calculated for the reliability of the scale. In the concurrent validity study of the scale, significant positive correlations were found between RECS and Social Skills Inventory.

Data Analysis

In the first stage, linguistic validity, exploratory factor analysis (EFA), Cronbach's alpha coefficient, test-retest, reliability, and item analysis studies were conducted. The IBM SPSS 26.0 software package was used for analysis.

Study 2

Participants

The sample consisted of 409 volunteer high school students (47.7% females [n=195], 52.3% males [n=214]) in the second stage. The ages of the participants ranged from 15 to 19 (16.51±1.24). Of the high school students, 117 (28.6%) were 9th grade, 92 (22.5%) were 10th grade, 94 (23.0%) were 11th grade, and 106 (25.9%) were 12th- grade students.

Data Collection

Communication Skills Scale (CSS). The 25-item CSS was used to assess communication skills (Korkut Owen & Bugay, 2014). The CSS items are rated on a 5-point Likert-type scale from 1 (never) to 5 (always) with scale total scores ranging from 25 to 125. Higher scores indicate higher communication skills. Cronbach's alpha coefficient was good(a=.88) and test re-test was good (r=.81). Cronbach's alpha obtained in the present study was good, too (a=.90).

Shyness Scale (SS). The 20-item SS was used to assess shyness (Cheek & Melchior, 1990; Güngör, 2001). The SS items are rated on a 5-point Likert-type scale from 1 (has nothing to do with me) to 5 (has a lot to do with me) with scale total scores ranging from 20 to 100. Higher scores indicate higher shyness levels. Cronbach's alpha coefficient was good (a=.90) and test re-test was good (r=.88). Cronbach's alpha obtained in the present study was good, too (a=.88).

Social Skills Scale (SSS). The 90-items SSS was used to assess social skills (Riggio, 1989; Yüksel, 1997). The SSS items are rated on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree) with scale total scores ranging 90-450. Higher scores indicate higher social skill levels. Cronbach's alpha coefficient was good (a=.94) and test re-test was good (r=.92). Cronbach's alpha obtained in the present study was good, too (a=.96).

Data Analysis

In the second stage, CFA was performed to determine if the structure of the scale obtained from the EFA was validated. Moreover, the concurrent validity analysis has been carried out. The IBM SPSS 26.0 and AMOS Graphic 23.0 software packages were used for analysis.

Research Ethics

Before this research was conducted, the necessary ethics committee permissions were obtained from a state university in Turkey. The research was conducted face-to-face with volunteer participants. A voluntary consent form was obtained from the participants. During the applications, information about the purpose of the research and its anonymity were explained to the participants.

FINDINGS

Study 1

Exploratory Factor Analysis

EFA was performed separately for the RECS form of RCS and the ECS form. The Kaiser-Meyer-Olkin (KMO) coefficient (KMO for RCS= .87 and for ECS=.85) of the questionnaire and the Bartlett sphericity test (for RCS $\chi 2$=4361.14, sd=153; for ECS $\chi 2$=4507.99, sd=153) results were examined before EFA was performed, and the results showed that factor analysis could be done. Varimax orthogonal rotation method was used for EFA, and a four-dimensional structure was obtained for each of the RCS and ECS subscales. The EFA results and factor load values are presented in Table 1.

As a result of the analysis, item factor loads ranged from .62 to .89 for the RCS subscale and from .55 to .89 for the ECS subscale. The four-factor structures of the RCS and ECS subscales explained 60.64% and 58.00% of the total variance, respectively (Table 1).

Table 1. EFA Results of The Scale

	Item	Sociability	Self-disclosure	Emotion decoding	Assertiveness
RCS	1	**.69**	.04	.03	.15
	5	**.74**	.13	.10	.01
	9	**.74**	.07	.24	.06
	13	**.79**	.12	.01	.06
	16	**.77**	.15	.10	.07
	2	.12	**.72**	.01	.07
	6	.16	**.70**	.07	.05
	10	.01	**.62**	.23	.13
	14	.14	**.77**	.05	.01
	17	.07	**.72**	.26	.16
	3	.18	.11	**.70**	.14
	7	.04	.13	**.73**	.13
	11	.21	.05	**.73**	.01
	15	.16	.14	**.76**	.16
	18	.10	.12	**.73**	.07
	4	.07	.04	.14	**.89**
	8	.10	.14	.19	**.81**
	12	.10	.15	.09	**.77**
	Eigenvalue	5.43	2.01	1.89	1.59
	% of variance explained	%30.16	%11.17	%10.50	%8.82
	% of total variance explained	%60.64			
	Item	Sociability	Self-disclosure	Emotion decoding	Assertiveness
ECS	1	**.62**	.10	.14	-.01
	5	**.65**	.02	-.10	.08
	9	**.60**	.18	.08	.05
	13	**.67**	.12	.21	.01
	16	**.68**	.10	.21	.01
	2	.14	**.77**	.08	.02
	6	.04	**.55**	.03	.05
	10	.06	**.66**	.18	-.07
	14	.08	**.71**	.08	.08
	17	.17	**.69**	.08	.05
	3	.07	.15	**.71**	.06
	7	.09	.10	**.78**	.17
	11	.15	.09	**.80**	.21
	15	.14	.18	**.77**	.20
	18	.15	.02	**.73**	.15
	4	.10	.07	.28	**.87**
	8	-.02	.01	.12	**.89**
	12	.09	.07	.23	**.86**
	Eigenvalue	5.11	2.36	1.57	1.40
	% of variance explained	%28.38	%13.11	%8.74	%.7.77
	% of total variance explained	%58.00			

Reliability Analysis

The Cronbach's alpha coefficient was calculated to determine the reliability of the scale. The reliability indexes of each of the RCS and ECS subscales were found to be equally good (Table 2). The test-retest reliability of the RCS and ECS subscales was determined by administering the same scale to 41 participants with 21 days' interval. All test-retest coefficients were good.

Table 2. Internal Consistency Reliability and Test-retest Results for RCS and ECS

Variables	RCS		ECS	
	a	*r*	*a*	*r*
Total	.86	.93	.84	.90
Sociability	.83	.93	.69	.88
Self-disclosure	.78	.88	.73	.90
Emotion decoding	.82	.88	.85	.85
Assertiveness	.81	.87	.90	.94

Item Analysis

The result of the item analysis, item-total correlations, arithmetic mean and standard deviation values were found as .49-.75, 2.41-3.46 and 1.17-1.35 for the RCS sub-scale and as .35-.83, 2.17-3.21, and 1.03-1.26 for the ECS sub-scale, respectively. The item analysis results of the scale are given in Table 3.

Table 3. Corrected Item-total Correlation, Arithmetic Mean and Standard Deviation Values for RCS and ECS

Variables		RCS			ECS		
	Item	*r*	x̄	SD	*r*	x̄	SD
Sociability	1	.62	3.05	1.26	.43	2.18	1.03
	5	.61	2.49	1.22	.36	2.43	1.17
	9	.64	2.72	1.26	.42	2.17	1.05
	13	.63	2.73	1.24	.49	2.36	1.12
	16	.65	2.70	1.23	.51	2.43	1.11
Self-disclosure	2	.53	2.66	1.19	.60	2.50	1.14
	6	.54	2.41	1.17	.35	2.46	1.15
	10	.49	3.01	1.26	.48	2.42	1.21
	14	.60	2.68	1.20	.51	2.33	1.14
	17	.62	2.79	1.24	.51	2.34	1.12
Emotion decoding	3	.60	3.41	1.29	.59	3.21	1.24
	7	.59	3.16	1.20	.69	3.19	1.26
	11	.60	3.46	1.25	.73	3.01	1.15
	15	.68	3.38	1.21	.71	3.09	1.19
	18	.60	3.33	1.18	.61	3.09	1.25
Assertiveness	4	.75	2.67	1.17	.83	2.84	1.20
	8	.65	2.69	1.35	.73	2.80	1.25
	12	.57	2.64	1.27	.83	2.85	1.21

Study 2

Confirmatory Factor Analysis

The CFA was performed, and it was evaluated whether the structure obtained as a result of the EFA performed in the first stage was confirmed. It is seen that all goodness-of fit indices of the RCS subscale were at a good level (χ^2=240.56, df=129, χ^2/df=1.86, p=0.00; RMSEA=.044, SRMR=.04, GFI=.94, AGFI=.92, CFI=.98, NFI=.96; IFI =.98; RFI = .95). In addition, the CFA model was found to be significant as a result of the analysis. Regression coefficients for RCS ranged from .43 to .92, and item factor loading values ranged from .59 to .93. All goodness-of-fit indexes of the ECS subscale were at a good level (χ^2=164.18, df=129, χ^2/df=1.27, p=0.00; RMSEA=.026, SRMR=.03, GFI=.96, AGFI=.94, CFI=.99, NFI=.96; IFI=.99; RFI=.96). Regression coefficients for the ECS ranged from.44 to .95, and item factor loading values ranged from .58 to .93. It is seen that all goodness of fit indices for the total RCS were at a good level (χ^2=803.43, df=451, χ^2/df=1.78, p=0.00; RMSEA=.044, SRMR=.04, GFI=.90, AGFI=.85, CFI=.98, NFI=.95; IFI=.98; RFI=.95). As a result of the analysis, the CFA model was found to be significant, and it can be said that the RCS structure was confirmed.

Concurrent Analysis

The Shyness Scale (SS), Communication Skills Scale (CSS) and Social Skills Scale (SSS) were used for the concurrent validity of the scale. Pearson correlation values between the scales are presented in Table 4.

Table 4. Pearson Correlation Values

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. RECS Total	-												
2. ECS Total	.83**	-											
3. Sociability	.55**	.60**	-										
4. Disclosure	.59**	.60**	.47**	-									
5. Decoding	.54**	.73**	.19**	.11*	-								
6. Assertiveness	.41**	.57**	.03	.01	.37**	-							
7. RCS total	.91**	.52**	.39**	.45**	.29**	.21**	-						
8. Sociability	.66**	.38**	.38**	.38**	.11*	.14**	.73**	-					
9. Disclosure	.62**	.29**	.25**	.35**	.12*	.05	.73**	.31**	-				
10. Decoding	.66**	.46**	.16**	.16**	.45**	.33**	.67**	.33**	.33**	-			
11. Assertiveness	.48**	.28**	.21**	.27**	.16**	.06	.53**	.12*	.25**	.23**	-		
12. SS	.21**	.16**	.09	.12*	.10*	.08	.21**	.08	.17**	.18**	.15**	-	
13. CSS	.29**	.26**	.11*	.03	.26**	.23**	.25**	.08	.10*	.36**	.19**	.35**	-
14. SSS	.14**	.07	.21**	.24**	-.11*	-.11*	.16**	.17**	.15**	.01	.07	.01	.06

Note: **p<.001, *p<.05

As a result of the concurrent validity of the scale, a significant positive correlation was found between RECs and shyness (r=.21), communication skills (r=.29) and social skills (r=.14). There was a positive correlation between ECS and shyness (r=.16) and communication skills (r=.26); A significant positive correlation was found between RCS and shyness (r=.21), communication skills (r=.25) and social skills (r=.16). Moreover, significant correlations were found between ECS and RCS sub-dimensions and shyness, communication skills and social skills.

DISCUSSION & CONCLUSION

This study was conducted to adapt the RECS developed by Mantzouranis et al. (2019) to Turkish culture. The scale adaptation study was carried out with high school adolescents. The study was carried out in two stages by considering the scale adaptation stages.

In the first stage, linguistic validity was performed by making the English-Turkish translation of the RECS. EFA was performed to reveal the structure of the Turkish form of the RECS. As a result of the EFA, a four-factor structure (sociability, self-disclosure, emotion decoding, assertiveness) was obtained for the RCS and the ECS separately. The RCS and ECS explained 60.64% and 58.00% of the total variance, respectively. The item factor load values of the scale were found to vary between .62 and .89 for the RCS and between .55 and .89 for the ECS. The results obtained appear to be similar to those of the original form (Mantzouranis et al., 2019). Moreover, the total variance values explained in the scale are expected to be 30% or higher (Büyüköztürk, 2007). Item factor load values of 0.45 and above are considered adequate (Büyüköztürk, 2007; Floyd, & Widaman, 1995).

The Cronbach's alpha coefficient for the scale's reliability was found to be *a*=.86 for RCS and *a*=.84 for ECS. The values obtained in this study were found to be higher than the values obtained from the original scale (RCS *a*=.75, ECS *a*=.78; Mantzouranis et al., 2019). Cronbach's alpha value obtained as a result of the analysis is expected to be .70 and above (Kılıç, 2016; Nunnally, 1978). As a result of test-retest analysis, it was calculated as .93 for RCS and .90 for ECS. The results of the analysis revealed that the scale had a stable and consistent structure.

In the second stage, CFA was performed. As a result of the analysis, it was concluded that the scale had 36 items and a good level of fit indices confirming the four-factor structure. The fit index values obtained from each model indicated good fit (Hu & Bentler 1999; Kline 2015; Şimşek, 2007). The results showed that the form of the RECS used for Turkish adaptation was validated. It was observed that the corrected item-total correlation values obtained within the scope of reliability studies were between .49 - .75 for the RCS and between .35 - .83 for the ECS.

Finally, concurrent validity studies were conducted in the research. Within the scope of the study, the RECS and the Shyness Scale, the Communication Skills Scale, and the Social Skills Scale were used, and the correlation coefficients obtained were found to be significant. In other words, positive significant relationships were found between the RECS and shyness, communication skills, and social skills. A review of the literature indicated that the results of this study were consistent with the results of previous studies (Aksoy & Baran, 2020; Durualp, 2009;

Kılıç & Güngör-Aytar, 2017; Korkut Owen & Bugay, 2014; Tepeli & Arı, 2011). There were positive correlations between the ECS and shyness and communication skills, and positive significant correlations between the RCS and shyness, communication skills and social skills.

Many scales have been developed in the literature to determine the level of social skills (Akçamete & Avcıoğlu, 2005; Avcıoğlu, 2007; Kabakçı & Owen, 2010; Ataş, et al., 2016). However, the RECS, which was adapted into Turkish, differs from other scales in that it includes social skills exhibited in the face-to-face communication process, as well as measuring the social skills used in the communication process carried out in the electronic environment where communication has gained a new dimension with the developing technology and has its own communication rules. Therefore, the RECS allows the measurement of communication skills both in the virtual environment and in real life at the same time.

As a result of the analysis, the RECS, which was intended to be adapted to Turkish culture, is thought to be a valid and reliable measurement tool to determine the social skill levels of individuals both in daily life and in the electronic environment. Despite the strengths of this research, there are also limitations. First, the scale was adapted to adolescents, who are high school students. It can be adapted to individuals of different age groups. Second, gender-based analyses were not performed in this study. Also, studies in which women and men make up separate study groups can be conducted. Third, this is a self-report scale. So, it may involve response bias error. Moreover, comparative studies can be conducted by adapting the scale into different cultures.

Statements of Publication Ethics

The ethics committee report of this research was obtained from Anadolu University, social and human sciences scientific research and publication ethics committee (Date: 29/09/2020; Decision no:39950). All participants who took part in the study provided informed consent.

Researchers' Contribution Rate

In this study, each of the authors contributed equally to each stage.

Authors	Literature Review	Method	Data Collection	Data Analysis	Results	Conclusion
Sami Kırteke	☒	☒	☒	☒	☒	☒
Bahtiyar Eraslan-Çapan	☒	☒	☒	☒	☒	☒
Fuad Bakioğlu	☒	☒	☒	☒	☒	☒

Conflict of Interest

The authors declare that there is not conflict of interest.

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An Investigation of the Complexity of the Problems Posed by Prospective Teachers: The Case of Whole Number

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Abstract

The aim of this case study is to examine the linguistic and mathematical complexity of the problems that prospective primary school teachers posed related to four operations with whole numbers. A Problem Posing Questionnaire was administered to 64 participants, and semi-structured interviews were conducted with 20 of 64 participants. The data were analyzed through descriptive analysis. The findings of the study revealed that many prospective teachers posed problems based on the single-statement problem root without any relation/condition. That is, the linguistic complexity of the problems written by the prospective teachers is in the lowest level, which is regarded as assignment category, regardless of the complexity of the problem situation. Furthermore, if the problem situations did not contain any relationship, many prospective teachers preferred to pose one-step problems. On the other hand, when the information in the problem situation was related to each other, then they were able to pose multi-step problems, which could be regarded as complex problems in terms of mathematically. It can be concluded that although the complexity of the problem situation given to the prospective teachers does not affect the linguistic complexity of the problems they pose; it affects the mathematical complexity.

Keywords: Problem posing, linguistic complexity, mathematical complexity, whole numbers, prospective primary school teachers.

Sınıf Öğretmeni Adaylarının Kurdukları Problemlerin Karmaşıklığının İncelenmesi: Doğal Sayılar Örneği

Öz

Bu durum çalışmasının amacı, sınıf öğretmeni adaylarının doğal sayılarda dört işlemle ilgili kurdukları problemlerin dilsel ve matematiksel karmaşıklığını incelemektir. 64 katılımcıya Problem Kurma Anketi uygulanmış ve 64 katılımcıdan 20'si ile yarı yapılandırılmış görüşmeler yapılmıştır. Veriler betimsel analiz yoluyla analiz edilmiştir. Araştırmanın bulguları, birçok öğretmen adayının herhangi bir ilişki/koşul olmaksızın tek ifadeli problem köküne dayalı problemler kurduklarını ortaya koymuştur. Yani öğretmen adayları tarafından yazılan problemlerin dilsel karmaşıklığı, problem durumunun karmaşıklığına bakılmaksızın, ödev kategorisi olarak kabul edilen en düşük düzeydedir. Ayrıca problem durumları herhangi bir ilişki içermiyorsa birçok öğretmen adayı tek adımlı problemler kurmayı tercih etmiştir. Öte yandan, problem durumundaki bilgiler birbiriyle ilişkili olduğunda matematiksel olarak karmaşık problemler olarak kabul edilebilecek çok adımlı problemler kurabilmişlerdir. Öğretmen adaylarına verilen problem durumunun karmaşıklığı, oluşturdukları problemlerin dilsel karmaşıklığını etkilemese de matematiksel karmaşıklığı etkilemektedir.

Anahtar kelimeler: Problem kurma, dilsel karmaşıklık, matematiksel karmaşıklık, doğal sayılar, ilkokul öğretmen adayları.

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INTRODUCTION

In more than two decades, problem-posing has become central to teaching and learning mathematics (English, 2019; National Council of Teachers of Mathematics [NCTM], 2014). The mathematics educators and researchers argued that knowing and understanding mathematics is strongly related to generating and exploring problems (Cai & Hwang, 2019). However, in most math classes, the problems are presented in textbooks and the students have to solve these problems with the aim of reaching the correct solution. It is claimed that these kinds of mathematics activities are not effective tools to ensure students comprehend mathematics (Crespo & Sinclair, 2008). The general consensus among mathematics educators is that it is vital for teachers and prospective teachers to change the types of activities related to problems in order to provide their students with more efficient learning experiences. In relation to that, Demirci (2018) suggested that the teachers and prospective teachers need to have such experiences including different kinds of activities as mathematics learners. One of the kinds of activities that the prospective teachers and the teachers need to have is the practice of problem posing, which has several benefits in teaching mathematics (Cai et al., 2019; Xu et al., 2019).

Problem posing helps teachers develop students' mathematical understanding, mathematical reasoning, and creativity (Singer et al., 2017). Moreover, it allows the students to explore the relationship among mathematics concepts, changing existing situations to new ones, and checking the solvability and complexity of the problems (English, 2019; Xie & Masingila, 2017). Besides, problem posing helps teachers realize students' misconceptions and their reasons, improve students' problem-solving ability, evaluate students' learning, and develop their content knowledge and pedagogical content knowledge (Chen & Cai, 2019; Lin, 2004; Xu et al., 2020). Due to the several benefits of the practice of problem posing, many countries have included problem-posing activities in their mathematics curriculum (Australian Education Council and Curriculum Corporation, 1991; National Council of Teachers of Mathematics [NCTM], 2000; Ministry of National Education, [MoNE], 2018). In addition to including problem-posing activities in the mathematics curriculum, it is also important to include such activities in teacher education programs to make the prospective teachers pose problems having different levels of complexity, to evaluate the problems posed by their students, and to decide what makes some problems better than others (Chen & Cai, 2020; Lee et al., 2019). Depending on these, it is important to assess the problems posed by prospective teachers, the solvability of the problems, and the level of complexity of them, too.

In order to assess problem-posing ability of prospective teachers, teachers, and students, a variety of research studies were conducted using different kinds of problem-posing classification (Christou et al., 2005; Silver, 1994; Silver & Cai, 1996; Stoyanova & Ellerton, 1996). Among these classifications, Silver emphasized that problem posing is the generation of new problems and takes place before, during, or after problem-solving. Accordingly, pre-solution, within-solution, and post-solution are the classification of problem posing. Different from this categorization, Stoyanova and Ellerton (1996) categorized problem-posing tasks as free problem posing, semi-structured problem posing, and structured problem posing. Grounded on Stoyanova and Ellerton's classification, Christou and his colleagues presented another classification focusing on the cognitive processes of the students. They defined semi-structured problem posing as editing and translating, and structured problem posing as selecting and comprehending. Finally, Silver and Cai (1996) analyzed problems in terms of complexity by categorizing them as assignment, relational, and conditional problems, which constitute the present study's theoretical framework. Although assignment type of problems involves only one statement without having a relationship among the issues, concepts, numbers, etc., relational and conditional problems are composed of relationship or condition. For instance, the problem of how many pencils Katrin has is regarded as an assignment, whereas the problem of how many more pencils Marc has compared to Katrin is considered relational. Lastly, the problem, if Katrin has twice as many pencils as Paul, then how many pencils Katrin has is regarded as conditional. Among these problem types, Mayer et al. (1992) specified that conditional and relational problems are more difficult than assignments for students to solve.

Due to the vital role of problem-posing activities in teaching and learning mathematics, many researchers aimed to investigate the problems posed by students, teachers, and prospective teachers. For instance, Van Harpen and Sririman (2013) aimed at investigating high school students' problem-posing abilities. They concluded that the students posed problems including inadequate information to solve the problem or they posed simple problems. In another study, Ngah et al. (2016) explored students' problem-posing ability in free, semi-structured, and structured problem-posing situations. Based on the data analysis, they concluded that the free problem-posing situations were more challenging tasks compared to semi-structured and structured problem-posing situations. In other words, the problem situations including more restrictions and directions are more likely easier tasks for

students. Additionally, some researchers focused on teachers' and prospective teachers' problem-posing abilities. Most of these studies were related to the difficulties that prospective teachers faced while posing problems (e.g. Chapman, 2012; Kilic, 2013; Köken & Gökkurt-Özdemir, 2018), the problem-posing performance of prospective teachers (e.g. Albayrak et al., 2006), and the most effective strategies that can be used to improve the problem-posing skills of prospective teachers and their problem-posing skills (Abu-Elwan, 1999). Moreover, some studies were conducted to reveal the complexity of the problems posed by teachers and prospective teachers. For instance, Isik et al. (2011) identified the problems posed by prospective teachers in relation to verbal and visual representations. As a result of the study, they stated that most of the problems posed by prospective teachers were in the category of assignment rather than in the category of conditional and relational. According to Mayer et al.'s statement, it could be specified that these teachers tended to pose easy and simple problems. Furthermore, the study conducted with prospective teachers by Tekin-Sitrava and Işık (2018) reached a similar conclusion. They stated that the prospective teachers established low-level problems due to having superficial content knowledge, inadequate problem-solving and problem-posing experience, and insufficient creativity ability. However, high-level problems have a vital role in developing students' mathematical understanding, mathematical reasoning, and teaching and learning mathematics (English, 1998; Silver, 1994; Stoyanova, 2003). From this point of view, the complexity of the problems presented during the mathematics lessons gained great importance. In this context, when it is considered that the problems posed by prospective teachers and teachers are used as teaching materials, it would be significant to investigate the level of complexity that the problems posed by prospective teachers and teachers. Owing to the fact that the prospective teachers are the future teachers, it would be significant to explore the problems posed by them from different perspectives both to gain insight about how to guide the students to pose problems and to make recommendations to the teacher education programs. In this sense, the study aims to investigate the problems that prospective primary teachers posed in relation to four operations with whole numbers from the point of the appropriateness to the given problem situation, its solvability, linguistic (verbal) and mathematical complexity. Thus, the present study seeks answers for the following research questions.

1. What is the level of linguistic complexity of the problems posed by prospective primary school teachers in the context of four operations with whole numbers?

2. What is the level of mathematical complexity of the problems posed by prospective primary school teachers in the context of four operations with whole numbers?

METHOD

Research Design

The design utilized in the present study is a case study providing an in-depth analysis and description of a case within a bounded system (Creswell, 2007). Concerning case study design, Yin (2003) proposed a more detailed framework focusing on the number of cases and the number of units of analysis. Of the different types of case study design, the single-case holistic design was employed which is defined as consisting of one single case and one unit of analysis. The single case was prospective primary school teachers and the unit of analysis was the problems that prospective teachers posed.

Context of the Study

The aim of the case study is to identify and choose the most suitable cases with regard to knowledge and experience related to the phenomenon of interest to acquire rich and comprehensive data (Creswell & Clark, 2011). Herein, the study context is the primary teacher education program in which prospective primary school teachers were educated. In this context, the study was conducted within the primary school education (grades 1-4) degree program in a public university in Central Anatolia, Turkey.

The Primary School Education Program, designated by Higher Education Institution (HEI, 2007), is a four-year program that qualifies graduates working as primary school teachers to teach grades 1-4. The program includes content courses (e.g. Mathematics, Physics, and Chemistry), education courses (e.g. Introduction to Educational Sciences, Education Psychology, Teaching Principles and Methods) and mathematics education courses (e.g. Science and Technology Teaching, Mathematics Teaching, Social Studies Teaching). The prospective teachers in this program take content courses and education courses mostly during the first two years of the program and take mathematics education courses during the final two years. The courses assumed to develop prospective teachers' problem-posing abilities are compulsory courses, which are mathematics content courses (Basic Mathematics I-II), mathematics education courses (Mathematics Teaching I-II), and education courses

(School Experience, Teaching Practice I-II). While the topics of Basic Mathematics courses include the basic concepts related to numbers, four operations, algebra, geometry, and data analysis; Mathematics Teaching courses comprise how to teach mathematics belonging to primary school mathematics teaching program. Moreover, within the scope of School Experience and Teaching Practice courses, prospective teachers observe the mathematics lessons in the real classroom environment, plan and prepare the mathematics lessons, and acquire teaching experience under the guidance of mentor teachers. During taking these courses, they become acquainted with the content of problems related to basic four operations, and also posing problems.

Participants

Participants were chosen through the purposive sampling method which allows researchers to choose participants intentionally who are proficient and have well-developed knowledge about the topic of interest (Creswell & Clark, 2011). Accordingly, the participants were selected based on two criteria: information-rich and being experienced in real classrooms. In order to select information-rich participants, the courses that they took were considered. Since the content of the Basic Mathematics and Mathematics Teaching courses cover the formation and structural properties of natural numbers, the acquisitions of arithmetic operations, problem types, problem-solving, and posing strategies, it was important to take these courses before the data collection period. Moreover, it is only possible for prospective teachers to be experienced if they have taken the teaching practice courses. Of these courses, the prospective teachers take the School Experience course in the fall semester of the third year and the Teaching Practice course in the fall semester of their fourth year. Thus, the prospective teachers who are in the 4th year of their teacher education program have taken the school experience course and are taking the Teaching Practice course. Under such circumstances, in order to ensure the prospective teachers are experienced in real classrooms, fourth-grade prospective primary school teachers were eligible. From this point of view, 64 prospective teachers who volunteered to participate in the study were selected. Pseudonyms (i.e., PST1, PST2…PST64) were used for all participants to ensure confidentiality.

Data Collection Tools

In order to investigate the problems posed by prospective primary school teachers related to basic mathematical operations with whole numbers, a problem-posing questionnaire and semi-structured interviews were applied to participants.

A Problem Posing Questionnaire consisting of 2 problem situations was prepared by the researchers with respect to the learning outcomes related to the four operations with whole numbers presented in the 4th-grade primary school mathematics curriculum (MoNE, 2018). Both problem situations in the questionnaire consisted of more than one situation in order to explore the complexity of the problems. The questionnaire, which is presented in Table 1, offers opportunities for prospective teachers to pose problems with linguistic complexity and mathematical complexity.

In order to ensure the validity and reliability of the Problem Posing Questionnaire, firstly, expert opinion was obtained from 2 mathematics educators who are experts in the field. After the necessary corrections were made in line with the opinions of the experts, a pilot study was conducted by applying the Problem-Posing Questionnaire to the prospective teachers who did not participate in the study. As a result of the pilot study, the questionnaire has been finalized.

Table 1. Problem Posing Questionnaire

1) Pose two problems at different levels according to the situation given below. A supermarket has 30 kilograms of rice, 50 kilograms of sugar, and 45 kilograms of flour. 6 kilograms of rice, 5 kilograms of sugar, and 3 kilograms of flour are sold every week. 2) Pose three problems using the situation given below. Zeynep, Beril and Nil went shopping together. Nil spent 200 Turkish Liras more than Beril. Beril's money is twice the money Zeynep spends. Zeynep spent 75 Turkish Liras.

After administering the questionnaire to 64 prospective teachers, the data was analyzed and the problems having different levels of complexity were determined. Based on this analysis, 20 volunteer prospective teachers were purposefully selected for semi-structured interviews. While some of the 20 prospective teachers were unable to pose an appropriate problem for the learning outcome and the given problem situation, the others posed problems with different levels of complexity. During the interviews, prospective teachers who posed different types of problems were first asked to explain the relationship between the problem and the given problem situation.

Afterwards, the questions such as "What kind of way did you follow while posing the problem?", "What did you think?", "Can you pose another problem with the given problem situation?" were asked to prospective teachers. Also, it was asked prospective teachers, who could not pose an appropriate problem, to read the problem and try to pose a problem. Thus, it was aimed to procure rich and comprehensive data and triangulate the data gathered from the questionnaire through the interviews.

Data Analysis

To attain the aim of the study, the data from the questionnaire and semi-structured interviews were analyzed through descriptive analysis proposed by Strauss and Corbin (1990). They specified that the data gathered from a variety of data sources is summarized and interpreted based on predetermined themes through descriptive analysis method. Moreover, in descriptive analysis method, the data are presented using direct quotations to reflect participants' understanding, views, and beliefs related to the issue of the study. Thus, the model proposed by Silver and Cai (1996) formed the basis of the data analysis. In addition, frequencies are presented to see the number of the problem types posed by the prospective teachers. As a first step of the analysis, the prospective teachers' responses were analyzed in terms of their appropriateness to the problem situation. Accordingly, the prospective teachers' responses were categorized as "appropriate to the given problem situation", "not appropriate to the given problem situation" and "empty". As a second step of the data analysis, the responses which were coded as appropriate to the given problem situation were analyzed with regard to solvability and coded as "solvable" and "unsolvable". The responses containing incomplete information or that cannot be solved with written expressions were examined under the category of unsolvable and the analysis of these responses was not continued. In the third step of the data analysis, the responses coded as solvable were analyzed from the point of linguistic and mathematical complexity according to the model proposed by Silver and Cai (1996). Accordingly, the solvable problems were coded as "assignment", "relational" and "conditional" based on their linguistic content. Lastly, if the solution of the problem necessitated one operation, then it was coded as a "one-step problem" and if the solution necessitated more than one operation, then it was coded as a "multiple-step problem". The data analysis was done by two mathematics educators to ensure the trustworthiness of the study. Although the inter-rater reliability, which was 81%, was acceptable due to over 70% (Miles & Huberman, 1994), the inconsistencies were discussed until a 100% consensus was reached among the coders.

Research Ethics

The approval of the Kırıkkale University Social and Behavioral Sciences Ethics Committee was obtained for ethical compliance with the research procedures.

FINDINGS

In this study, it was aimed to investigate the types of problems that prospective primary teachers posed in relation to four operations with whole numbers. In this sense, the appropriateness to the given problem situation, its solvability, linguistic (verbal) and mathematical complexity are presented on the basis of problem situations in the problem-posing questionnaire.

Findings Related to the First Problem-Posing Situation

In the first problem-posing situation, it was given prospective primary school teachers a problem situation indicating that **"A supermarket has 30 kilograms of rice, 50 kilograms of sugar and 45 kilograms of flour. 6 kilograms of rice, 5 kilograms of sugar and 3 kilograms of flour are sold every week"** and they were asked to pose two problems, coded as 1A and 1B, at different levels suitable for this situation. Based on the data analysis process, the frequencies and percentages obtained from the analysis of the responses written by the prospective teachers are given in Table 2.

Table 2. Frequency analysis of the 1st problem posing situation

	Appropriateness to the given problem situation								
	Appropriate							Not Appropriate	Empty
	Unsolvable	Solvable							
		Assignment		*Relational*		*Conditional*			
		One-Step	Multiple-Step	One-Step	Multiple-Step	One-Step	Multiple-Step		
1A	2 (%3.13)	31 (%48,44)	11 (%17,19)	1 (%1,56)	1 (%1,56)	0	1 (%1,56)	13 (%20,31)	4 (%6,24)
1B	3 (%4,68)	18 (%28,13)	8 (%12,5)	2 (%3,13)	8 (%12,5)	0	4 (%6,25)	17 (%26,56)	4 (%6,25)

As can be seen in Table 2, most of the statements written by prospective primary school teachers are in the category of solvable problems. The statements in this category are categorized linguistically (verbal) as assignments, relational and conditional, and mathematically as one-step and multiple-step problems. According to the results of the analysis made in this direction, the number of problems in the one-step assignment is higher than the others. In other words, most of the problems are routine problems, do not contain any relation or conditional situation, and can be solved with only one basic operation. An example of problems in the one-step assignment category is given below.

The problem of Prospective Teacher 3 (PT 3)

A supermarket has 30 kilograms of rice, 50 kilograms of sugar, and 45 kilograms of flour. 6 kilograms of rice, 5 kilograms of sugar, and 3 kilograms of flour are sold every week. Ahmet sells 5 kg of sugar each week. If Ahmet has 50 kg of sugar, then in how many weeks does Ahmet sell all the sugar?

As seen in the example, PT3's problem is a single-expression problem that can be solved with one step, where there is no relation or condition between the statements. For this reason, the problems of prospective teachers who posed problems in this way were evaluated in the one-step assignment category.

Among the prospective teachers who posed 2 problems, the maximum number of prospective teachers who posed relational problems was 8. The problem posed by PT 29 is presented below as an example of multiple-step relational problem.

The problem of PT 29

A supermarket has 30 kilograms of rice, 50 kilograms of sugar, and 45 kilograms of flour. 6 kilograms of rice, 5 kilograms of sugar, and 3 kilograms of flour are sold every week. After 6 weeks, how much more sugar is sold than the flour?

In the problem posed by PT29, a relationship has been established between the amount of sugar and the amount of flour, and the problem can be solved by performing more than one step. Therefore, the problems similar to PT29's are regarded as in the relational multi-step problems category.

On the other hand, as seen in Table 1, the number of prospective teachers who posed conditional problems for the 1st problem posing situation is quite limited. As an example of conditional problems, the problem written by PT26 is given.

The problem of PT 26

A supermarket has 30 kilograms of rice, 50 kilograms of sugar, and 45 kilograms of flour. 6 kilograms of rice, 5 kilograms of sugar, and 3 kilograms of flour are sold every week. How many kilograms of rice, sugar, and flour should be bought at the supermarket so that all three products are finished at the same time?

Due to the fact that it is asked how many kg of flour, sugar, and rice should be taken from these products to the supermarket on the condition that they finished at the same time, PT26's problem is in the conditional problem category. Also, since the problem can be solved with more than one step, it is coded as a multi-step problem.

In addition, at least 20% of the prospective primary school teachers could not write any problem statement appropriate to the given situation. The problem posed by PT12 is below as an example of the responses evaluated in this category.

The problem of PT12

Since a kilogram of rice is 5 TL, a kilogram of sugar is 7 TL, and a kilogram of flour is 4 TL, how much rice, sugar, and flour are sold in 3 weeks?

Although the problem given above is a problem that can be solved with four operations in whole numbers, 30 kg of rice, 50 kg of sugar, and 45 kg of flour were not used in the problem. However, since prospective primary school teachers had to pose problems using the given problem situation, the problem of PT12 and similar problems were evaluated as not appropriate to the given problem situation.

In addition, some prospective teachers' responses were evaluated in the category of unsolvable. As an example of the responses in this category, the response of PT7 is given below.

The problem of PT7

A supermarket has 30 kilograms of rice. Since 5 kilograms of rice are sold each week, how many kilograms of sugar would be sold in the second week?

PT7 stated that 6 kg of rice is sold every week, but asked how many kg of sugar is sold in the second week. Since it did not give any information about the amount of sugar sold each week, the amount of sugar sold in the 2nd week could not be calculated; therefore, this response was coded as unsolvable.

In the 1st problem-posing situation, the majority of the prospective primary teachers posed problems which could be solved with one-step. More specifically, since most of these problems include only one statement, they lie in the category of assignment.

Findings Related to the Second Problem-Posing Situation

The second problem-posing situation, "**Zeynep, Beril, and Nil went shopping together. Nil spent 200 Turkish Liras more than Beril. Beril's money is twice the money Zeynep spends. Zeynep spent 75 Turkish Liras",** was presented to pose three problems with different levels, labeled as 2A, 2B and 2C. The findings related to the second problem-posing situation are indicated in Table 3.

Table 3. Frequency Analysis of the 2nd Problem Posing Situation

	Appropriateness to the given problem situation								
		Appropriate						Not Appropriate	Empty
	Unsolvable	Solvable							
		Assignment		*Relational*		*Conditional*			
		One-Step	Multiple-Step	One-Step	Multiple-Step	One-Step	Multiple-Step		
1A	1(%1,56)	14 (%21,88)	37 (%57,81)	0	1 (%1,56)	0	2 (%3,13)	5 (7,81)	4 (%6,25)
2B	3(%4,68)	6 (%9,38)	26 (%40,62)	0	15 (%23,43)	0	6 (%9,38)	6 (%9,38)	4 (%6,25)
2C	2(%3,13)	3 (%4,68)	24 (%37,5)	0	13 (%20,31)	0	7 (%10,94)	8 (%12,5)	7 (%10,94)

Table 3 presents that most of the responses of the prospective primary teachers are appropriate to the given problem situation. When the problems appropriate to the given situation are evaluated in terms of solvability, it is seen that almost all of them are solvable problems. However, the majority of such problems are in the assignment category. As an example of the problems in the assignment category, the problem written by PT4 is given below.

The problem of PT4

Zeynep, Beril, and Nil went shopping together. Nil spent 200 Turkish Liras more than Beril. Beril's money is twice the money Zeynep spends. Zeynep spent 75 Turkish Liras. According to this, how much did Nil spend?

Since the problem given above does not contain any relations or conditions, it was regarded as an assignment. However, since more than one step is required to solve the problem, it was handled as a multi-step problem.

Although the number of prospective teachers who posed multi-step relational and conditional problems in the second problem-posing situation is higher than the first problem-posing situation, there are no teachers who

posed one-step relational and conditional problems. The problems posed by PT20 as an example of relational problems and by PT50 as an example of conditional problems are given below.

The problem of PT20

Zeynep, Beril, and Nil went shopping together. Nil spent 200 Turkish Liras more than Beril. Beril's money is twice the money Zeynep spends. How much is Zeynep, Beril, and Nil's total money more than Beril's money?

The problem of PT50

Zeynep, Beril, and Nil went shopping together. Nil spent 200 Turkish Liras more than Beril. Beril's money is twice the money Zeynep spends. If Nil had spent 25 TL less than the total money spent by Zeynep and Beril, how much money would three of them have spent?

The problem posed by PT20 is a problem that can be solved with more than one step by establishing a relationship between the total money of Zeynep, Beril and Nil and Beril's money. PT50, on the other hand, put a condition in the problem statement by using the statement "if Nil had spent 25 less than the total money spent by Zeynep and Beril". Also, PT50 posed the problem in such a way that it can be solved with multiple steps.

Apart from these problems, some prospective teachers could not pose a problem appropriate to the given problem situation. As an example to these, the problem that PT9 has posed is given as an example below.

The problem of PT9

Nil and Beril went to shopping. Nil spent 400 TL. If Beril spent 200 TL more than Nil, how much did Nil and Beril spend in total?

Although they were asked to pose a problem appropriate to the situation presented in the problem-posing questionnaire, PT9 ignored this situation and posed a problem related to a different situation by using the same names. For this reason, the problem of PT9 and the problems of prospective teachers who have problems similar to PT9 are considered as not appropriate to the given situation.

On the other hand, less than 5% of the prospective teachers participating in the study posed unsolvable problems. In the following, the problem of PT34 was given as an example.

The problem of PT34

How much money does Zeynep, Nil, and Beril have before going shopping?

Although the problem posed by PT34 is appropriate to the given situation, the information given in case of a problem is related to the money Zeynep, Beril, and Nil spend in shopping. There is no information required to calculate how much money Zeynep, Beril, and Nil have before going shopping. For this reason, this problem has been evaluated as an unsolvable problem. Apart from this, approximately 10% of the prospective teachers could not establish any problem for the 2nd problem situation.

Different from the 1st problem posing situation, most of the prospective teachers posed multi-step problems in the 2nd problem posing situation. However, in terms of linguistic complexity, the majority of prospective teachers posed the problems in the assignment category as in the case of 1st problem posing situation.

DISCUSSION & CONCLUSION

In this study, the types of problems that prospective primary teachers posed in relation to four operations with whole numbers, the solvability of these problems, and their linguistic (verbal) and mathematical complexity were examined.

Based on the analysis of the data, it was concluded that the vast majority of prospective teachers posed solvable verbal problems in accordance with both problem situations. Similar results were presented in the literature which emphasized that most of the teachers and prospective teachers posed verbal problems (Kilic, 2013; Korkmaz & Gür, 2006). The linguistic complexity of the problems posed by the prospective teachers was evaluated based on the classification stated in the study of Silver and Cai in 1996. As a result of this evaluation, it was seen that most of the prospective teachers wrote problems based on the single-statement problem root, without any relation or condition. In other words, the linguistic complexity of the problems written by the prospective teachers is in the lowest level which is regarded as the assignment category, regardless of the complexity of the problem situation. Similarly, in their study, Işık, Işık, and Kar (2011) reached the conclusion that the problems that most of the prospective teachers had posed were in the assignment category. From the point of mathematical complexity, the problems posed by prospective teachers vary according to the given problem situation. More specifically, if the problem situations do not contain any relationship as it is the case of the first problem situation,

then the majority of prospective teachers preferred to pose one-step problems. On the other hand, as in the case of the second problem-posing situation, when the information contained in the problem situation is related to each other, then they were able to pose multi-step problems which could be regarded as complex problems in terms of mathematically. In line with these results, it can be reached an outstanding conclusion which is related to the relationship between the complexity of the given problem situation and the linguistic and mathematical complexity of the problems posed by prospective teachers. In other words, it can be concluded that although the complexity of the problem situation given to the prospective teachers does not affect the linguistic complexity of the problems they pose; it affects the mathematical complexity of the problem.

In addition, it was observed that some prospective teachers could not pose any problems in both problem situations, some of them could not set up appropriate problems for the given situation, or some of them posed problems containing data deficiency. One of the reasons for prospective teachers not to be able to pose verbal solvable problems may be their inability to analyze and interpret mathematical expressions in the given problem situation. To be more detailed, it can be said that the prospective teachers were unable to formulate given problem situations into new situations by establishing relationships between mathematical concepts. Similar results were also demonstrated in the literature. For instance, Kılıç (2013) stated that prospective teachers had difficulties in choosing the correct numbers and concepts and establishing relationships between them while posing problems. Moreover, Örnek and Soylu (2017) emphasized that the prospective teachers could pose problems containing the addition of fractions; however, they could not establish a relationship between the given fractions in the problem-posing situation and the result of the problem that they pose. In relation to this, mathematics educators emphasized that analyzing given situations, and exploring and formulating them into new situations are the basis of problem-posing (Abu-Elwan, 1999; Silver, 1994). In addition, it is revealed that the prospective teachers who cannot set up problems in accordance with the given situation or who set up problems that contain data deficiency do not control the problem in terms of solvability after establishing the problems. This result is consistent with the result of Örnek and Soylu's (2017) study which concluded that the prospective teachers did not check whether the problem they posed could be solved or not. However, English (1998) stated that one of the important features of problem posing is checking the correctness of the problem. In addition, problem posing is highly correlated with the content knowledge that teachers have (Demirci, 2018; Örnek & Soylu, 2021; Van Harpen & Presmeg, 2013). In line with this information, another reason for prospective teachers to pose problems that could not be solved may be their inadequate content knowledge.

One of the important findings of the study is that prospective primary school teachers tend to pose problems based on the single-statement problem root in terms of linguistic complexity. These types of problems are not only important for students to understand the problem sentence, but also easier ones. However, it is important that students not only solve problems that can turn the problem sentence into simple operations, but also solve problems that will enable them to think multi-faceted, explore mathematical situations, and make mathematical reasoning (English, 1998; Silver, 1994). From this point of view, it is necessary to provide opportunities for prospective teachers to pose problems based on relational and conditional problems, as well as posing single-statement problem roots. In this direction, taking into account the gains in the elementary school mathematics teaching program, problem-posing activities can be given more place in 'Mathematics Teaching I' and 'Mathematics Teaching II' courses. In addition, within the scope of these courses, it can be emphasized that problem posing has a very important place in mathematics teaching and learning (English, 1998; MONE, 2018; NCTM, 2000), and the necessity of including problem posing activities in their classes can be emphasized. In addition, it can be suggested that the knowledge and beliefs of the prospective teachers who are not successful in problem-posing activities might be increased, and problem-posing teaching approach might be included more in teacher training programs.

Despite the study's findings, further research would provide additional details about teachers' problem-posing abilities and the complexity of the problems that they posed. Since the complexity of the problems posed by prospective primary school teachers are investigated in the frame of one of the basic subjects of primary school mathematics, there is still a need for additional studies aiming to investigate the complexity of the problems in the context of various subjects such as fractions, algebra, etc. Moreover, due to the fact that problem-posing has many benefits for teachers, prospective teachers, and students (Lin, 2004; Stoyanova, 2003), it would be noteworthy to conduct studies aiming at the ways of developing their problem-posing abilities. Moreover, prospective teachers' difficulties and errors that they confront while posing problems could be explored so that suggestions could be made to overcome these difficulties and errors.

Statements of Publication Ethics

This research was reviewed by the Kirikkale University Social and Humanities Ethics Committee and it was decided that the research was ethically appropriate. Meeting date: 29/11/2017.

Researchers' Contribution Rate

Authors	Introduction	Method	Data Collection	Data Analysis	Results	Conclusion
Ahmet Işık	☒	☒	☒	☒	☒	☒
Reyhan Tekin Sitrava	☒	☒	☐	☒	☒	☒

Conflict of Interest

We confirm that there are no conflicts of interest associated with this research.

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Reflections from the Experiences of Elementary Mathematics Teaching Undergraduate Students within the scope of Mathematicians Who Left a Mark on History Project: A Project of CSP Course

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Abstract

This study aimed to examine the experiences of the second-year undergraduate students of Elementary Mathematics Teaching (EMT) within the scope of the Mathematicians Who Left a Mark in History (MWLMH) Project carried out within the scope of the Community Service Practices (CSP) course. The case study method, one of the qualitative research designs, was used in the study. The participants of the research consist of 14 undergraduate students studying in the second year of the EMT program of a state university in the Western Black Sea region of Turkey in the spring semester of the 2021-2022 academic year. The research data were gathered from the reflective diaries that the students kept regularly every week from the beginning to the end of the project process and from the focus group interviews held with the students after the process was over. The gathered data were subjected to content analysis. As a result of the research; it has been determined that the MWLMH project contributes to EMT undergraduate students in different aspects such as gaining teaching experience, experiencing designing materials and how to integrate History of Mathematics (HoM) into lessons and strengthening their communication skills. In addition, EMT undergraduate students were determined mostly pre-service teacher-related challenges as designing materials, also administrator-related challenges as being unwilling/indifferent. Lastly, EMT students emphasized that the activities/materials they developed were useful, interesting and entertaining for students and contributed to their awareness towards HoM. Based on the results of the research, various recommendations were provided.

Keywords: Community service practices, history of mathematics, undergraduate students, mathematics education.

İlköğretim Matematik Öğretmenliği Lisans Öğrencilerinin Tarihte İz Bırakan Matematikçiler Projesi Kapsamında Yaşadıkları Deneyimlerden Yansımalar: Bir THU Dersi Projesi

Öz

Matematik tarihi (MT); hem matematik bilim dalının hem de matematik eğitiminin ayrılmaz bir parçası olarak karşımıza çıkmaktadır. Bu araştırmada İlköğretim Matematik Öğretmenliği (İMÖ) ikinci sınıf lisans öğrencilerinin Topluma Hizmet Uygulamaları (THU) dersinde yürütülen Tarihte İz Bırakan Matematikçiler (TİBM) Projesi kapsamında yaşadıkları deneyimlerin incelenmesi amaçlanmıştır. Bu amaç doğrultusunda nitel araştırma desenlerinden özel durum çalışması yöntemi kullanılmıştır. Araştırmanın katılımcılarını 2021-2022 eğitim öğretim yılı bahar döneminde Batı Karedeniz bölgesinde bulunan bir devlet üniversitesinin İMÖ programında ikinci sınıfta öğrenim görmekte olup THU dersini alan 14 lisans öğrencisi oluşturmuştur. Araştırmanın verileri, proje sürecinin en başından başlamak üzere en sonuna kadar öğrencilerin her hafta düzenli olarak tuttukları yansıtıcı günlüklerden ve süreç sona erdikten sonra öğrencilerle gerçekleştirilen odak grup görüşmelerinden elde edilmiştir. Elde edilen verilerin analizinde içerik analizinden yararlanılmıştır. Araştırma bulgularından hareketle; TİBM projesinin İMÖ lisans öğrencilerine öğretmenlik deneyimi elde etme, MT etkinliklerinin derslerde kullanılabileceğini görme, iletişim becerilerini güçlendirme gibi farklı açılardan katkı sağladığı tespit edilmiştir. Bunun yanı sıra İMÖ lisans öğrencilerinin kendilerinden kaynaklı olarak en çok materyal tasarlamaya yönelik güçlük yaşarken; yöneticilerden kaynaklı olarak ise en çok okul yöneticilerinin isteksiz/ilgisiz olmasına yönelik güçlük yaşadıklarını belirlenmiştir. Ayrıca İMÖ lisans öğrencilerinin MT'ye yönelik olarak öğrencilerin ilgisini çektiğini ve akılda kalıcılığı arttıracağını düşündüğü saptanmıştır.

Anahtar kelimeler: Topluma hizmet uygulamaları, matematik tarihi, lisans öğrencileri, matematik eğitimi.

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INTRODUCTION

Statement of the Problem

Mathematics can be regarded as a collection of knowledge that has taken its place in all periods and that has reached the present day in a way that will guide the development of society since the beginning of human history. This period of time, from the first moment that mathematics was born to its present form, can be called as the history of mathematics [HoM]. Considering mathematics both as a branch of science and as a course, those who have helped mathematics develop cumulatively and reach its current state because of their studies are undoubtedly scientists who deal with mathematics (Baki, 2014). Upon analyzing HoM, which briefly and concisely summarizes the process of mathematical progress spanning thousands of years, it is divided into five different periods (Ülger, 2006) as Egyptian-Mesopotamian Mathematics, Greek Mathematics, Indian-Islamic Renaissance Mathematics, Classical Mathematics and Modern Mathematics including many mathematicians who left their mark on each period. On the other hand, due to the studies of many mathematicians with different paradigms and philosophies, mathematical knowledge continues to enhance. In this regard, HoM is an integral part of mathematics and mathematics education (Siu &Tzanakis, 2004; Taşkın et al., 2010) and has evolved into an interdisciplinary domain of educational research and practice by exploring the possible relevance and significance of the history of mathematics in the context of mathematics education (Chorlay et al., 2022, p. 1407). The National Council of Teachers of Mathematics (NCTM, 2000) considers that the use of HoM in lessons is necessary and significant in order to increase motivation and develop a more positive approach towards mathematics, to understand the difficulties of learning in today's mathematics by identifying the problems, to see the human factor by making use of historical sources in gaining perspective towards mathematical knowledge, to guide historical learning and to develop students' mathematical thinking of historical problems. In other words, HoM provides us with the support we need to transcend and better understand ourselves (Radford & Santi, 2022). Likewise, Baki (2008) noted that teaching practices containing HoM contents and activities can make sense of students by revealing how mathematics shapes our world of thought and finds a response. On that point, it is of great importance to bring students together with HoM activities. However, it will be impossible for teachers to integrate the HoM into lessons unless they have the necessary equipment, knowledge and skills regarding the HoM (Taşkın et al., 2010). However, on the one hand HoM helps students understand that mathematics is a human activity, people have struggled with it for a long time, and it is a subject that has been developed and applied by many over time the HoM, on the other hand helps teachers to show that mathematics is in action, a creative process, and a meaningful activity, thus it is a resource for them to make their lessons more meaningful and cognitively demanding for students (Agterberg et al., 2021). Therefore, the significance of the practices that allow EMT undergraduate students, who are the teachers of the future, to gain concrete experiences about HoM during their undergraduate education should not be underestimated. In this context, considering that CSP is a suitable opportunity, it is aimed that pre-service teachers get concrete experiences in the course of CSP course, and their opinions are taken after these experiences.

In line with the Higher Education Law No. 2547 ([YÖK], 1981), the Community Service Practices [CSP] course, which was included as an experience-based course to various undergraduate programs of Education faculties for the first time as of the 2008-2009 academic year, consists of total of three course hours, one hour of which theoretical and two of which are practical in the curriculum. CSP course contents in the Elementary Mathematics Teaching (EMT) Undergraduate Program prepared by YÖK (2018) are “Society, community service practices and social responsibility concepts; social responsibility projects in terms of social and cultural values; identifying current societal problems; preparing projects for the solution of identified social problems; voluntarily taking part in social responsibility projects individually and as a group; participating in social responsibility projects in various institutions and organizations; participating in scientific events such as panels, conferences, congresses, symposiums as audience, speaker or organizer; evaluating the results of social responsibility projects”. Within the scope of the CSP course, which is based on making undergraduate students active, students first determine a social need as a result of their research, examination and observations, and then they carry out the necessary social discussions and determine the subjects they will work on. Afterwards, they design a project to eliminate this need and carry out this project in the relevant public institutions and organizations. In such manner, undergraduate students have the opportunity to learn by doing, they also strengthen their social skills and self-confidence by establishing social relations with the institutions they include in their projects (Arcagök & Şahin, 2013; Boran & Karakuş, 2017; Çetinkaya, 2018; Kesten, 2012). Numerous studies revealed that students’ human relations and leadership skills are strengthened thanks to the CSP course (Kesten, 2012); their awareness towards

community and social issues has improved (Demir, 2019); their professional experiences have changed positively (Deliveli, 2021) and their reflective thinking skills have increased (Çetinkaya, 2018).

Thus, the second year undergraduate students were expected to carry out a project that included preparing posters about the lives of some mathematicians who left their mark on history, designing materials/activities related to their contribution to mathematics and presenting these posters and materials to secondary school students within the scope of CSP course. They were also requested to keep reflective diaries in which they epitomized all their experiences. Besides, focus group interviews were held at the end of the project. Hence, this study aims to examine the experiences of the second year undergraduate students, who took CSP in the spring semester of the 2021-2022 academic year, within the scope of the Mathematicians Who Left a Mark on History (MWLMH) Project. In service of this aim, the research question was "What are the reflections of the elementary school mathematics teaching undergraduate students' experiences within the scope of the mathematicians who left their mark on history project?".

Significance of the Study

On analyzing the textbooks available in many countries, they contain rich content about HoM (Erdoğan et al., 2015; Mersin & Durmuş, 2018). The role and significance of HoM in mathematics education has been emphasized with the renewal of the curriculum designed and implemented in line with the constructivist approach in 2005 by the Ministry of National Education (Ministry of National Education, [MoNE]) for the first time in our country. However, the parts allocated to HoM in mathematics textbooks were reduced in terms of quantity and quality by making them very limited with the curriculum update studies carried out in 2018 (Başıbüyük & Soylu, 2019; İncikabı et al., 2019; Mersin & Durmuş, 2018; Tan-Şişman & Gençkaya, 2021). This shortcoming may be an obstacle to the integration of HoM into lessons and hence, the lack of knowledge/experience that teachers have in this regard (Alpaslan & Işıksal-Bostan, 2016; Başıbüyük & Soylu, 2019; Yıldız & Baki, 2016; Yıldız & Baki, 2017). Indeed, the integration of HoM with mathematics education is considered vital for both teachers and students (Baki & Bütüner, 2018; Dündar & Çakıroğlu, 2014; Fried, 2008; İncikabı et al., 2019). Therefore, raising teachers' and students' awareness is a social need. Considering the literature on the use of HoM in mathematics teaching, secondary school students' attitudes and thoughts towards mathematics are positively affected, their academic achievement increased, their HoM knowledge improved and their meaningful learning is endorsed (Alpaslan & Işıksal-Bostan, 2016; Baki, 2008; Başıbüyük & Soylu, 2019; Bayam, 2012; Bütüner, 2014; Dündar & Çakıroğlu, 2014; İdikut, 2007; Tan-Şişman & Gençkaya, 2021; Tokay, 2019; Wilson & Chauvot, 2000). Along with a large number of studies conducted with students, many studies were carried out with teachers on integrating HoM activities into the teaching process (Baki & Yıldız, 2010; Yıldız & Baki, 2016). Thus, HoM is also essential for teachers to know the history of basic concepts in order to carry out an interactive teaching (Başıbüyük & Soylu, 2019). In line with the studies that Baki and Bütüner (2018) examined in their meta-synthesis survey on the use of HoM in mathematics education, various studies noted that activities with HoM content mainly increase the student's academic achievement and change their attitudes positively and that teachers have positive views regarding the incorporation of activities into content in the lessons, while others emphasized that the presence of historical content that is disconnected from modern mathematics in mathematics lessons hurts students.

The related literature includes several studies conducted on the use of HoM in mathematics teaching with primary school students (Ersoy & Öksüz, 2016; Tokay, 2019) and secondary school students (Alpaslan & Işıksal-Bostan, 2016; Başıbüyük & Soylu, 2019; Bütüner, 2014; İdikut, 2007; Karakuş, 2009; Küçükoğlu & İncikabı, 2020; Tan-Şişman & Gençkaya, 2021; Yıldız & Taşkın, 2011); teachers (Yıldız & Baki, 2016; Yıldız & Baki, 2017; Yıldız, 2021); postgraduate students (Taşkın et al., 2010) and undergraduate students (Baki & Gürsoy, 2018; Burns, 2010; Dündar & Çakıroğlu, 2014; Galante, 2014; Radford & Santi, 2022; Ulusoy & Girit-Yıldız, 2019; Yenilmez, 2011; Yıldız et al., 2010). However, the studies conducted with undergraduate students heavily focus on examining the participants' views on the HoM course and the use of the HoM in mathematics teaching. However, it is of great importance for undergraduate students, who are the teachers of the future, to conduct research on both Turkish-Islamic mathematicians and other mathematicians who have given direction to mathematics by actively participating to work on the problems (historical problems) that these mathematicians deal with, to have the opportunity to share and experience them through concrete experiences and to include HoM in their lessons in their further teaching experiences. Besides, no such study is specifically published on the project carried out by EMT undergraduate students within the scope of the CSP course. Thus, this study will shed light on the literature regarding being conducted with undergraduate students and contributing to raising awareness among teachers, secondary school students, and undergraduate students that HoM and HoM-related activities can be used in lessons through a CSP project.

Even though it has been a long time since CSP course was included in undergraduate programs, various studies have been carried out in this field (Arcagök & Şahin, 2013; Çetinkaya, 2018; Deliveli, 2021; Demir, 2019; Kesten, 2012; Küçükoğlu et al., 2016; Tanrısever & Yelken, 2011). The relevant literature holds numerous studies on mainly examining the undergraduate students and instructors' views regarding this course (Arcagök & Şahin, 2013; Demir, 2019; Kesten, 2012; Tanrıseven & Yelken, 2011; Uğurlu & Kıral, 2012; Yılmaz, 2011), undergraduate students' social skills and their self-efficacy beliefs related to the course (Çetinkaya, 2018), the knowledge and awareness levels of the undergraduate students about institutions and organizations that can provide social assistance (Arcagök & Şahin, 2013; Boran & Karakuş, 2017; Aykırı, 2017; Çetinkaya, 2018); undergraduate students' feelings and thoughts about social assistance (Akkocaoğlu et al.,2010; Kocadere & Seferoğlu, 2013). However, there is a scarcity of studies carried out with EMT undergraduate students within the scope of the CSP course. Besides, there is no such study specifically conducted on HoM. As Baki and Gürsoy stated, knowing the history of mathematics and how it can be used in the lessons will shed light on the prospective teachers' designing learning environments that include the history of mathematics by developing their horizons (Baki & Gürsoy, 2018).

In this regard, the present study is expected to fill the gap in the relevant literature as it attempts to reveal the undergraduate students' views and experiences about this process includes preparing posters and activities/materials related to the mathematicians determined within the scope of the MWLMH Project and presenting them to secondary school students by examining them through reflective diaries and focus group interviews. In addition, the fact that the project dealt with within the scope of the study includes the integration of HoM with mathematics teaching both allows the pre-service teachers involved in the study to gain experience on this subject and can potentially encourage other researchers in this direction.

Aim of the Study

This study aims at examining the experiences of the second year undergraduate students regarding the MWLMH Project carried out within the scope of the CSP course. EMT undergraduate students prepared a poster and mathematical activity/material about the mathematicians determined within the relevant Project and organized an exhibition to promote these mathematicians in 5 different secondary schools. Hence, the research question was; "What are the reflections of the elementary school mathematics teaching undergraduate students' experiences regarding the MWLMH Project carried out within the scope of the CSP course?". In service of the research question, the sub-problems were identified as follows:

1. What are the reflections of the EMT undergraduate students' experiences in the meetings held within the scope of the MWLMH Project carried out in the CSP course?

2. What are the reflections of the EMT undergraduate students' experiences during the implementation of the MWLMH Project within the scope of the CSP course in schools?

METHOD

Research Design

This study employed the particular case study, one of the qualitative research designs, to analyze the experiences of the EMT second-year undergraduate students regarding the MWLMH Project carried out within the scope of the CSP course. The particular case study method involves the researcher's in-depth examination of a case, activity, process, or individual(s) (Creswell & Creswell, 2021).

Participants of the Study

The participants consisted of 14 EMT undergraduate students, ten girls and four boys, who received a CSP course in the second year at a state university in the Western Black Sea region of Turkey during the spring semester of the 2021-2022 academic year. The students carried out a project called MWLMH within the scope of the CSP course and worked in pairs within the project. In this regard, each group was coded as G1, G2, ..., G7.

Carrying out the Project

The objective of the CSP project, which was carried out by EMT undergraduate students under the supervision of researchers, is to prepare a poster revealing the contributions of mathematicians who left their mark on history and an activity/material that offers the opportunity for secondary school students to experience these contributions concretely and to present these posters and activities/materials to the secondary school students. In this vein, each group initially identified a mathematician who left a historical mark. The Turkish-Islamic

Mathematicians were prioritized when selecting the mathematicians. Since the project was designed for secondary school students, considerable attention was paid to ensure that the contributions made by the mathematicians were congruent with the secondary school learning outcomes and that the activities/materials were of the type that secondary school students could make sense of prior knowledge. Therefore, including mathematicians from different civilizations and Turkish-Islamic mathematicians was deemed appropriate. Afterward, all groups prepared a poster and an activity/material revealing the contribution of the mathematician within the scope of the project and introduced these posters and activities/materials to the secondary school students and teachers through exhibitions in 5 different secondary schools. Table 1 depicts the mathematicians that the groups selected within the project's scope.

Table 1. The Mathematicians that the Groups Selected within the Scope of the Project

Groups	Mathematicians	Contribution of the Relevant Mathematician to the Activity/Material
G1	Omar Khayyam	Khayyam's Triangle
G2	Pyhtagoras	Proof of the Pythagorean Theorem
G3	John Napier	Napier's Bones
G4	Birunî	Chess Problem
G5	Eratosthenes	Sieve of Eratosthenes
G6	Ali Kuşçu	Equation solution by guessing
G7	Hârizmî	Solution the equation of the x2+10x=39

Weekly meetings were held with EMT undergraduate students throughout the entire process. The whole process of the project lasted a total of 14 weeks. The activities carried out with EMT undergraduate students are as in Table 2.

Table 2. The Activities Carried Out with EMT Undergraduate Students

Weeks	Activities
Week 1 and 2	Determining the subject of the project
Week 3 and 4	Identifying the mathematician to be addressed
Week 5 and 6	Preparing and finalizing the posters for the related mathematician
Week 7, 8 and 9	Designing activities/materials to reveal the contribution of the mathematician to mathematics
Week 10 and 11	No events were held due to mid-term exam and public holiday.
Week 12 and 13	Clarifying the implementation schedule and reporting the needs for implementation by meeting with the determined secondary school administrators
Week 13 and 14	Implementing the project designed for secondary school students

Data Collection Tools

This study employed reflective diaries and focus group interviews as data collection tools. The students were expected to highlight what they did within the scope of the CSP course, what kind of difficulties they encountered and how they overcame these difficulties, the success they achieved and their views on CSP course for the relevant week in the reflective diaries used to reveal their reflective thoughts and experiences in the process. Therefore, they were requested to write a reflective diary for the relevant week after each meeting. Reflective diaries were collected weekly and individually as word documents over a classroom created on the Google Classroom platform. As the students were working as a group, the quoted sentence was expressed with the code of the group belonging to the member of the group while the excerpts were presented in the findings section. The present study also used focus group interview technique conducted with a specific subject and group (Yıldırım&Şimşek, 2008). Focus group interviews conducted online with each group lasted approximately 10-15 minutes and they were recorded. These interviews included questions about the students' positive/negative views on the project, their suggestions for the development of the project, whether it met their expectations, the challenges they experienced during its implementation and how they overcame these difficulties, the success they achieved within the scope of the Project and their views on the use of HoM in mathematics teaching.

Data Analysis

Content analysis was used during data analysis. The recorded focus group interviews were transcribed. Afterwards, both the documents of the focus group interviews and the reflective diaries were coded simultaneously by the researchers and the codes were finalized with consensus. Similarly, themes were created by categorizing similar codes by the researchers simultaneously. The codes and themes obtained as a result of the content analysis were presented in tables in line with the related sub-problems and supported with direct quotations. Hence, Yıldırım and Şimşek's (2008) expert review method was used to provide reliability of the research. In terms of protection of personal rights and scientific ethics, the names of schools and teachers were coded and expressed.

FINDINGS

The findings were presented in line with the sub-problems. In this regard, Table 3 displays the findings regarding EMT undergraduate students' views on the project they carried out within the scope of the CSP course.

Table 3. EMT Undergraduate Students' Views towards the Project

Theme	Code	Group
Positive Views	Experiencing a more efficient/successful project process than expected	G2, G3, G4, G5, G6, G7
	Engaging students	G3, G4, G5, G6, G7, RD3, RD7
	Being fun	G1, G3, RD1
	Being a different project from other CSP projects / serving as a model	G2, G4, RD1
	Contributing to students' learning about HoMat an early age	G4, G5, RD7
	Allowing students to have different experiences	G2, G5
	Helping students understand the subject	G2, G6
	No negative view	G1, G6
	Being socially beneficial	G2, G4
	Influencing the views of school administrators/teachers/students positively	G2, RD2
	Pre-service teachers take an active role in each process	G2
	Giving students a different perspective	G3
	Contributing to students' love of mathematics	G4
	Providing permanent learning	G2
Negative Views	Schools are not well set up	G3, G5
	The mathematician they are dealing with does not attract as much attention as other mathematicians	G3
	Compression of application time	G7
Suggestions	More systematic planning of implementation	G1, G5, G6
	Longer application time	G1, G7
	Development of material and/or expression	G3
	Choosing a mathematician suitable for designing game material	G3
	More visualization of poster content	G4
	Contacting teachers instead of administrators	G1
	Preferring more ergonomic materials	G1
	Preference for materials adaptable to levels	G6

*RD1: Reflexive diary Group 1, RD2: Reflexive diary Group 2, …

As in Table 3, EMT undergraduate students shared their positive and negative views as well as various recommendations regarding the project. EMT undergraduate students mostly stated that the project was much more successful and productive than they expected. For instance, G4 emphasized in the focus group meeting that the project was more productive than expected with the following statement:

"It was beyond my expectations. I did not expect that they would be so interested in mathematics historians and materials. [...] In the beginning, we did not believe that it would be so effective, and even as we went on the first day, we had a question mark in our minds. However, it was very productive and we started to continue more enthusiastically. At first, I thought the students would be bored, unwilling to count the grains and would find counting simple. When a student counted to 2048 at the first school we went to, we started to continue with more enthusiasm."

As is seen in Table 3, EMT undergraduate students also expressed positive views regarding the project such as attracting their attention, allowing them to learn about HoM at an early age and having different experiences as well as being fun. To illustrate, G2 emphasized during the focus group meeting that "*I think it is beneficial for students because they have the opportunity to see and discover something different and learn by exploring and reinforce with our own narratives*.". G5, on the other hand, stated "*At first, I didn't think the material would attract attention, but after going to schools, I saw that the children were engaged."* Similar views emerged in the students' reflective diaries. Indeed, G3 explained that the project attracted the students attention in most schools, "*I noticed that there was at least one child who always came to us and tried to take care of us, even during breaks."*; while G7 stated the contribution of the project to the students' acquisition of knowledge about HoMat an early age with such words: *"We started to learn Turkish-Islamic mathematicians at the university. I think students learned about these issues at an earlier age."*. G4 reflected their happiness to be a part of this project in their reflexive diaries as

such, *"We have experienced a teaching practice which we felt valuable. I am very happy that we have made such a practice within the scope of this course."*.

EMT undergraduate students also expressed some negative views about the project process. Only G3 shared a negative opinion that the mathematician they dealt with did not attract as much attention as the others. The determination of schools and the implementation period were among the most common negative views on the project. To exemplify, G5 stated that they experienced a negativity due to school with the following sentences:

"Some schools did not take us seriously, which was a negative experience. Yet, I think we have closed this gap with schools that behaved well. It was a negative aspect for us to give reasons for students to prepare for the exam in A class. Therefore, we lost our enthusiasm, and we could not be very productive. We waited throughout the whole lesson, but we were only able to practice in 10 minutes of break time. The students did not have much time. With the presence of another teacher and the CSP group that day, the limited amount of time was limited even more."

EMT undergraduate students also provided some suggestions regarding the project process. It is remarkable that most of them are consistent with the negative views, namely, they are related to the implementation process of the project. In this regard, G1 recommended that *"If students are divided into groups, it may be good for each student to try and not be confused."*; G5 said, *"There should be a place, table, etc. in schools for this project. It will be better if it is arranged and the lessons are planned accordingly - like 2 classes in each lesson."* and G6 stated, *"Actually, if they can plan which school and which day we will go by communicating with the schools in advance, the confusion we experience can be reduced to a great extent."* These suggestions indicate more systematic planning of the project process. G3 emphasized before the implementation that *"Voluntary and willing schools can be preferred by making a list of which schools will welcome us for the implementation of such a project. Therefore, there won't be any problems for either side."*

EMT undergraduate students were asked about their challenges during the project process. Table 4 demonstrates the students' views on the challenges they encountered during the process.

Table 4. Challenges faced by EMT Undergraduate Students during the Project Process

Theme	Code	Group
Nature of the Project-Related Challenges	Difficulty in determining mathematician and material	G3, G4, G5, RD3
	Difficulty due to narrow scope of the subject	G2
Teacher-Related Challenges	Some teachers are reluctant	G2, G4, RD2
	Being inquisitive	G4
Administrator-Related Challenges	School administrators are unwilling / uninterested	G1, G2, G4, G5, RD1, RD2, RD4, RD7
	Trying to push things hard	G4, G5
Student-Related Challenges	Low academic achievement of students	G5, G7, RD2, RD5, RD7
	Negative student behaviors	G2
	Reluctance of students	G2, RD2
Pre-service Teacher-Related Challenges	Having difficulty in designing materials	G1, G2, G3, G5, G6, G7, RD1, RD2, RD3, RD5, RD6, RD7
	Low motivation due to negative attitudes in schools	G2, G4, G6, G7
	Experiencing concerns arising from instructional activities	G2, G7, RD2
	Facing unexpected questions (lack of knowledge)	G4
	Disagreement in deciding the subject	G6
Other	Unable to cope with the reluctance of administrators/teachers/students	G2, G4, G5
	Difficulty in transferring materials to schools	G2
	Difficulty in acting together	G4
	Having a large number of students	G1, RD1
	Thinking that they do not have much difficulty	G5

Table 4 shows that the challenges faced by EMT undergraduate students during the project were grouped under the themes of challenges related to the nature of the project, the teacher, the administration, the student, the pre-service teacher and other reasons. EMT undergraduate students were determined to mostly mention pre-service teacher-related challenges during the focus group interviews. To exemplify, G1 explained the challenges they

experienced while designing the material: "*While we were preparing the material, we had difficulty in finding a material that would appeal to the level of the students and attract their attention.”*

Most EMT undergraduate students pinpointed that the school administrators were unwilling/indifferent. For instance, G2 wrote in the reflective diary, *“We became more and more reluctant when the administrator thought we were doing something aimlessly even though we had repeatedly explained our purpose.”* Besides, G5 indicated that when faced with an adverse reaction from a school principal, they were greatly affected and could not overcome it. Here is an excerpt supporting this view:

“We couldn't do anything as the principals were too harsh. The principal’s speech made a great impression on us 'This school is not like other schools, this is a successful school, so we cannot give lessons.' etc.. However, I couldn't do anything to overcome that challenge."

As regards the student-related challenges, the EMT undergraduate students implicated the students’ low academic achievement. In this context, G5 mentioned that *“While I expected students to know mathematicians/materials at the beginning, I saw that it was not. The 8th graders didn't know Pythagoras, so only successful students were familiar."*

EMT undergraduate students noted that the pre-service teachers had the most difficulty in designing materials amongst the challenges arising from the pre-service teachers. G7 expressed the complexity they experienced while choosing the material in the reflective diary with such a statement *“The challenge we faced was how we would design the material, what it would look like. We had a hard time deciding what to use as a material.”*

EMT undergraduate students pointed out that they could not overcome the reluctance of administrators/teachers/students, which they stated as another challenged, they faced. For instance, G2 mentioned that *“A teacher in a school said, 'You are not a teacher.' and 'This school is not like others.' and we did nothing. We thought that such negative situations might be reflected on the students as well due to our negative moods.”*. In addition, G1 concluded that they had to work hard due to the large number of students with such a statement, as *“It was sometimes difficult to address the crowd in the class. Confusion arose because the students had to try one-on-one for the duration and it was too much. We got them to line up.”*

EMT undergraduate students were asked for their views regarding the contribution of the MWLMH project. The students' views on the contribution of the project are displayed in Table 5.

Table 5. EMT Undergraduate Students’ Views on The Contribution of the Project

Theme	Code	Group
Pedagogical Knowledge	Thinking that it contributes to knowing the student	G3, G6
Field Knowledge	Learning more about HoM	G1, G2, G3, G4, G5, G6, G7, RD7
Field Teaching Knowledge	Gaining experience in teaching the subject	G2, G4, G6, G7
	Pondering on gaining prior experience for teaching lessons	G2, G4, G5, RD4
	Realizing the usefulness of concrete materials	G2, G3
	Having experience on how to integrate HoM into lessons	G1
Social Skill	Developing communication with students	G2, G4, G5, G6, G7, RD2, RD4
	Gaining experience in communicating with teachers and administrators	G1
Teaching Experience	Aiding to develop teaching strategies	G1, G3, G4, G6, RD2, RD3, RD4
	Gaining experience in communicating with students	G1, G5, G6, RD1, RD3
	Having experience with the school environment	G1, G5, RD1
	Realizing that s/he likes the teaching profession	G1, G7, RD7
	Thinking that s/he has knowledge about the teaching profession	G1, RD1
	Observing the teacher-student relationship	G1
Other	Realizing that HoM should be attached more importance in lessons	G1, G6, G7
	Observing that HoM can be used in lessons	G5, G6, G7
	Realizing that students have prejudices against mathematics	G1, G3, G7
	Observing students' negative attitudes	G1, G6
	Realizing that it contributes to changing students' bias	G1
	Realizing that use of HoM in lessons is not boring for students	G1
	Thinking that it is the first step to teaching	G6

As in Table 5, EMT undergraduate students stated their views on the contribution of the project under the themes of pedagogical knowledge, field knowledge, field teaching knowledge, social skills, teaching experience and other. It was noteworthy that EMT undergraduate students mostly stressed the contributions to their field knowledge, field teaching knowledge and teaching experience. For instance, G3 expressed that their knowledge of HoM increased thanks to this project with such a statement *"Mathematicians and materials in other groups also reinforced our own knowledge. I knew only Matrakçı Nasuh in the lattice diagram, I also learned about John Napier and Napier's bones thanks to this project."*. Although they received the HoM course, which is among the EMT first-year courses, G7 stated in the following sentences that they gained more permanent knowledge about the mathematicians who shaped the development of mathematics with this project:

"We, too, learned new things about mathematicians and their contributions. Even though we took HoM as a lesson last year, we forgot all about it, still I think that the permanence of this project has increased by giving lectures for a long time and learning by being a part of it for six days."

EMT undergraduate students expressed their views on gaining experience in subject teaching among the contributions of the project to field teaching knowledge. To this end, G2 stated their concern about how to explain the material they designed about Pythagorean Theorem in the first days they went for practice, but this situation changed in the following days: *"Even if we don't give lectures, I think it is an experience for us to tell what we know. When we had to teach the area of the rectangle, etc., we hesitated about how to teach in the first days. But I saw that our narration and diction improved in the following days."*. G4, on the other hand, said that the project contributed in terms of pre-experience for teaching courses with such words *"It was a good experience and experience for all of us and a preliminary preparation for our teaching courses."*.

EMT undergraduate students mostly concentrated on helping to develop teaching strategies of all the contributions of the project in terms of teaching experience. To illustrate, G1 underlined the change they made between the primary secondary school where they practiced and the other schools with their own expressions "*I observed that we get much better results when we motivate and stimulate students. We asked the students to take only the puzzle pieces in the primary school, while we had a competition by keeping time in other schools."*. G3 pointed out that *"It allowed us to experience how it should be explained according to students and their levels."*, while G6 stated *"We made transfers by making arrangements according to the incoming student group and their levels such as the process and/or only the mathematician, his life and contributions."* These groups identified the teaching strategies they used while teaching through making inferences according to the level of the student group. G2 included the following sentences in the reflective diary related to their views that the MWLMH project provides information about the teaching profession:

"We realized that we need to be balanced in our behavior. We have seen that sometimes the seriousness that should be when we want to be close to the students can be broken, and we tried to be friendly at the same time by staying a little serious from time to time. Today, I realized how effective the behavior and body language are in teaching."

According to Table 5, EMT undergraduate students announced that the project contributed to their teaching experience in terms of having experience in communicating with students. To give an example; G2 regarded the improvement of their communication with students as: *"We had the opportunity to improve ourselves in terms of lectures and communication with students in six different schools."* AndG6 stated thattheir self-confidence increased, "*My self-confidence increased while teaching. It was an opportunity to overcome the situation of not being able to reflect what I know to the students."*

EMT undergraduate students marked the project contributed to observing that HoM could be used in mathematics lessons. For instance, G6 experienced that it was likely to incorporate HoM into the curriculum so as to hinder students from memorizing *"I believe that mathematicians and their contributions can be included in the curriculum in a way that will not be based on rote learning and that can be put into practice thanks to this project."* Highlighting the contributions of using HoM in mathematics lessons, G7 implied that *"After explaining these, I realized that they should be used since it makes what students do become more meaningful as they get to know mathematicians, it makes learning easier and it is memorable."*

EMT undergraduate students also shared their views on HoM after the project. Table 6 depicts the students' views on HoM.

Table 6. EMT Undergraduate Students' Views towards HoM

Theme	Code	Group
Positive Views	Thinking that it attracts the attention of the student	G1, G2, G3, G4
	Thinking it will increase memorability	G2, G5, G7
	Thinking it will help to understand the basics of mathematical concepts	G4, G5, G6
	Thinking it helps to realize the necessity of mathematics	G2
	Thinking that students love mathematics	G4
	Thinking it helps students to break their bias against mathematics	G4
	Realizing that the use of HoMin lessons is not boring for students	G1
	Thinking that it motivates students	G1
	Thinking that Turkish-Islamic mathematicians should be prioritized	G6
Negative Views	Thinking that it is difficult to teach all the subjects	G7
	Thinking that the priority subjects will be different	G7
	Unsure about whether they can include HoM	G7

As is observed in Table 6, EMT undergraduate students expressed their positive and negative views on HoM at the end of the project; however, many views were found to be positive. Besides, they expressed a positive view about HoM, if it attracted students' attention at the most level. For instance, G3 argued, "*I think it tells a good story and provides a good introduction. In other words, by whom and how it was found rather than directly dealing with numbers, which draws more attention."*

EMT undergraduate students proved that HoM would help them understand the basics of mathematical concepts. At that point, G4 pinpointed that HoM would be beneficial for students by emphasizing the use of mathematics in daily life and where mathematical concepts come from with such words: *"I think it can be helpful because it shows that we can use many things in our daily lives thanks to historians of mathematics. When I was a student, I used to wonder where a subject came from. Likewise, I think that it will be effective in understanding the concepts as the students are also curious."* G5, on the other, expressed that HoM will be beneficial for mathematics teachers in terms of observing the development of mathematics. "*I think that HoM is a significant course for mathematics teachers. It is crucial in terms of learning that everything emerged in simpler state thousands of years ago such as the currently used formula etc. We can observe how much and how mathematics has developed."*

EMT undergraduate students stated that they would include HoM in their teaching lives since they thought it would increase students' memorability at the end of the project. For example, G2 mentioned that *"I would like to mention it in a way that will attract the attention of the students and stick in their minds."* Assuming that it both facilitates the narration and enhances its permanence, G5 shared the following expression: ,

"I think it can be used in lessons. It can be considered as extra information that can be associated. For example, when Pythagoras is explained, it may not be immediately understandable, but when it is explained together with HoM, it is useful in terms of memorability. I would like to tell stories in break times to be informative and increase memorability."

Upon analyzing Table 4, some EMT undergraduate students expressed negative views on integrating HoM as it would be difficult to teach all mathematics subjects. G7 expressed that *"I have doubts if HoM can be included when it's a bit difficult to teach normal subjects. I think that's why current teachers don't teach through including HoM."*. Similarly, G7 emphasized that *"I think HoM will stay behind as there will be more preferred subjects. In other words, because the students were told 'You read the orals anyway..*

DISCUSSION & CONCLUSION

The present study, which examines EMT undergraduate students' experiences within the scope of the MWLMH Project carried out in CSP course, revealed that the students mostly had positive views about the project. The participants also highlighted that the project carried out with EMT undergraduate students was more productive than expected and held various contributions such as attracting secondary school students' attention and offering them a different experience, helping to make sense of the relevant subject, giving a different perspective, improving their knowledge about HoM and their love of mathematics.

EMT undergraduate students had negative views regarding the selection of schools and the inadequacy of the implementation period for CSP project. This result is congruent with the challenges experienced by undergraduate students due to administrators. The CSP course directive indicates that the cooperation protocols between the Rectorate and the Governorship will be followed in the practices planned at the local level (within the

province) (CSP Course Directive, 2011, p. 2). In this regard, the schools for CSP course project were selected by the undergraduate students, who were the project consultants and coordinators, and were clarified through obtaining the necessary permissions from the Provincial Directorate of National Education within the scope of cooperation protocols between the Rectorate and the Governorship. Besides, the implementation date and the environment were prepared by negotiating with the school administrators. However, as revealed in Küçükoğlu et al.'s (2016) study, undergraduate students had difficulties in the implementation process due to the negative attitudes of some school administrators. EMT undergraduate students stated that school administrators' negative attitudes towards the project adversely affected both teachers' and students' approaches to the project and their own motivation. Moreover, school administrators' negative attitudes affected both teachers' and students' perceptions towards the project, which also decreased their motivation. However, undergraduate students implicated that the school principal they first went to practice with was interested in the project, and teachers and students were also interested.

On the contrary, the school principal considered the project as a waste of time due to exam-oriented perspective in another school; furthermore, s/he did not create a suitable environment for the exhibition of the project and guide the teachers and students to the project exhibition area for similar reasons. These two attitudes affected the EMT undergraduate students' motivation, which could be observed in their reflective diaries and focus group interviews. Thus, it is of utmost importance for the voluntary schools to apply to the Ministry of National Education in advance during the implementation of CSP projects and to design the project process systematically with voluntary schools to carry out the project and ensure the undergraduate students' motivation. In addition, it is remarkable that the school principal has an exam-oriented perspective and hence believing that this project, in which the poster and the concrete material/activity for the contribution of the relevant mathematician to mathematics are designed, will not contribute to the student's development. Likewise, in the study conducted by Arcagök and Şahin (2013), the instructors noted that they encountered many problems related to the institutions and organizations where CSP course was conducted and that the representatives or administrators of institutions and organizations had a low level of awareness regarding the significance of the course. Even though official permissions were obtained, it is vital to determine the schools that are willing to participate voluntarily in CSP course projects and to inform the administrators of the schools where the implementation will be made about the scope and importance of the course before the implementation of the projects. In addition, undergraduate students indicated that communicating with teachers rather than administrators would help the process to work more effectively. This may be due to the perspectives of school administrators and teachers on using HoM in mathematics teaching. Yıldız and Baki (2016) concluded that the integration of HoM in lessons positively and negatively affected the teaching process. The negative reasons that teachers mentioned mostly which prevent them from using HoM in lessons were identified as teachers' anxiety about teaching all the subjects, lack of self-confidence, lack of knowledge and experience about HoM (Fauvel, 1991; Panasuk & Horton, 2012; Yıldız & Baki, 2016). This may be interpreted as an indication that HoM is still underestimated. However, teachers can use HoM in lessons for many different purposes such as alerting students, increasing their attention and making lessons interesting. Teachers will also likely feel self-confident and more experienced for using HoM in their lessons (Clark, 2012; Yıldız & Baki, 2016).

EMT undergraduate students had the most difficulty in deciding which material to prepare and designing the material (suitability of the material for the level of the student, the utensils to be used in the design of the material, ergonomics, etc.). The students affirmed that the discussion environments and the studies they carried out in CSP course meetings helped to overcome these difficulties. Fauvel (1991) noted that HoM played a significant role in coping with the problems by encouraging research. In this regard, weekly meetings with students and discussion environments that offer an opportunity to exchange ideas may help students overcome their difficulties. Similarly, Çetinkaya (2018) investigated the effects of CSP activities on social skills and self-efficacy belief levels of pre-service teachers with a total of 135, 30 of whom were science teachers, 31 primary school teachers, 40 mathematics teachers and 34 pre-school teachers. As a result, they confirmed that the regular exchange of ideas between the advisor and the students would increase the effectiveness of the course.

The results also suggested that the project contributed to the EMT undergraduate students in terms of their field and pedagogical knowledge of mathematics (and HoM), social skills as well as teaching experience. In this vein, the related project activates the undergraduate students in the whole process and directs them to research both about mathematicians and materials; moreover, it contributes to their experience in designing materials and how to integrate HoM into lessons. There are studies stating that integrating HoM in teacher training contributes to the development of pre-service teachers' content knowledge and pedagogical content knowledge (for example Clark, 2012; Galante, 2014; Fauvel, 2007; Panasuk & Horton, 2012). In addition, EMT undergraduate students

emphasized that they were happy to be involved in the project, that they had fun and efficiency, and that their social skills increased. Similarly, some studies showed that CSP course contributes significantly to increasing social sensitivity, improving social and individual skills and professional development (Çetinkaya, 2018; Kesten, 2012). As in Çetinkaya's (2018) study, the present study also demonstrated that CSP course project provided undergraduate students the opportunity to be familiar with the school, the environment, students, institutions, and their future professions and to gain experience. Following the project, EMT undergraduate students expressed positive views about using HoM in mathematics teaching. Accordingly, they emphasized that the activities/materials they developed were useful, interesting and entertaining for students and contributed to their awareness towards HoM. They were also found to develop ideas that they could include HoM in their lessons to make mathematics fun for students, to motivate students to love mathematics, to increase memorability, to eliminate bias against mathematics and to help make sense of mathematical concepts. The relevant literature shows that pre-service teachers having experience with HoM and its use in lessons have developed similar ideas (Burns, 2020; Clark, 2012; Dündar & Çakıroğlu, 2014; Ulusoy & Girit-Yıldız, 2019). For example, in the study conducted by Burns (2010), undergraduate students emphasized that it is important to integrate HoM in the high school curriculum to establish relationships between concepts, draw attention to the subject, and enable students to look at mathematics from a different perspective. Ulusoy and Girit-Yıldız (2019) concluded that the pre-service teachers could benefit from HoM in order to strengthen their teaching processes, to support and motivate students emotionally towards mathematics after HoM course, which included pedagogical experiences with EMT candidates.

Similarly, Dündar and Çakıroğlu (2014) conducted a study with pre-service classroom teachers and found that the pre-service classroom teachers supported the use of HoM in the lessons as it helped students to increase their motivation, display positive attitudes towards mathematics, realize their own skills, actively participate in the problem solving process, increase their tendency towards mathematics, enrich their knowledge, gain a different perspective on problems and think mathematically along with arousing curiosity. Therefore, this study revealed that the CSP project named MWLMH, which is carried out with a focus on HoM, helps undergraduate students to gain awareness and develop a positive perspective on the use of HoMin lessons. Hence, Burns (2010) also stated that the reason for the positive change in the views of pre-service teachers is that they examined some mathematicians and examples of how the history of mathematics could be incorporate in the lessons and had the opportunity to prepare a lesson plan accordingly. Briefly, they gained an appreciation of how they may be able to incorporate HoM in their teaching. In that context, as Clark (2012) stated, we need vigorous examples of how using history in teaching mathematics enables future teachers to both understand mathematics more deeply and to recognize the role of history of mathematics in developing that understanding (p. 81). Finally, a pre-service teacher stated that he thought he couldn't use HoM in his future mathematics teaching, since lack of time and there may be subjects that need to be given priority. It is thought that the reason for this thougt is test anxiety in our country. Hence, as mentioned above there are findings in the literature that lack of time and test anxiety negatively affect teachers' inclusion of MT in their teaching (Panasuk & Horton, 2012; Yıldız & Baki, 2016).

RECOMMENDATIONS

Based on the research findings, various recommendations were provided:

• Pre-service teachers should be offered the opportunity to participate in more projects in which they will take an active role during the undergraduate education process.

• Pre-service teachers should be provided environments to interact more with the school and students.

• For CSP projects where the target organization is schools to be carried out more efficiently, it is of great importance to pre-determine the schools that are willing to participate in the project and sign the relevant protocols by the Provincial Directorate of National Education in each province, just like in the "School Experience" and "Teaching Practice" courses. Besides, informing the institutions and organizations that will participate in the CSP project about the purpose and scope of the course may help school administrators give the projects the necessary attention and importance in terms of the effective functioning of the process.

• The theoretical part of the CSP course is as significant as the practical part. In this regard, weekly meetings with students, the guiding role of the counselor in this process and peer discussions should be highlighted.

• Practical courses should be included in the undergraduate education process so that they can understand the significance of using HoM in lessons and gain experience on this subject. HoM course hours in EMT undergraduate programs are believed to be insufficient. In this respect, the course hours can be increased so that the HoM course can be carried out in two stages, theoretical and practical.

• As many of the contributions of the MWLMH project listed above were observed because of the study, including more HoM in the lessons is recommended. Thus, in-service seminars may be provided for teachers who lack knowledge of how HoM can be used in lessons.

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Researchers' Contribution Rate

The authors contributed equally to the study.

Conflict of Interest

The authors of this article declare that there is no personal conflict of interest within the scope of the study.

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Metaphorical Perceptions of Preservice Teachers Enrolled in Different Departments About the Concept of "Art": The Case of Bartın University, Faculty of Education

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Abstract

The purpose of this study is to identify, using metaphors, the perceptions of preservice teachers, who study in different departments at the Faculty of Education of Bartın University, about the concept of "art". The study is based on the case study model, which is one of the qualitative research methods, and the study group consists of 198 preservice teachers who are enrolled in the programs of Turkish Language Education, Social Sciences Education, Psychological Counselling and Guidance (PCG), Science Education, Elementary Mathematics Education, Foreign Language Education, and Primary Education at Bartın University, Faculty of Education. The research data were obtained through the "Art Metaphor Survey Form" and analysed using the content analysis method. Based on the research results, the metaphors for the concept of art were grouped under 9 categories including "art as born and enhanced under difficulties and pressure", "art as a complex structure", "art as the fruits of labour", "art as reflective and expressive", "art as relaxing", "art as immersive", "art as a vital need", "art as liberating" and "art as radiant and supportive". The results also revealed that preservice teachers enrolled in different programs interpreted art considering different semantic properties. In this context, it was observed that preservice teachers in Turkish Language and Social Sciences Education Programs mainly described art as "liberating", those in PCG as "reflective and expressive", those in Science Education as "relaxing", and those in Elementary Mathematics Education as "a vital need". On the other hand, preservice teachers in Foreign Language Education Program focused on two different categories and described art as "complex" and "reflective and expressive", whereas those in Primary Education mostly characterised art as "reflective and expressive".

Keywords: Metaphor, metaphorical perception, art, faculty of education, preservice teacher

Farklı Bölümlerde Öğrenim Gören Öğretmen Adaylarının ''Sanat" Kavramına İlişkin Metaforik Algıları: Bartın Üniversitesi Eğitim Fakültesi Örneği

Öz

Bu araştırmanın amacı, Bartın Üniversitesi Eğitim Fakültesinde farklı bölümlerde öğrenim gören öğretmen adaylarının "Sanat" kavramına ilişkin algılarının metaforlar yolu ile belirlenmesidir. Nitel araştırma yöntemlerinden durum çalışması modeli ile yürütülen araştırmanın çalışma grubunu Bartın Üniversitesi Eğitim Fakültesi'nde Türkçe Öğretmenliği, Sosyal Bilgiler Öğretmenliği, Psikolojik Danışmanlık ve Rehberlik (PDR), Fen Bilgisi Öğretmenliği, İlköğretim Matematik Öğretmenliği, İngilizce Öğretmenliği ve Sınıf Öğretmenliği Programlarında öğrenim gören ve geleceğin öğretmenleri olacak olan 198 öğretmen adayı oluşturmaktadır. Araştırmanın verileri "Sanat Metaforu Araştırma Formu" aracılığıyla elde edilmiş ve içerik analizi yöntemi ile çözümlenmiştir.Araştırma sonuçlarına göre, sanat kavramına yönelik metaforların "zorluk ve baskı karşısında doğan ve gelişen olarak sanat", "karmaşık bir yapıya sahip olarak sanat", "emek verilerek ortaya çıkan olarak sanat", "yansıtıcı ve dışavurumcu olarak sanat", "rahatlatıcı olarak sanat", "sürükleyici olarak sanat", "hayati bir ihtiyaç olarak sanat", "özgürleştirici olarak sanat" ve "enerji saçan ve destekçi olarak sanat" olmak üzere 9 kategori altında toplandığı tespit edilmiştir. Öte yandan farklı bölümlerde okuyan öğretmen adaylarının sanatı farklı anlamsal niteliklerle yorumladığı ortaya konmuştur. Bu kapsamda, Türkçe Öğretmenliği ve Sosyal Bilgiler Öğretmenliği Programlarında okuyan öğretmen adaylarının sanatı ağırlıklı olarak "özgürleştirici", PDR Programı Öğretmen adaylarının "yansıtıcı ve dışavurumcu", Fen Bilgisi Öğretmenliği Programında eğitim alan öğretmen adaylarının "rahatlatıcı", İlköğretim Matematik Öğretmenliği Programında okuyan öğretmen adaylarının ise sanatı "hayati bir ihtiyaç" olarak nitelediği görülmüştür. Bununla beraber, İngilizce Öğretmenliği Programında okuyan öğretmen adaylarının iki farklı kategori üzerinde yoğunlaştığı ve sanatı "karmaşık" ve "yansıtıcı ve dışavurumcu" olarak betimlediği, Sınıf Öğretmenliği Programında eğitim alan öğretmen adaylarının ise sanatı genel olarak "yansıtıcı ve dışavurumcu" olarak tanımladığı tespit edilmiştir.

Anahtar Kelimeler: Metafor, metaforik algı, sanat, eğitim fakültesi, öğretmen adayı.

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INTRODUCTION

Art education should not be considered as a field in which only technical and artistic knowledge is delivered to train artists. Art education is crucial at every level of education for individuals of all ages to express themselves better, to acquire an aesthetic sensitivity and perspective, to be more sensitive to nature and humanity in their lives, and to make sure that art exists in every stage and area of their lives. Not only art teachers, such as visual arts and music teachers, but also all subject matter teachers can make use of artistic activities. In this way, more effective and permanent learning will be provided, and an important step will be taken in raising individuals who are sensitive to art and have an aesthetic perspective.

Education and art have appeared as fields expressing continuity throughout the history of humanity. Depending on the course of evolution, the dimensions of the relationship between the history of art and the history of education have changed constantly. Art and art education have largely maintained their originality, continuity and role in the lives of individuals and the society with their metaphorical indicators. The interest in the metaphorical indicators today, ranging from everyday life to the scientific field, makes the existence of metaphors more significant at every stage of the educational processes.

Metaphor

Metaphor is defined as "the art of expressing a literal meaning by referring to something with similar features, and conveying the meaning of a word or a name provisionally by making use of analogies". In another way, metaphor is defined as words or concepts that are assigned meanings different from their literal meaning based on a relevance or a similarity (Lakoff & Johnson, 2015). According to Woodgate et al. (2021), metaphors can be used both visually and verbally as a communicative tool to facilitate the dissemination and interpretation of information. Moreover, Skrefsrud (2020) notes that a good metaphor can make it easier to understand a concept or a subject.

Furthermore, metaphors have an insightful psychological aspect with their conceptual structures. They serve as a tool in modelling the whole of intangible things, including the cultural language in use (İflazoğlu Saban & Erden Özcan, 2022; Stampoulidis & Bolognesi, 2023).

Art and Art Education

Art is a phenomenon that has existed since the beginning of humanity, and that has been changed and enhanced by humans. Art means accessing the world of beauty (Hye & Ja, 2017). It has a role as a document and proof of events, historical developments, and various cultures (Goldberg, 2021; Morphy, 2020). Art affects human behaviour and gives meaning to experiences due to its social structure (Acord & DeNora, 2008). It surrounds people in the course of life and enables them to balance with the world they live in. When art reaches a dead end, people lose their balance (Fischer, 2010). It is also effective in increasing the academic achievement of students with daily life and social life skills. Art can help students with higher-level social skills express themselves in the academic field, which also increases self-confidence.

With a general definition, art education refers to in-school and out-of-school art instructions including all fields and forms of fine arts, and in a narrow sense, it covers the art-related lessons delivered in the relevant departments and classes in schools (San, 2010). Fundamentally, the purpose and the necessity of art education pursue to glorify the human spirit, to satisfy the spiritual needs of individuals, and to build a balanced, modern, and sensitive society (Artut, 2013). With a widespread misconception, art education is considered as an education only for talented students (Yılmaz, 2005). It is, however, necessary for the spiritual satisfaction and perceptual development of individuals of all ages.

Art education provided in educational institutions contributes to students' recognition of different cultures and various visual worlds. By increasing the level of sensitivity, it encourages individuals to develop a relationship with their environment. Art promotes the individual's social-emotional development starting from the school ages, and what matters here is that schools need art education (Dickenson, 2017). Art education is an important tool in acquiring critical thinking skills in young children (Santn & Torruella, 2017). Students who are deprived of art education are likely to have difficulties in accessing different cultural heritages and diversity, and in being in social harmony with their surroundings (Ilić, 2017).

When the profession of teaching is viewed from the perspective of art-based education, the field of art can easily be integrated into every discipline of the field of education. This approach provides important advantages in increasing the quality of education, and it is also highlighted in contemporary education (Ilić, 2017). Studies on the subject have revealed results that support this situation (Hausman, 1967; Perry & Edwards, 2021; Shockley & Krakaur, 2021).

As emphasised by previous research, the need for art education in teacher training programs is an indisputable fact. However, when the undergraduate programs of the Faculties of Education in Türkiye are examined, it is observed that the respective programs lack art courses. They are only offered as elective or low-credit courses in these programs, which constitutes a disadvantage considering the artistic development and some interdisciplinary teaching skills of preservice teachers.

Metaphor and Art Education

Metaphors are highly important at every stage of teaching processes and in teacher training. It is one of the resources that educators should refer to in explaining themselves, conveying their experiences or exemplifying subjects. They also play an essential role in teaching and teacher training (Craig, 2018; Bahadır, 2021; MacDonald et al., 2017). They can help educators make sense of their own language and convey it to the other side. Therefore, use of metaphors in education should be valued and adopted in practice (Fenech et al., 2020; Gallagher & Lindgren, 2015).

Metaphors have both aesthetic and epistemic values. The functionality of metaphors in featuring creativity in science cannot be ignored. Considering all these facts, metaphors can be considered aesthetically pleasing in different fields and can make abstract concepts more recognizable in a tangible way (Veit & Ney, 2021; Gonigroszek & Szmigiero, 2023). It is observed that metaphors are used effectively in the field of design and art (Casakin & Kreitler, 2017). It is thus possible to consider metaphor not only as an abstract functionality, but also as a tangible practice of understanding-explaining in the artistic and scientific sense (Ware, 2023).

Considering the literature review, it is remarkable that there are many metaphor studies conducted on different subjects around the world and in Türkiye. It is also observed that the studies in Türkiye are mostly in the field of education and on educational concepts (Balcı, 2001; Saban, 2004; Saban et al., 2006; Taşdemir & Taşdemir, 2011; Pesen et al., 2015; Toker Gökçe & Bülbül, 2014; Umuzdaş & Işıldak, 2018), and that the studies in the field of art are generally limited to those presenting the views of preservice teachers or secondary school students about the visual arts course (Kalyoncu, 2012; Kalyoncu & Liman, 2013; Fidan & Fidan, 2016; Dilmaç & İnanç, 2015).

Metaphor studies on preservice teachers' perceptions of art are encountered in the literature, albeit in limited numbers. Among these studies, "*A study of trainee visual arts teachers' metaphorical perception of the concept of 'the teacher' and 'the artist'*" conducted by Yalçın Wells (2015) focuses on preservice visual arts teachers' perceptions of art, and the study entitled "*Teacher candidates' metaphors regarding art and creativity*" conducted by Nalinci and Yapıcı (2020) focuses on preservice primary education teachers' perceptions of art. Similarly, in their study entitled "*Examining, through metaphors, the perceptions of the art term of the prospective teachers who take art education course*", Hiçyılmaz and Adanır (2019) concentrates on the art perceptions of preservice teachers studying in primary and early childhood education programs. As observed in these studies, metaphor studies in which preservice teachers' perceptions of the concept of art are evaluated have been conducted in a limited number of departments, yet there are no relevant studies carried out in other teacher training programs in faculties of education.

Future teachers' metaphors for art provide insight into their opinions on art and thus their ability to teach their future students the love of art. From this point of view, this study aims to identify, through metaphors, the art perceptions of preservice teachers studying in different departments at the Faculty of Education of Bartın University. This aim is important in the sense that it contributes to the literature by revealing the perceptions and opinions of preservice teachers, who study in different programs, about the concept of art.

Purpose of the Study

The purpose of this study is to identify the metaphorical perceptions of art held by preservice teachers enrolled in different programs at the Faculty of Education of Bartın University. For this purpose, answers to the following questions were sought:

1. What are the conceptual categories under which preservice teachers' metaphorical perceptions of the concept of "art" are grouped?
2. What are the metaphors created by the preservice teachers according to their programs?
3. Do the metaphors of preservice teachers differ by program?

METHOD

Study Design

This study, which aims to identify, through metaphors, the perceptions of art held by preservice teachers enrolled in the Faculty of Education of Bartın University, was conducted as a case study, one of the qualitative research methods. In simple terms, case study is defined as a thorough description and examination of a bounded system or situation (Merriam, 2018). In this study, the case study method was used in order to describe the preservice teachers' perceptions of the concept of "art" using metaphors and to establish a cause-and-effect relationship between the results, within the scope of the research questions addressed.

Study Group

The study group consists of 198 preservice teachers who are senior students enrolled in different programs at the Faculty of Education of Bartın University. The reason why senior students are preferred in determining the study group is that these students are about to complete their education and step into the profession of teaching in the near future. The programs of the preservice teachers involved in the study include Turkish Language Education, Social Sciences Education, Psychological Counselling and Guidance (PCG), Science Education, Elementary Mathematics Education, Foreign Language Education, and Primary Education. Even though the department of Fine Arts Education is actively present under the Faculty of Education of Bartın University, it is excluded from the study group since the students of this program study the field of art throughout their education life, and their readiness level for the concept of "art" is high. The purpose of this study is to identify the metaphorical perceptions of art held by preservice teachers whose major is not art education.

Demographic information of the study group is presented in Table 1.

Table 1. Demographic information of the study group

Program	Program Code	Female	Male	Unspecified	n
Turkish Language Education	TL	13	12	0	25
Social Sciences Education	SS	18	11	7	36
Psychological Counselling & Guidance	PC	26	13	2	41
Science Education	S	4	1	0	5
Elementary Mathematics Education	EM	15	14	2	31
Foreign Language Education	FL	12	9	0	21
Primary Education	P	32	6	1	39
Total		120	66	12	198

As can be observed in the table, the participants were assigned codes based on their programs during the reporting process of the study. In addition, codes for the gender difference were assigned following the program and sequence codes, including "F" for females and "M" for males, and "U" was used for those who did not prefer to specify gender while filling out the form. For example: *"TL5F": Turkish Language Education, 5th participant, female; "P17U": Primary Education, 17th participant, gender unspecified*.

Data Collection Tool

One of the most frequently used methods to obtain data in metaphor studies includes administering a form in which a written statement about the subject of study is given, and the participant is asked to write what they associate with this statement and the reason for this association. These forms are usually in the form of "X is like ……. because ……". In this way, it is aimed to identify what the participant compares X with and what the relevant reason is. In this context, the "Art Metaphor Survey Form" was developed in order to identify the perceptions of art held by preservice teachers studying at Bartın University, Faculty of Education. The form consists of two parts. In the first part of the form, there are items including the demographic information of the participant, and in the second part, there is the item including sample metaphor expressions and the statement aimed at identifying the participant's perception of art. This part is structured as "*Art is like …….. because ……*" so that the participants' metaphors regarding the concept of "art" will be revealed. During the development of the data collection tool, it was aimed to accurately identify the perception of the study subject, and it was also regarded that a statement that the participants could understand clearly without confusion would be selected.

Data Collection Process

The data of the study were collected during the fall semester of the 2022-2023 academic year upon approval of the authorities. The data collection process was carried out during lesson hours by obtaining permission from

the instructor of the relevant course so that the students were all together. The students were informed about the study before data collection, and it was highlighted that participation was on a voluntary basis and those who were unwilling to participate in the study did not have to fill out the form. The students were then distributed the forms and asked to review the sample statements provided and to fill out the form with expressions reflecting their own opinions. It was especially emphasised that they should not look at each other's responses and influence others with their opinions while filling out the forms. It was also noted that the statements they would write on the forms would not affect their course assessments or the teacher's attitude and that they should be free to write any opinion of theirs. They were given 15 minutes to fill out the form. Then, the forms were collected and reviewed, and the data to be analysed were obtained by eliminating the forms that lacked metaphors.

Data Analysis

The data obtained within the scope of the study were analysed using the content analysis method. Patton (2014) defines content analysis as an attempt of data reduction and interpretation to identify the basic consistencies and meanings in a volume of qualitative data. Similarly, Yıldırım and Şimşek (2011) state that "the main purpose in content analysis is to reach the concepts and relationships that can explain the collected data". In qualitative data analysis, descriptive analysis and content analysis are often confused and used interchangeably. Basically, descriptive analysis is a method in which the conceptual structure is clearly determined beforehand and the analysis process is performed based on this framework, whereas content analysis is a method in which the collected data is analysed thoroughly with a view to revealing the themes and dimensions, which are previously unclear, based on an inductive approach (Yıldırım & Şimşek, 2011, p.223).

In this context, the data obtained at the end of the data collection process were examined preliminarily, and possible erroneous/incomplete data were eliminated. Following this process, the metaphors created by the preservice teachers were grouped according to their programs and read many times by two researchers who were experts in their fields, and the metaphors of similar nature were divided into general categories. This analysis performed by two different researchers at different times was then compared, and the categories were finalised. The metaphors organised under the final categories were presented in tables. Besides, direct quotations from the metaphors of the preservice teachers were presented in the text in order to increase the reliability of the study results.

Ethics

Ethical principles were followed in all processes of this study, which aims to identify the metaphorical art perceptions of preservice teachers who study at the Faculty of Education, and the approval of the ethics committee dated 18/01/2023 and numbered 2022-SBB-0690 was received from the Social and Human Sciences Ethics Committee of Bartın University.

FINDINGS

In this section, the findings obtained from the analysis of the metaphors used by the participating preservice teachers for the concept of "art" are presented in line with the sub-purposes of the study. The findings are itemised within the scope of the research questions.

What are the conceptual categories under which preservice teachers' metaphorical perceptions about the concept of "art" are grouped?

The first sub-purpose of the study is expressed with the question: "*What are the conceptual categories under which preservice teachers' metaphorical perceptions of the concept of "art" are grouped?*". In line with this sub-purpose, all the metaphors created for the concept of art were analysed, and categories were formed by grouping the metaphors considered semantically similar. While forming these categories, the expression "*is like*" in the data collection tool was used to understand the connection between the subject and the source of the metaphor, and the conjunction "*because*" formed a rationale or a logical basis for the metaphors of the participants. The categories formed as a result of the analyses are presented in Table 2.

Table 2. Conceptual categories of the metaphors for the concept of art

Category 1: Art as born and enhanced under difficulties and pressure
Category 2: Art as a complex structure

Category 3: Art as the fruits of labour
Category 4: Art as reflective and expressive
Category 5: Art as relaxing
Category 6: Art as immersive
Category 7: Art as a vital need
Category 8: Art as liberating
Category 9: Art as radiant and supportive

What are the metaphors created by the preservice teachers according to their programs?

The second sub-purpose of the study is expressed with the question: "*What are the metaphors created by the preservice teachers according to their programs*?". In line with this sub-purpose, the metaphors produced by the preservice teachers were analysed based on their programs, and the data obtained from the analysis were presented using tables and direct quotations.

Turkish Language Education Program

The metaphors of art created by 25 preservice teachers studying in the Turkish Language Education Program are presented in Table 3.

Table 3. Conceptual Categories and Metaphors Created by Preservice Teachers in Turkish Language Education Program

Conceptual categories		Metaphors created for art	n
1	Art as born and enhanced under difficulties and pressure	Questionnaire distributed in an exam (TL1M) Lesson (TL18M)	2
2	Art as a complex structure	Life (TL2M) Compass (TL19M)	2
3	Art as the fruits of labour	Soil (TL3M) Climbing the stairs (TL23M)	2
4	Art as reflective and expressive	Mirror (TL4M) Mirror (TL17M)	2
5	Art as relaxing	Meditation (TL5F) Coming of spring (TL7F) Having a conversation (TL8F) Tree (TL22M)	4
6	Art as immersive	Book (TL6F) Black hole (TL9F)	2
7	Art as a vital need	Eating (TL10M) Nourishment for the soul (TL11F) Water (TL12F)	3
8	Art as liberating	Freedom (TL13F) Unseen side of a mountain (TL14F) Stairs up to the sky (TL16F) Endless road (TL20M) Liberty (TL21M) Sky (TL24F)	6
9	Art as radiant and supportive	Sun (TL15F) Investment (TL25M)	2
		Total	25

The data in the table show that the preservice teachers studying in the Turkish Language Education Program have created metaphors in all 9 categories. The details and sample statements for these metaphors are presented below.

Category 1: Art as born and enhanced under difficulties and pressure

In this category, 2 participants describe art as born and enhanced under difficulties and pressure, using the metaphors of questionnaire distributed in an exam (TL1M) and lesson (TL18M). A sample statement regarding the category is as follows: "*Art is like a questionnaire distributed in an exam because it appears under pressure, builds up under pressure and becomes complete*." (TL1M)

Category 2: Art as a complex structure

In this category, art is described as a complex structure by 2 participants. The metaphors used include life (TL2M) and compass (TL19M). Relevantly, one student states; "*Art is like life because it is very complex*." (TL2M)

Category 3: Art as the fruits of labour

In this category, 2 participants refer to art as the fruits of labour. The relevant metaphors include soil (TL3M) and climbing the stairs (TL23M). A sample statement is as follows: "*Art is like soil because as you dig, water, dredge and maintain, you definitely gain something*." (TL3M)

Category 4: Art as reflective and expressive

In this category, 2 participants consider art as reflective and expressive, using the metaphor of mirror (TL4M, TL17M). An example statement for the category is; "*Art is like a mirror because it allows us to express everything inside*." (TL4M)

Category 5: Art as relaxing

In this category, 4 participants describe art as relaxing. The metaphors used include meditation (TL5F), the coming of spring (TL7F), having a conversation (TL8F), and tree (TL22M). As an example, one student states; "*Art is like meditation because it relaxes you*." (TL5F)

Category 6: Art as immersive

In this category, 2 participants consider art as immersive, using the metaphors of book (TL6F) and black hole (TL9F). A sample statement in the category is as follows: "*Art is like a book because as long as you do not open it up, it is boring, but when you get curious and look inside, it engages you*." (TL6F)

Category 7: Art as a vital need

In this category, 3 participants refer to art as a vital need. The metaphors they have created include eating (TL10M), nourishment for the soul (TL11F), and water (TL12F). A relevant student statement is as follows: "*Art is like nourishment for the soul because it is essential*." (TL11F)

Category 8: Art as liberating

In this category, 6 participants define art as liberating. The metaphors used are freedom (TL13F), unseen side of a mountain (TL14F), stairs up to the sky (TL16F), endless road (TL20M), liberty (TL21M), and sky (TL24F). A sample student statement for the category is as follows: "*Art is like freedom because you only act on your own thoughts.*" (TL13F)

Category 9: Art as radiant and supportive

In this category, 2 participants describe art as radiant and supportive, using the metaphors of the sun (TL15F) and investment (TL25M). Relevantly, one student states; "*Art is like the sun because it radiates energy.*" (TL15F)

When the metaphors are examined, it is observed that the preservice teachers have developed 25 meaningful metaphors for the concept of "art". Considering the distribution of these metaphors, there are expressions for all 9 conceptual categories. The percentage distribution of the categories is illustrated in Figure 1:

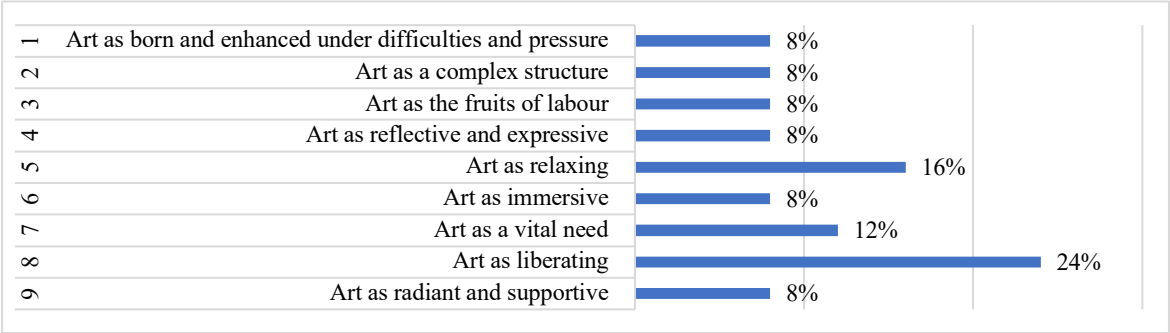

Figure 1. *The Percentage Distribution of the Conceptual Categories of Metaphors Created by the Preservice Teachers Studying in the Turkish Language Education Program*

Social Sciences Education Program

The metaphors produced for the concept of "art" by 36 preservice teachers studying in the Social Sciences Education Program are presented in Table 4.

Table 4. Conceptual Categories and Metaphors Created by Preservice Teachers in the Social Sciences Education Program

Conceptual categories		Metaphors created for art	n
2	Art as a complex structure	Life (SS27F) Mind (SS26U) Religion (SS20F)	3
3	Art as the fruits of labour	Human (SS37M) Bee (SS9F) Woman (SS4U) Being in love (SS3F)	4
4	Art as reflective and expressive	Emotion (SS33M) Part of human emotions (SS32U) Mirror (SS22F) Speaking without words (SS16M) Mirror (SS11F)	5
5	Art as relaxing	Love (SS34M) Love (SS30F) Smell of earth (SS24M) Chocolate (SS10F) Medicine (SS8M) Alcohol (SS7M) Mirror (SS2U)	7
6	Art as immersive	Water (SS31F) Universe (SS23F) Time (SS14F)	3
7	Art as a vital need	Furkan (SS35F) Sun (SS17F) Breath (SS5F)	3
8	Art as liberating	Time machine (SS29M) Door (SS28F) Daydreaming (SS25F) Dream (SS19M) Infinite sky (SS18U) Colours (SS15F) Pen (SS12M) Ocean (SS6F)	8
9	Art as radiant and supportive	Summer (SS36U) Sun (SS13F) Song (SS1U)	3
		Total	36

When the data in the table is examined, it is observed that the preservice teachers in the Social Sciences Education Program have created metaphors in 8 of 9 categories, excluding "*Category 1: Art as born and enhanced under difficulties and pressure*". The relevant details and sample statements are presented below.

Category 2: Art as a complex structure

In this category, 3 participants describe art as a complex structure. The metaphors used include life (SS27M), mind (SS26U), and religion (SS20F). A sample student statement in the category is as follows: "*Art is like life because it changes*." (SS27F)

Category 3: Art as the fruits of labour

In this category, 4 participants describe art as the fruits of labour. The metaphors used are human (SS37M), bee (SS9F), woman (SS4U), and being in love (SS3F). As an example, one student states; "*Art is like a bee because it creates its own work with its own efforts*." (SS9F)

Category 4: Art as reflective and expressive

In this category, 5 participants consider art as reflective and expressive. The metaphors created include emotion (SS33M), part of human emotions (SS32U), mirror (SS22F, SS11F), and speaking without words (S16M). A sample student statement is as follows: "*Art is like a mirror because it is the reflection of the soul. Just as we look in the mirror and see the reflection of our mood, art is the expression of the illusions in our souls.*" (SS22F)

Category 5: Art as relaxing

In this category, 7 participants characterise art as relaxing. The relevant metaphors include love (SS34M, SS30F), the smell of earth (SS24M), chocolate (SS10F), medicine (SS8M), alcohol (SS7M), and mirror (SS2U). A sample student statement for the category is; "*Art is like the smell of earth because it gives people peace.*" (SS24M)

Category 6: Art as immersive

In this category, 2 participants describe art as immersive, using the metaphors of universe (SS23F) and time (SS14F). A sample statement is as follows: "*Art is like time because when we are engaged in art, we do not understand how it flows*." (SS14F)

Category 7: Art as a vital need

In this category, 4 people describe art as a vital need. The metaphors produced include Furkan (SS35F), the sun (SS17F), breath (SS5F), and water (SS31F). As an example, one student states; "*Art is like breath because it provides the individual with the right to live*." (SS5F)

Category 8: Art as liberating

In this category, 8 participants describe art as liberating. The metaphors used are time machine (SS29F), door (SS28F), daydreaming (SS25F), dream (SS19M), infinite sky (SS18U), colours (SS1F), pen (SS12M), and ocean (SS6F). A relevant statement is as follows: "*Art is like a time machine because it can make you travel to the past and the future.*" (SS29F)

Category 9: Art as radiant and supportive

In this category, 3 participants describe art as radiant and supportive using the metaphors of summer (SS36U), sun (SS13F), and song (SS1U). An example student statement in the category is; "*Art is like the summer season because there is excitement in both*." (SS36U)

When the metaphors are examined, it is observed that the preservice teachers have created 36 meaningful metaphors for the concept of "art". The distribution of these metaphors indicates that metaphors have been developed for 8 of 9 conceptual categories. The percentage distribution of the categories is illustrated in Figure 2.

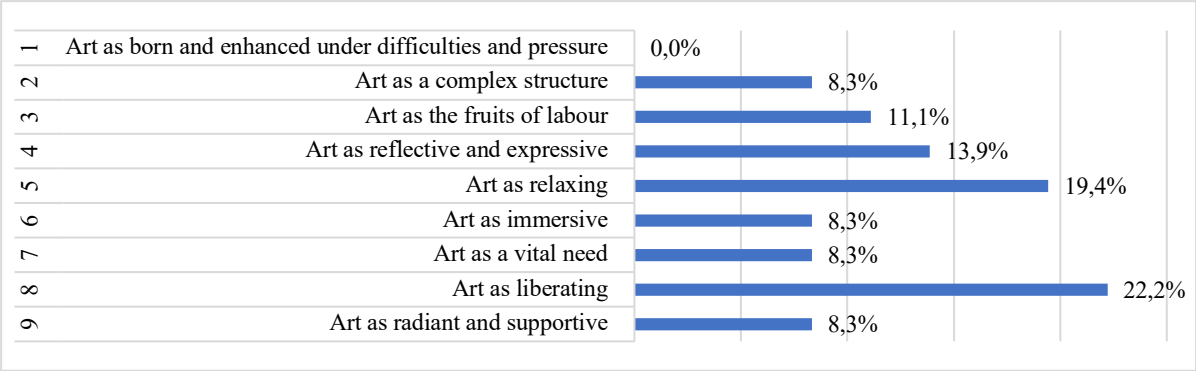

Figure 2. *The Percentage Distribution of the Conceptual Categories of Metaphors Created by the Preservice Teachers Studying in the Social Sciences Education Program*

Psychological Counselling and Guidance Program

The metaphors created for the concept of "art" by 41 preservice teachers in the PCG Program are presented in Table 5.

Table 5. Conceptual Categories and Metaphors Created by Preservice Teachers in the PCG Program

Conceptual categories		Metaphors created for art	n
1	Art as born and enhanced under difficulties and pressure	Love (PC8M)	1

2	Art as a complex structure	Life (PC40U) Reading a book (PC34M) Puzzle (PC24M) Life (PC11F) Soul (PC7F) Human (PC4M)	6
3	Art as the fruits of labour	Rose (PC20M) Human (PC14M)	2
4	Art as reflective and expressive	Loneliness (PC30F) Feeling of love (PC21U) Water (PC19M) Mirror (PC18F) Language of the soul (PC17F) Mirror (PC5M) Human soul (PC3F) Night abandoned by the Sun (PC2M) Reflection of dreams (PC1F)	9
5	Art as relaxing	Rainbow (PC39F) Sea (PC32F) Lying on a lush green river full of swans (PC29F) Therapy (PC28M) Resting hours (PC23U) Ability to produce something (PC12F) Sky (PC10F) Freshly washed bed linens (PC6F)	8
6	Art as immersive	Dream (PC15F)	1
7	Art as a vital need	Food (PC37M) Water (PC31F) Water (PC16F) Sun (PC13F)	4
8	Art as liberating	Ocean (PC38F) Eternity (PC36M) Ocean (PC33F) Outer space (PC26F) Giving a speech (PC25M) Sky (PC22F) Freedom (PC9F)	7
9	Art as radiant and supportive	Unopened gift (PC41F) Book (PC35F) Rainbow (PC27F)	3
		Total	41

When the data in the table are examined, it is observed that the preservice teachers studying in the PCG Program have created metaphors in all 9 categories. The details and sample expressions of these metaphors are presented below.

Category 1: Art as born and enhanced under difficulties and pressure

In this category, only 1 participant describes art as born and enhanced under difficulties and pressure, using the metaphor of love (PC8M). The relevant statement is: "*Art is like love because both are painful*." (PC8M)

Category 2: Art as a complex structure

In this category, 6 participants refer to art as a complex structure. The metaphors used include life (PC40U, PC11F), reading a book (PC34M), puzzle (PC24M), soul (PC7F), and human (PC4M). A sample student statement in the category is as follows: "*Art is like life because it contains everything.*" (PC40U)

Category 3: Art as the fruits of labour

In this category, 2 participants describe art as the fruits of labour. The metaphors used are rose (PC20M) and human (PC14M). As an example, one student states; "*Art is like human because it wants to exist and strives to exist with good or bad, right or wrong*." (PC14M)

Category 4: Art as reflective and expressive

In this category, 9 participants describe art as reflective and expressive. The metaphors used include loneliness (PC30F), the feeling of love (PC21U), water (PC19M), mirror (PC18F, PC5M), language of the soul (P17F), human soul (PC3F), the night abandoned by the sun (PC2M), and the reflection of dreams (PC1F). A sample student statement is as follows: "*Art is like water because just as water takes the shape of its container, art takes the shape of every human being and reflects it*." (PC19M)

Category 5: Art as relaxing

In this category, 8 participants consider art as relaxing. The metaphors used include rainbow (PC39F), sea (PC32F), lying on a lush green river full of swans (PC29F), therapy (PC28M), resting hours (PC23U), the ability to produce something (PC12F), sky (PC10F), and freshly washed bed linens (PC6F). An example statement in the category is as follows: "*Art is like therapy because both the performer and the audience are relaxed*." (PC28M)

Category 6: Art as immersive

In this category, only 1 person describes art as immersive, using the metaphor of dream (PC15F). The relevant statement is as follows: "*Art is like a dream because when we wake up, we wish to experience it very intensely again in order to feel its magic and peace*." (PC15F)

Category 7: Art as a vital need

In this category, 4 participants refer to art as a vital need. The metaphors created include food (PC37M), water (PC31F, PC16F), and the sun (PC13F). Relevantly, one student states; "*Art is like water because we always need it in our life*." (PC31F)

Category 8: Art as liberating

In this category, 7 participants describe art as liberating. The metaphors used are ocean (PC33F, PC38F), eternity (PC36M), outer space (PC26F), giving a speech (PC25M), sky (PC22F), and freedom (PC9F). An example student statement in the category is; "*Art is like giving a speech because we can freely express our own ideas in our area of talent*." (PC25M)

Category 9: Art as radiant and supportive

In this category, 3 participants describe art as radiant and supportive, using the metaphors of unopened gift (PC41F), book (PC35F), and rainbow (PC27F). A sample statement in the category is as follows: "*Art is like a rainbow because it colours our lives with colourful works*." (PC27F)

When the metaphors are examined, it is observed that the preservice teachers have developed 41 meaningful metaphors for the concept of "art". The distribution of these metaphors demonstrates that there are expressions for all 9 conceptual categories. The percentage distribution of the categories is illustrated in Figure 3.

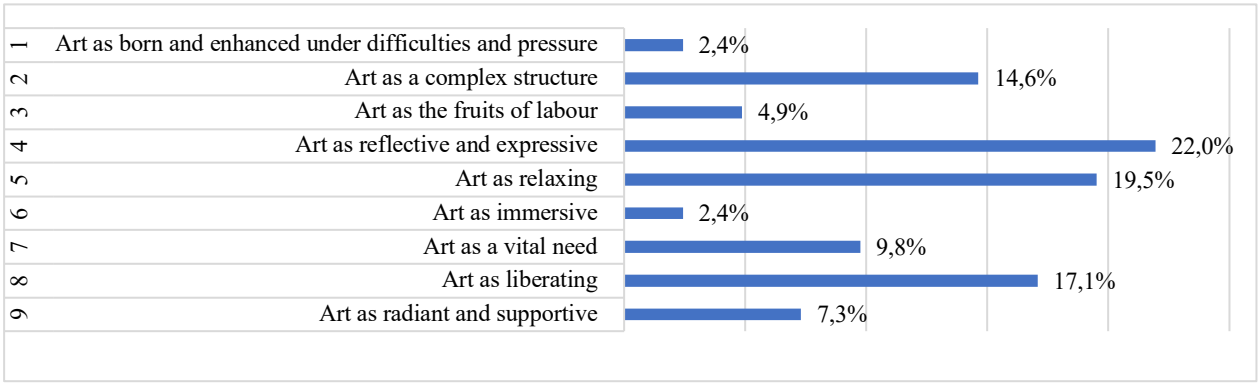

Figure 3. *The Percentage Distribution of the Conceptual Categories of Metaphors Created by the Preservice Teachers Studying in the Psychological Counselling and Guidance Program*

Science Education Program

The metaphors created for the concept of "art" by 5 preservice teachers in the Science Education Program are presented in Table 6.

Table 6. Conceptual Categories and Metaphors Created by Preservice Teachers in the Science Education Program

Conceptual categories		Metaphors created for art	n
2	Art as a complex structure	Formation of a garden or a swamp by raindrops (S5F)	1

4	Art as reflective and expressive	Door opening to thoughts (S2F)	1
5	Art as relaxing	Spring enriching the spirit (S1M) Psychologist (S4F)	2
9	Art as radiant and supportive	Sun (S3F)	1
		Total	5

When the data in the table are examined, it is observed that the preservice teachers studying in the Science Education Program have created metaphors in 4 of 9 categories. There are no metaphors for *"Category 1: Art as born and enhanced under difficulties and pressure", "Category 3: Art as the fruits of labour", "Category 6: Art as immersive", "Category 7: Art as a vital need"* and *"Category 8: Art as liberating"*. The relevant details and sample expressions are presented below.

Category 2: Art as a complex structure

In this category, 1 person describes art as a complex structure, using the metaphor of formation of a garden or a swamp by raindrops (S5F). The relevant statement is as follows: "*Art is like a raindrop because depending on where the raindrop falls, there forms either a garden or a swamp*." (S5F)

Category 4: Art as reflective and expressive

In this category, 1 person describes art as reflective and expressive, using the metaphor of door opening to thoughts (S2F). The relevant statement is: "*Art is like a door because it allows you to open your thoughts so that you pour your ideas and feelings into your work*." (S2F).

Category 5: Art as relaxing

In this category, 2 participants consider art as relaxing. The metaphors used include spring enriching the spirit (S1M) and psychologist (S4F). An example student statement in the category is as follows: "*Art is like a psychologist because it relieves distress and relaxes the mind*." (S4F).

Category 9: Art as radiant and supportive

In this category, 1 person describes art as radiant and supportive, using the metaphor of the sun (S3F). The relevant statement is: "*Art is like the sunrise and sunset because when the sun rises, art rises, when the sun reaches the top, art rises to the top, and when the sun sets, art ends*." (S3F)

When the metaphors are examined, it is observed that the preservice teachers have created 5 meaningful metaphors for the concept of "art". The distribution of these metaphors shows that there are expressions for 4 of 9 conceptual categories. The percentage distribution of categories is illustrated in Figure 4.

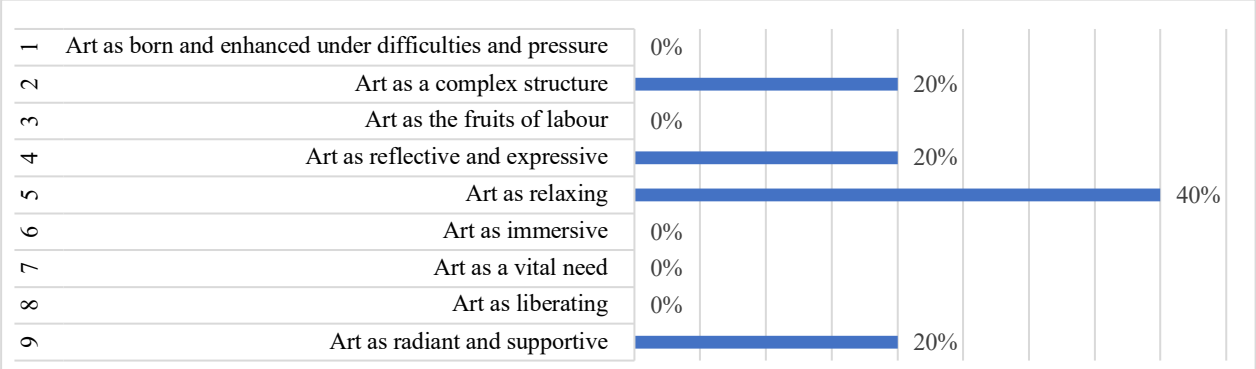

Figure 4. *The Percentage Distribution of the Conceptual Categories of Metaphors Created by the Preservice Teachers Studying in the Science Education Program*

3.2.5. Elementary Mathematics Education Program

The metaphors created for the concept of "art" by 31 preservice teachers in the Elementary Mathematics Education Program are presented in Table 7.

Table 7. Conceptual Categories and Metaphors Created by Preservice Teachers in the Elementary Mathematics Education Program

Conceptual categories	Metaphors created for art	n

2	Art as a complex structure	Moon (EM1M) Fingerprint (EM2M) Math (EM3M) Woman (EM4F) Tree (EM5M)	5
3	Art as the fruits of labour	Rain (EM6M) Growing flowers (EM7M) Wine (EM8M)	3
4	Art as reflective and expressive	Ayran (EM9M) Peacock (EM10M) Song (EM11F)	3
5	Art as relaxing	Peace (EM12M) Sea (EM13U) Breeze (EM14F) Cotton (EM15F) Silence of the nature (M16M) Psychologist (EM17F)	6
6	Art as immersive	TV Series (EM19M)	1
7	Art as a vital need	Soul (EM20F) Soul (EM21U) Math (EM22F) Sun (EM23U) Eye (EM24M) Fruit tree (EM25F) Light (EM26F) Rice and beans (EM18M)	8
8	Art as liberating	Sky (EM27F) Stairs to the light (EM28F) Sky (EM29F) Infinity in Math (EM30F) Eternity (EM31F)	5
		Total	31

When the data in the table are examined, it is observed that the preservice teachers studying the Elementary Mathematics Education Program have created metaphors in 7 of 9 categories. The categories for which no metaphors have been created include *"Category 1: Art as born and enhanced under difficulties and pressure"* and *"Category 9: Art as radiant and supportive".* The details and sample expressions of the existing metaphors are presented below.

Category 2: Art as a complex structure

In this category, 5 participants describe art as a complex structure, using the metaphors of moon (EM1M), fingerprint (EM2M), math (EM3M), woman (EM4F), and tree (EM5M). A sample statement in the category is as follows: "*Art is like a tree because it has all sorts of branches and leaves*." (EM5M)

Category 3: Art as the fruits of labour

In this category, 3 participants consider art as the fruits of labour. The relevant metaphors include rain (EM6M), growing flowers (EM7M), and wine (EM8M). An example statement in the category is as follows: "*Art is like growing flowers because watching it grow day by day enlightens one's heart*." (EM7M)

Category 4: Art as reflective and expressive

In this category, 3 participants describe art as reflective and expressive. The metaphors used are ayran (EM9M), peacock (EM10M), and song (EM11F). As an example, one student states; "*Art is like ayran because everybody has their own way of drinking it*." (EM9M)

Category 5: Art as relaxing

In this category, 6 participants characterise art as relaxing. The metaphors created include peace (EM12M), sea (EM13U), breeze (EM14F), cotton (EM15F), silence of the nature (EM16M), and psychologist (EM17F). A sample statement is as follows: "*Art is like cotton because when you are engaged in art you feel the same feeling that touching the cotton gives you*." (EM15F)

Category 6: Art as immersive

In this category, only 1 person describes art as immersive, using the metaphor of TV series (EM19M). The relevant statement regarding the category is as follows: "*Art is like TV series because it slowly drags you in*." (EM19M)

Category 7: Art as a vital need

In this category, 8 participants consider art as a vital need. The metaphors used include the soul (EM20F, EM21U), math (EM22F), sun (EM23U), eye (EM24M), fruit tree (EM25F), light (EM26F), and rice and beans (EM18E). An example statement is; "*Art is like rice and beans because one remains plain without art*." (EM18M)

Category 8: Art as liberating

In this category, 5 people describe art as liberating. The relevant metaphors are the sky (EM27F, EM29F), stairs to light (EM28F), infinity in math (EM30F), and eternity (EM31F). A sample statement in the category is as follows: "*Art is like the sky because it is immense, and imagination is used limitlessly*." (EM27F)

When the metaphors are examined, it is observed that the preservice teachers have created 31 meaningful metaphors for the concept of "art". The distribution of these metaphors shows that there are expressions for 7 of 9 conceptual categories. The percentage distribution of categories is illustrated in Figure 5.

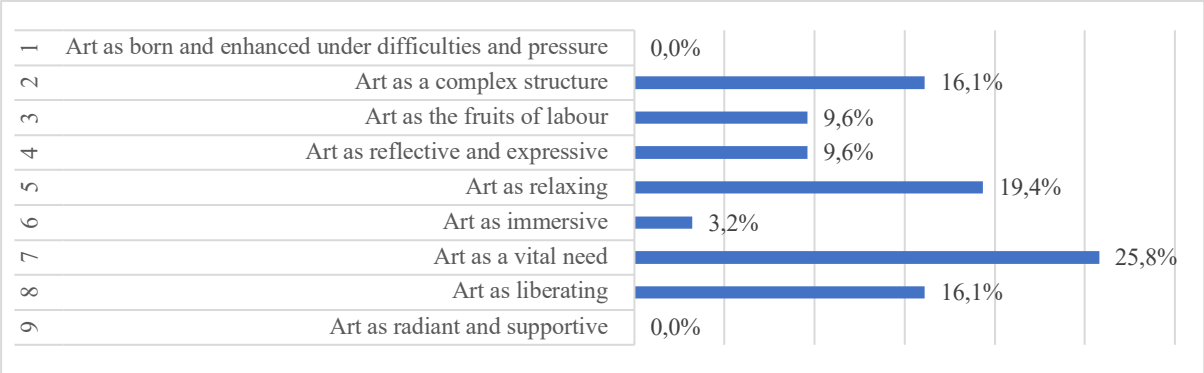

Figure 5. *The Percentage Distribution of the Conceptual Categories of Metaphors Created by the Preservice Teachers Studying in the Elementary Mathematics Education Program*

Foreign Language Education Program

The metaphors created for the concept of "art" by 22 preservice teachers in the Foreign Language Education Program are presented in Table 8.

Table 8. Conceptual Categories and Metaphors Created by Preservice Teachers in the Foreign Language Education Program

Conceptual categories		Metaphors created for art	n
2	Art as a complex structure	Breeze (FL21F) Religion (FL18M) Soul (FL14M) Couple in a long-distance relationship (FL8F) Pearl (FL7F) Incomplete life (FL6M)	6
4	Art as reflective and expressive	Life (FL3F) Mirror (FL13M) Reflection on the water (FL10F) Bright eye (FL9M) Lecturing (FL2F) Woman (FL11F)	6
5	Art as relaxing	Guide (FL1F) Faraway home (FL20M) Hot coffee (FL19M) Therapy (FL17F) Window (FL15M)	5

7	Art as a vital need	Love (FL12M)	1
8	Art as liberating	Soul (FL5F) Universe (FL4F)	2
9	Art as radiant and supportive	Face of the beloved one (FL16F)	1
		Total	21

The data in the table show that the preservice teachers studying in the Foreign Language Education Program have created metaphors in 6 of 9 categories, excluding *"Category 1: Art as born and enhanced under difficulties and pressure", "Category 3: Art as the fruits of labour"* and *"Category 6: Art as immersive"*. The relevant details and sample expressions are presented below.

Category 2: Art as a complex structure

In this category, 6 participants describe art as a complex structure. The metaphors used include breeze (FL21F), religion (FL18M), soul (FL14M), a couple in a long-distance relationship (FL8F), pearl (FL7F), and incomplete life (FL6M). A sample statement in the category is as follows: "*Art is like a religion because it is up to us to believe whether it will make our life better or not when we have faith.*" (FL18M)

Category 4: Art as reflective and expressive

In this category, 6 participants describe art as reflective and expressive. The relevant metaphors are life (FL3F), mirror (FL13M), reflection on the water (FL10F), bright eye (FL9M), lecturing (FL2F), and woman (FL11F). As an example, one student states; "*Art is like lecturing because we try to convey our feelings and thoughts in the best way, and we get help from many methods, techniques, etc. while doing this, just as we use certain methods while teaching a lesson. The most important point is that it makes you happy, as when the person who lectures is happy, the lesson becomes very productive, when the artist is pleased with his/her work, it becomes valuable*." (FL2F)

Category 5: Art as relaxing

In this category, 5 participants describe art as relaxing. The metaphors used are guide (FL1F), faraway home (FL20M), hot coffee (FL19M), therapy (FL17F), and window (FL15M). A sample statement in the category is as follows: "*Art is like a faraway home because you always miss that home, and when you arrive there, you feel warm and safe*." (FL20M)

Category 7: Art as a vital need

In this category, only 1 person refers to art as a vital need, using the metaphor of love (FL12M). The relevant statement is as follows: "*Art is like love because you cannot neglect it, you cannot give it up. When you give up, you become aimless and you become nothing*." (FL12M)

Category 8: Art as liberating

In this category, 2 participants describe art as liberating, using the metaphors of soul (FL5F) and universe (FL4F). Relevantly, one student states; "*Art is like the universe because art has no boundaries like the universe*." (FL4F)

Category 9: Art as radiant and supportive

In this category, only 1 person refers to art as radiant and supportive, using the metaphor of the face of the beloved one (FL16F). The relevant statement is as follows: "*Art is like the face of your beloved one because the more you look at it, the more you want to look, and you lose yourself in a different detail at each glance. You never get tired of looking at it, you take more pleasure each time*." (FL16F)

When the metaphors are examined, it is observed that the preservice teachers have created 21 meaningful metaphors for the concept of "art". The distribution of the metaphors indicates that there are expressions for 6 of 9 conceptual categories. The percentage distribution of the categories is illustrated in Figure 6.

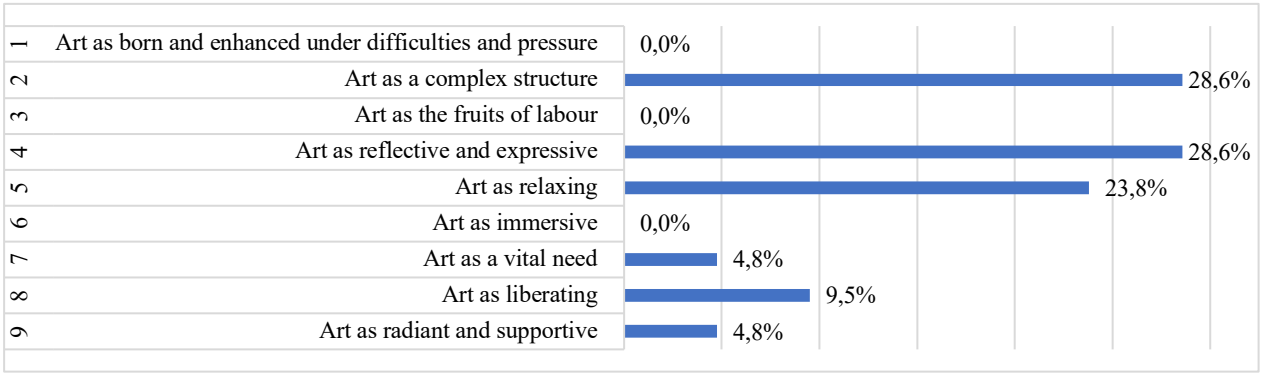

Figure 5. *The Percentage Distribution of the Conceptual Categories of Metaphors Created by the Preservice Teachers Studying in the Foreign Language Education Program*

Primary Education Program

The metaphors created for the concept of "art" by 39 preservice teachers in the Primary Education Program are presented in Table 9.

Table 9. Conceptual Categories and Metaphors Created by Preservice Teachers in the Primary Education Program

Conceptual categories		Metaphors created for art	n
1	Art as born and enhanced under difficulties and pressure	Chain (P26M)	1
2	Art as a complex structure	Running (P38F) God (P34F) Trees growing without harming each other's branches (P30F) Rainbow (P11F)	4
3	Art as the fruits of labour	Love (P10F) Gardening (P9F)	2
4	Art as reflective and expressive	Spring (P23F) Nature (P22M) What is felt while drinking coffee or smoking (P20U) Feeling (P14M) Life (P7M) Rainbow (P1M) Sincerity (P3F)	7
5	Art as relaxing	Meditation (P36F) Ship's captain (P27F) Sibling/Pen (P24F) Favourite food (P17U) Air, water, family (P5F)	5
6	Art as immersive	Painting (P31F) Dream (P25M) Time (P16F) Discovering new places (P12F) Compass (P4F) Liberating and relaxing game (P6F)	6
7	Art as a vital need	Nature (P39F) Sun (P37F) Sun (P35F) Life (P32F) Food (P15F) Water (P19F)	6
8	Art as liberating	Dream (P2F) Sky (P13F) Music (P18F) Republic (P21F) Freedom (P28F) Blue sea (P29F)	6
U9	Art as radiant and supportive	Sun glitters (P33F) Candle (P8F)	2
		Total	39

The data in the table show that the preservice teachers studying in the Primary Education Program have created metaphors in all 9 categories. The details and sample expressions of these metaphors are presented below.

Category 1: Art as born and enhanced under difficulties and pressure

In this category, only 1 person describes art as born and enhanced under difficulties and pressure, using the metaphor of chain (P26M). The relevant statement is as follows: "*Art is like a chain because it connects people.*" (P26E).

Category 2: Art as a complex structure

In this category, 4 participants describe art as a complex structure. The metaphors used include running (P38F), God (P34F), trees growing without harming each other's branches (P30F), and rainbow (P11F). A sample

statement in the category is as follows: "*Art is like a rainbow because art arises from differences like the colour differences in the rainbow. Both are rich with their differences*." (P11F).

Category 3: Art as the fruits of labour

In this category, 2 participants consider art as the fruits of labour. The metaphors used are love (P10F) and gardening (P9F). Relevantly, one student states; "*Art is like gardening because the gardener takes care of the garden in his/her responsibility making the environment beautiful. Similarly, art make the environment beautiful as one is engaged in it.*" (P9F)

Category 4: Art as reflective and expressive

In this category, 7 participants characterise art as reflective and expressive. The relevant metaphors include spring (P23F), nature (P22M), what is felt while drinking coffee or smoking (P20U), feeling (P14M), life (P7M), rainbow (P1M), and sincerity (P3F). A sample statement in the category is as follows: "*Art is like what is felt while drinking coffee or smoking because one has the opportunity to think more deeply and listen to their innermost at these moments.*" (P20U)

Category 5: Art as relaxing

In this category, 5 participants describe art as relaxing. The metaphors used are meditation (P36F), ship's captain (P27F), sibling/pen (P24F), favourite food (P17U), and air-water-family (P5F). An example for the student statements in the category is as follows: "*Art is like a sibling (1) and a pen (2) because 1: It shares one's burden like a brother/sister. 2: We can move it as we wish like a pen*" (P24F) (Since the metaphor of pen falls under the reflective expressive category, it was considered that this data could fall under the relaxing/reflective category).

Category 6: Art as immersive

In this category, 6 participants describe art as immersive. The relevant metaphors include painting (P31F), dream (P25M), time (P16F), discovering new places (P12F), compass (P4F), and liberating and relaxing game (P6F). A sample statement in the category is as follows: "*Art is like a game that liberates and relaxes people because it arouses interest to the full extent and unites it at one single point*." (P6F)

Category 7: Art as a vital need

In this category, 6 participants refer to art as a vital need. The metaphors produced are the nature (P39F, received art education), the sun (P37F, P35F), life (P32F), food (P15F), and water (P19F). An example for the student statements regarding the category is as follows: "*Art is like water because it is the basic need of life as is water.*" (P19F)

Category 8: Art as liberating

In this category, 6 participants describe art as liberating. The metaphors used include dream (P2F), sky (P13F), music (P18F), republic (P21F), freedom (P28F), and blue sea (P29F). A sample student statement in the category is as follows: "*Art is like a republic because the republic is freedom and hope, because both make human free and modern*." (P21F)

Category 9: Art as radiant and supportive

In this category, 2 participants consider art as radiant and supportive, using the metaphors of sun glitters (P33F), and candle (P8F). A relevant statement is as follows: "*Art is like a candle because it radiates its surroundings*." (P8F).

When the metaphors are examined, it is observed that the preservice teachers have created 39 meaningful metaphors for the concept of "art". The distribution of these metaphors indicates that there are expressions for all 9 conceptual categories. The percentage distribution of the categories is illustrated in Figure 7.

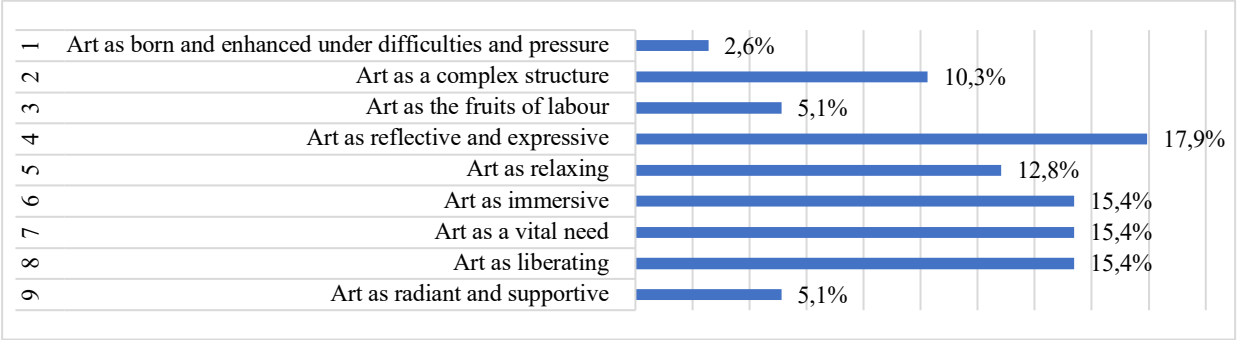

Figure 6. *The Percentage Distribution of the Conceptual Categories of Metaphors Created by the Preservice Teachers Studying in the Primary Education Program*

Do the metaphors of preservice teachers differ by program?

The third sub-purpose of the study is expressed with the question: "*Do the metaphors of preservice teachers differ by program*?". In line with this sub-purpose, the metaphors created by the preservice teachers were first analysed based on their programs, and then the data obtained from the analysis were compared on the basis of all programs and presented in Table 10.

Table 10. The Percentage Distribution of Categories of Metaphors Created on the Basis of All Programs

	Turkish Language Education	Social Sci. Education	PCG	Science Education	E. Math. Education	Foreign Language Education	Primary Education
Category 1: Art as born and enhanced under difficulties and pressure	8%	-	2.4%	-	-	-	2.6%
Category 2: Art as a complex structure	8%	8.3%	14.6%	20%	16.1%	**28.6%**	10.3%
Category 3: Art as the fruits of labour	8%	11.1%	4.9%	-	9.6%	0.0%	5.1%
Category 4: Art as reflective and expressive	8%	13.9%	**22.0%**	20%	9.6%	**28.6%**	**17.9%**
Category 5: Art as relaxing	16%	19.4%	19.5%	**40%**	19.4%	23.8%	12.8%
Category 6: Art as immersive	8%	8.3%	2.4%	-	3.2%	-	15.4%
Category 7: Art as a vital need	12%	8.3%	9.8%	-	**25.8%**	4.8%	15.4%
Category 8: Art as liberating	**24%**	**22.2%**	17.1%	-	16.1%	9.5%	15.4%
Category 9: Art as radiant and supportive	8%	8.3%	7.3%	20%	-	4.8%	5.1%

As can be observed in the table, three programs perceive art as "reflective and expressive", while two programs consider art as "liberating". Even though it seems that these results can be generalised at a certain level, no opinion can be formed due to the lack of an adequately identifiable relationship between the categories and programs. Therefore, it can be suggested that the metaphors created differ from each other based on programs.

DISCUSSION AND CONCLUSION

The study has revealed that the art-related metaphors of the senior-year preservice teachers enrolled in different departments at the Faculty of Education of Bartın University generally reflect their positive emotional states. The result of these reflections evaluated under 9 categories also indicates that the perception of art metaphor is considered with regard to creativity. Based on their semantic structures, these categories are named as *"art as born and enhanced under difficulties and pressure", "art as a complex structure", "art as the fruits of labour", "art as reflective and expressive", "art as relaxing", "art as immersive", "art as a vital need", "art as liberating"* and *"art as radiant and supportive"*. Similarly, Yalçın Wells (2015) came up with 9 categories in her research with preservice visual arts teachers, whereas Hiçyılmaz and Adanır (2019) determined 7 themes for the perceptions of art in their study with preservice teachers studying in primary education and early childhood education programs. When these results are compared, it can be stated that the reason for the relevant diversity in the study by Yalçın Wells (2015) is that the research was conducted with preservice visual arts teachers receiving art education. Since the preservice teachers in this department study art during their four-year education, their perceptions of art develop throughout this period. On the other hand, the reason for fewer themes in the study by Hiçyılmaz and Adanır (2019) is that the research was limited to primary education and early childhood education programs. Taking these into account, it can be concluded that 9 categories could be achieved in this study because teaching programs with different qualities were included.

The study has also revealed that the perspectives of art-related metaphors vary based on different programs, which constitute one of the original values of the research. In this context, the preservice teachers in Turkish Language Education and Social Sciences Education programs mainly describe art as "**liberating**" (24% and 22.2% respectively), those in PCG and Primary Education programs as "**reflective and expressive**" (22% and 17.9% respectively), those in Science Education program as **"relaxing"** (40%), those in Elementary Mathematics

Education program as **"a vital need"** (25.8%), and those in Foreign Language Education program as **"complex"** (28.6%) and **"reflective and expressive"** (28.6%).

It is noteworthy that these results differ from those obtained by Nalinci and Yapıcı (2020), when considered specifically for primary education. In their research, Nalinci and Yapıcı (2020) present that preservice teachers in primary education program describe art mostly in terms of beauty and admiration. This result is a remarkable example of the fact that perceptions of individuals may differ even if they go through the same educational processes, and that different results may be obtained in studies on human.

In the present study, the preservice teachers enrolled in different programs have come up with descriptions based on the dynamics and values of their field of study. For example, the reflective and expressive descriptions of PCG students are affected by their interest in psychology, and they are complementary to their ability to get to know and understand people in the broadest sense. The dominance of liberating description in the fields of Turkish language and social sciences can be associated with their need for creativity and unconventional teaching methods. The high number of relaxing descriptions in the field of science indicates the hope and tendency for the systematic structure of this field to become more understandable with metaphors of art. The reflective and expressive descriptions in the field of primary education can be considered as a reference to the practical environment where students are in childhood and the teacher can understand individual differences with reflective and expressive reactions. Art metaphors considered as a vital need in the field of mathematics imply that art education also plays a role in the systematic structure of mathematics and mathematics education. Even though the combination of complex and reflective-expressive descriptions in the field of foreign language does not lead to a significant result, it can be associated with the complex structure of language education.

The fact that different fields at the faculty of education have different perspectives of art metaphors reveals a basic necessity and similarity. Each field's view of art metaphors and the metaphorical language they use while expressing this view indicate that art and art metaphors serve as an interdisciplinary teaching tool, and a facilitating and improving dynamic of learning and teaching stages. At this point, it is necessary to mention the difference between computational and linguistic fields considering their perspectives of art. Art is considered rather as a liberating and complementary discipline which is compulsory to get to know the student in the field of social sciences, whereas an intuitive relationship is established between the nature of metaphor and the nature of mathematical sciences even though rhetorical approaches are occasionally encountered in these fields.

It is necessary that preservice teachers in all departments receive art education or take interdisciplinary art courses during their undergraduate education and make their lessons more educational, instructive, enjoyable and permanent using art and artistic practices at all levels. In Faculties of Education, only Primary Education programs involve a course called Visual Arts Education. In other teacher training programs, students do not have the chance to establish a disciplinary contact with art, except for elective courses. However, all students in the fields of teaching can increase the quality of education using the opportunities provided by interdisciplinary practices including modernisation and STEAM activities. For this reason, the need for art and art education can be emphasised.

In addition, it should be noted that preservice teachers' metaphors of art are important in that teachers as essential components to raise future generations and guide the development of the society have knowledge of art, deliver their lessons enriching with art, and raise creative students who have an enhanced aesthetic perspective, increased social sensitivity, and a different view to the environment and society.

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Analysis of Middle School Mathematics and Science Curriculum Learning Outcomes According to TIMSS-2019 Evaluation Frameworks

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Abstract

The purpose of this research is to examine the cognitive qualities of the learning outcomes in middle school mathematics and science curricula according to grade levels and learning fields. In the study, case design, one of the qualitative research methods, was used and the data were collected with the help of document analysis technique. The learning outcomes in the middle school mathematics and science curricula published by the Ministry of National Education Board of Education and Discipline in 2018 were discussed on the axis of cognitive domains and sub-dimensions in the TIMSS-2019 evaluation frameworks. Descriptive analysis technique was used to examine the learning outcomes in the curricula. In this context, 215 outcome expressions in the mathematics curriculum and 223 learning outcome expressions in the science curriculum were evaluated. According to the findings of the study, while 46.6% of the learning outcomes in the mathematics curriculum are in the domain of knowing, 36.6% of them are in the applying, 16.8% of them are in the reasoning cognitive domain; 27.1% of the learning outcomes in the science curriculum are in the knowing, 32.4% of them are in the applying and 40.5% of them are in the reasoning cognitive domain. According to the findings, it was suggested that learning outcomes should be updated to include more metacognitive skills, and that primary and secondary teaching programs should be evaluated according to similar frameworks.

Keywords: Cognitive domain, learning outcomes, mathematics, science, TIMSS.

Ortaokul Matematik ve Fen Bilimleri Öğretim Programları Kazanımlarının TIMSS-2019 Değerlendirme Çerçevelerine Göre Analizi

Öz

Bu araştırmanın amacı, ortaokul matematik ve fen bilimleri dersi öğretim programlarındaki kazanımların bilişsel niteliklerini sınıf düzeylerine ve öğrenme alanlarına göre incelemektir. Çalışmada, nitel araştırma yöntemlerinden durum deseni kullanılmış ve veriler doküman incelemesi tekniği yardımıyla toplanmıştır. 2018 yılında Milli Eğitim Bakanlığı Talim Terbiye Kurulu Başkanlığı tarafından yayımlanan ortaokul matematik ile fen bilimleri dersi öğretim programlarındaki kazanımlar TIMSS-2019 değerlendirme çerçevelerindeki bilişsel alanlar ile alt boyutları ekseninde ele alınmıştır. Öğretim programlarındaki kazanımların incelenmesinde betimsel analiz tekniği kullanılmıştır. Bu bağlamda, matematik öğretim programında 215, fen bilimleri öğretim programında 223 kazanım ifadesi değerlendirilmiştir. Çalışmanın bulgularına göre, matematik öğretim programındaki kazanımların %46,6'sı bilme, %36,6'sı uygulama, %16,8'i akıl yürütme bilişsel alanında yer alırken fen bilimleri öğretim programındaki kazanımların %27,1'i bilme, %32,4'ü uygulama ve %40,5'i akıl yürütme bilişsel alanında bulunmaktadır. Çalışma bulgularına göre, kazanımların daha fazla üst bilişsel becerileri içerecek şekilde güncellenmesi ve ilkokul ile ortaöğretim öğretim programlarının da benzer çerçevelere göre değerlendirilmesi öneri olarak sunulmuştur.

Anahtar kelimeler: Bilişsel alanlar, kazanım, matematik, fen bilimleri, TIMSS.

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INTRODUCTION

With the rapid changes experienced in the information age, the importance of individual differences is increasing day by day and individual differences are more prominent in educational systems. The inevitable rise of knowledge and information, especially due to technological advances, has led to radical changes in the roles of individuals. Therefore, curricula that put individuals in the center have entered the race to evolve towards an innovative understanding rather than their current deficiencies (TEDMEM, 2022). This mentality has necessitated a change in the systems that guide education policies and has caused radical changes in the dynamics of the curricula of many nations (Common Core State Standards Initiative [CCSSI], 2010; Ministry of National Education [MoNE], 2017; National Council of Teachers of Mathematics [NCTM], 2014; National Research Council [NRC], 2011). Although these changes were not effective in solving the problems completely, they constituted an important step in the development of the concept of Society 5.0 (super smart society) (Holroyd, 2022; Saracel & Aksoy, 2020). Influenced by these changes, our country's education system has aimed to raise individuals who can produce, solve problems, think critically, contribute to the society, have entrepreneurial and communication skills. In this context, it has made an effort to create a curriculum that is more integrated with skills, competence, daily life, and other disciplines by carrying out structural reforms in the curriculum (MoNE, 2018a, 2018b). In this direction, existing curricula, especially science and mathematics curricula have been renewed to meet both the requirements of the era and the changing needs of individuals and society (MoNE, 2017). This situation has become an essential transformation not only in the educational system of our country, but also in the educational system of many countries, and the importance of curricula responding to the differing needs of individuals has often been emphasized (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2021). In today's technology-centered societies, especially in the 2000s, as a result of the rapid change in digital technology, differentiation of education from the direction of information transfer to the direction of skill development has made it necessary to update the content of current curricula (Feriver & Arık, 2021).

Renewal, development, and updating of curricula in Turkey were completed in the 2015-2016 academic year. However, comprehensive renewal (update, revision, and change) works have been continued from the beginning of the 2016-2017 academic year to the present day, by considering a different dimension of them (MoNE, 2017). The starting point of structural changes is to enable our children, who will be the guarantee of the future, to grow up more equipped and to meet the needs of individuals and society on the axis of innovative developments in learning-teaching approaches (MoNE, 2017). With this belief, the curricula determined by the MoNE aim to provide individuals with knowledge, skills, and behaviors integrated with values and competencies (MoNE, 2018a, 2018b). The skills that individuals will need are determined in the Turkish Competencies Framework (TCF) in the form of communication in mother tongue and foreign languages, and mathematical, basic, science/technology, digital, learning, social and civic, initiative and entrepreneurship competencies (MoNE, 2018a, 2018b). According to this purpose, among the main objectives of the curriculum implemented are favorable changes in the students' behavior or the behaviors planned to be acquired by the students (Tekin, 2009). On the other hand, curricula consist of learning outcomes, contents, learning-teaching processes and measurement-evaluation items. With this feature, curricula are very important programs for schools (Hewitt, 2018). Therefore, the level of attainment of the learning outcomes in the curriculum is a guide for the learning-teaching process to serve a certain purpose (Birgin, 2016). In accordance with the purpose of the Turkish Ministry of National Education's curricula, "on the one hand, repetitive learning outcomes and explanations at the different subject and grade levels with a spiral approach, on the other hand, learning outcomes that are aimed to be acquired holistically and at once are included" (MoNE, 2018a, p. 4). Therefore, an effort has been made to act with a mentality that puts individuals in the center while preparing the curricula. While the mathematics curriculum, which was renewed at the middle school level consists of learning fields which are numbers and operations, algebra, geometry and measurement, data processing, and probability, the science curriculum consists of learning fields which are the earth-universe, living-life, physical events, matter-nature (MoNE, 2018a, 2018b).

Theoretical Frameworks

Trends in International Mathematics and Science Study (TIMSS) is a four-year success monitoring study conducted by the International Association for the Evaluation of Educational Achievement (IEA). According to the data in 2019, 39 countries participated in the monitoring study, which measured the mathematics and science performance of eighth-grade students (MoNE, 2020). TIMSS, which made its first implementation in 1995, aims to obtain data on how education systems around the world carry out and improve mathematics and science learning. Since TIMSS data provides the opportunity to compare the achievements of the students of the participating

countries, it is very useful in the development improvement of the curriculum and also in obtaining information about the general situation of the education strategies of the countries (Hooper et al., 2013). On the other hand, since TIMSS is the most comprehensive student achievement assessment study in the world, it also contributes significantly to the effectiveness and efficiency of education systems (Cotter et al., 2020). In particular, the fact that countries enable them to conduct studies both on their own education systems and comparatively with other countries increases the importance of TIMSS data even more. The increase in the necessity and importance of international assessment exams with each passing day also positively affects the interest and participation of countries in these exams. Therefore, it guides and gives ideas to the participating countries not only about student achievements but also about schools, teachers, families and education systems (Mullis et al., 2016). In this respect, it provides information about the strengths and weaknesses of the education system to experts who prepare curricula, curricula politicians, and researchers. It also provides an important data set to researchers as it includes various variables that affect the mathematics and science achievements of participating country students (Foy, 2017; Martin et al., 2016). In this data set, in addition to the achievement scores of the students of the participating countries, there is also information obtained from their teachers, parents and administrators through questionnaires on the variables that affect student success (MoNE, 2020). The data obtained are analyzed and interpreted in line with certain evaluation frameworks. TIMSS not only provides information about the rankings and student scores of the participating countries, but also shares information that is quite comprehensive and allows comparison.

The mathematics and science TIMMS-2019 evaluation frameworks used within the scope of the study are based on the evaluation history of TIMSS for 24 years. Evaluation frameworks used in monitoring research conducted once in every four years are updated on specific issues in order to have better standards. The distribution of the TIMSS-2019 mathematics evaluation framework according to the cognitive domains in the eighth-grade consists of 35% knowing, 40% applying and 25% reasoning. In the domain of knowing within the framework of mathematics evaluation, students are mostly expected to establish relationships between basic knowledge in order to solve problems. In order to use mathematical methods fluently, students are required to remember a series of actions and how to perform them, and to be able to use various calculation methods and tools correctly (Lindquist et al., 2017). Subject fields that constitute the cognitive domain of knowing consist of the dimensions of recalling, recognizing, classifying/ordering, computing, retrieving and measuring. In the domain of application, problems can be presented both in real-life situations and can be related to mathematical subjects such as algebraic expressions, functions, equations, geometric shapes or statistical datasets (Mullis, 2017). The subject fields that constitute the cognitive domain of application include determining, representing modeling and implementing. The reasoning domain includes logical and systematic thinking. It also covers the determination and correct implementation of methods that can be used to solve problems in new and non-routine situations. Therefore, students are expected to use multiple skills together when solving questions in the domain of reasoning (Foy, 2017; Mullis, 2017). The subject fields that constitute the cognitive domain of reasoning consist of the dimensions of analyzing, synthesizing, evaluating, drawing conclusions, generalizing, and justifying.

On the other hand, the distribution of the TIMSS-2019 science evaluation framework by cognitive domains at the eighth-grade level is 35% knowing, 35% applying, and 30% reasoning. The domain of knowing within the science evaluation framework is the step in which students' knowledge about facts, relationships, processes, concepts and tools is evaluated. The basic knowledge in this field enables students to succeed in more complex processes required for scientific research (Centurino & Jones, 2017; Foy, 2017). The subject fields of the cognitive domain of knowing are the fields of recalling-recognizing, describing and providing examples. In the domain of application students are expected to apply their knowledge of facts, relationships, processes, concepts, and methods to problematic situations (Centurino & Jones, 2017). The subject fields that constitute the cognitive domain of application are comparing, classifying, relating, using models, interpreting information and explaining. In the domain of reasoning, students are required to reason in order to analyze the information presented, draw conclusions and adapt what they know to new situations. As in the domain of applying, questions in the domain of reasoning rather than direct application of knowledge and skills involve new and more complex situations. Reasoning also includes hypothesizing and designing scientific research (Centurino & Jones, 2017; Mullis et al., 2020). The subject fields that constitute the cognitive domain of reasoning are analyzing, synthesizing, formulating questions-hypothesizing-predicting, designing investigations, evaluating, drawing conclusions, generalizing, and justifying.

When the literature is examined, it can be seen that the middle school mathematics curriculum is discussed within the scope of TIMSS-2015 exam (Baysura, 2017; Erdoğan, 2020), the science curriculum is discussed within the scope of TIMSS-2015 (Böyük, 2017; Pedük, 2019), science questions in the central exams is discussed in the context of TIMSS-2019 cognitive domains (Bostan-Sarıoğlan et al., 2021), TIMSS-2015 mathematics success is

discussed with the help of the cognitive diagnostic model (Parlak, 2017), learning outcomes in data processing learning field is discussed in the context of TIMSS-2019 cognitive domains (Yılmaz et al., 2021), elementary school mathematics curriculum learning outcomes is discussed on the axis of TIMSS-2019 evaluation framework (Delil et al., 2020), science curriculum is discussed within the scope of the impact of the TIMSS-2007 and TIMSS-2011 monitoring exams (Yatağan, 2014), mathematics curriculum is discussed in line with the changes in TIMSS-2011 perspective (Kılıç et al., 2014), questions in the mathematics workbook is discussed in the context of the TIMSS-2019 exam (Sümen, 2021) and mathematics curriculum learning outcomes is discussed within the scope of the cognitive domains within the TIMSS-2015 mathematics framework. In most of the researches, TIMSS cognitive domain levels in the past years were discussed. For example, the learning outcomes in the science curriculum were examined by Pedük (2019) within the scope of TIMSS-2015 cognitive domain levels. At the end of the study, it was reported that in the science curriculum, the learning outcomes at the level of knowledge were mostly in the field of living things and life, the learning outcomes at the level of applying were mostly in the field of the physical events and the learning outcomes at the level of reasoning were mostly again in the field of living things and life. On the other hand, it was concluded that the learning outcomes at the knowing level were mostly in the seventh-grade, the learning outcomes at the applying level were mostly in the fifth-grade, and the learning outcomes at the reasoning level were mostly in the eighth-grade. In the study conducted by Kılıç et al. (2014), it was stated that the subjects and concepts contained in the articles in the 2013 mathematics curriculum were mostly mentioned in the sixth-grade, and while the items related to applying skills were in the majority in the TIMSS exam, more emphasis was placed on learning outcomes of the ability to know in both the old and new curriculum. The mathematics curriculum was examined by İncikabı et al. (2016) according to TIMSS-2015 cognitive domains. In the study, it was reported that the cognitive domain of knowing was mostly included in the fifth-grade learning outcomes, lower but not much change at other class levels. The applying domain is most commonly included in the seventh-grade curriculum among all classes. While the grade level that included the reasoning domain the most in the curricula was the sixth-grade, the least was the seventh-grade. In the distribution of cognitive characteristics of curriculum learning outcomes by learning fields, it has been reported that the cognitive dimension of knowledge in the fields of numbers and operations, the applying dimension in the fields of algebra, geometry and measurement, and the reasoning dimension in the fields of data processing and probability are intense. On the other hand, it was reported that the learning outcomes related to the dimensions of recalling, determining, generalizing and justifying were not included in any grade level and learning field. In another study conducted by Delil et al. (2020), it was reported that the number of learning outcomes in the primary school mathematics curriculum decreased as one went from the first-grade to the fourth-grade in the knowing level, and the number of learning outcomes increased in the reasoning level. In addition, it was reported that more than half of all the learning outcomes were in the domain of knowing, and the learning outcomes related to the domain of reasoning were included at least.

When the relevant literature is examined in general, the fact that no similar studies have been carried out in the relevant field for both middle school mathematics and science learning fields according to the TIMSS-2019 evaluation framework reveals the necessity of the study. At the same time, considering the fact that TIMSS success monitoring research is carried out at regular intervals, the continuity of such studies in order to determine how the adaptation of the curricula has changed over the years reveals the necessity of the research. In this respect, it is expected that the study will be beneficial both in terms of filling the gap in the relevant field and guiding the curriculum makers. The study, which is considered in accordance with the TIMSS content, is considered valuable in terms of creating a resource and guiding researchers who work or will work in the fields of both mathematics and science curricula. On the other hand, it is hoped that this study will not only provide ideas for similar studies, but also support the development of studies to be done in an original way and making inferences for researchers.

Research Questions

The aim of this research is to examine the learning outcome expressions in the middle school mathematics and science curriculum on the axis of grade levels and learning fields according to the cognitive domain skills in the TIMSS-2019 evaluation frameworks. In accordance with this purpose, answers to the following research problems were sought:

1. What is the distribution of the learning outcome expressions in the middle school mathematics curriculum according to TIMSS-2019 cognitive domain levels?

a) When the middle school mathematics curriculum is examined according to the grade levels, how are the learning outcome expressions at each grade level distributed according to TIMSS-2019 cognitive domain skills?

b) When the middle school mathematics curriculum is examined according to the learning fields, how are the learning outcome expressions in each learning field distributed according to TIMSS-2019 cognitive domain skills?

2. What is the distribution of the learning outcome expressions in the middle school science curriculum according to TIMSS-2019 cognitive domain levels?

a) When the middle school science curriculum is examined according to grade levels, how are the learning outcome expressions at each grade level distributed according to TIMSS-2019 cognitive domain skills?

b) When the middle school science curriculum is examined according to learning fields, how are the learning outcome expressions in each learning field distributed according to TIMSS-2019 cognitive domain skills?

3. What is the distribution of total learning outcome expressions in middle school mathematics and science curriculum according to TIMSS-2019 cognitive domain levels?

METHOD

In this research, case design, one of the qualitative research methods was used, and the data obtained were collected with the help of the document analysis technique. Document analysis includes the analysis of written materials containing information about the fact or facts that are aimed to be investigated (Yıldırım & Şimşek, 2018). Documents are important sources of information that should be used effectively in qualitative research, as well as a systematic procedure for the evaluation and review of materials (Yıldırım & Şimşek, 2018). Examination of documents (i) accessing documents, (ii) checking documents for authenticity, (iii) understanding documents, (iv) analyzing data, and (v) using data (Forster, 1995). In the examination of the documents carried out within the scope of the research, the analysis of written materials containing information about the subjects planned to be researched was used. Descriptive analysis was used while analyzing the document sources in the research. In the descriptive analysis approach, the data obtained are summarized and interpreted according to the previously determined themes (Yıldırım & Şimşek, 2018, p. 239). In this analysis approach, it is stated that it is a frequently used method for researchers to obtain summary information about the different facts and events they want to study (Büyüköztürk et al., 2018). In descriptive analysis, it consists of four stages: (i) creating a framework for analysis, (ii) processing data according to the thematic framework, (iii) defining the obtained findings, and (iv) interpreting the findings (Yıldırım & Şimşek, 2018). The data obtained within this process is systematically and clearly described and the general view is tried to be determined. Within the scope of this research, the outcome expressions in the Middle School Mathematics and Science Curricula, implemented by the Ministry of National Education Board of Education and Discipline were examined (MoNE, 2018a, 2018b).

Data Collection

Within the scope of this study, first of all, the Primary School (1-4. Grades) Middle School, and Imam Hatip Middle School (5-8. Grades) Mathematics and Science Curricula, which were adopted by the Ministry of National Education Board of Education and Discipline in 2018, have been saved in PDF formats in a folder created on the computer in order to facilitate the analysis. Afterwards, learning outcomes in the curriculum were transferred to the WORD document as only learning outcome expressions, taking into account the courses and grade levels. 26.1% (56) of the learning outcomes in the mathematics curriculum are at the level of fifth-grade, 27.4% (59) of them are at the level of sixth-grade, 22.3% (48) of them are at the level of seventh-grade, 24.2% (52) of them are at the level of eighth-grade. 49.3% (106) of total outcome expressions are in numbers operations, 10.7% (23) of them are in algebra, 31.1% (67) of them are in geometry and measurement, 6.5% (14) of them are in data processing and 2.3% (5) of them are in probability learning. 16.1% (36) of the learning outcomes in the science curriculum are at the fifth-grade, 26.5% (59) of them are at the sixth-grade, 30.1% (67) of them are at the seventh-grade, and 27.3% (61) of them are at the eighth-grade level. 11.2% (25) of total learning outcome expressions are in the field of learning earth and the universe, 31.8% (71%) of them are in the field of living and life, 33.6% (75) of them are in the field of physical events and 23.4% (52) of them are within the field of matter and nature learning. The table in which the learning outcome expressions in the curricula are expressed in detail according to the grade levels is presented below (Table 1).

Table 1. Number of Learning Outcomes in Mathematics and Science Courses Learning Fields by Grade Levels

Content Domain Related to Courses	Grade Levels				
	5. Grade	6. Grade	7. Grade	8. Grade	Total
	% (f)	*% (f)*	*% (f)*	*% (f)*	*% (f)*
Mathematics Content Domains					
Numbers and Operations	31.1 (33)	30.2 (32)	23.6 (25)	15.1 (16)	49.3 (106)
Algebra	-	13.1 (3)	30.4 (7)	56.5 (13)	10.7 (23)
Geometry and Measurement	29.8 (20)	28.4 (19)	17.9 (12)	23.9 (16)	31.1 (67)
Data Processing	21.4 (3)	35.7 (5)	28.6 (4)	14.3 (2)	6.5 (14)
Probability	-	-	-	100 (5)	2.3 (5)
Total	26.1 (56)	27.4 (59)	22.3 (48)	24.2 (52)	100 (215)
Science Content Domains					
Earth and Universe	28.0 (7)	20.0 (5)	40.0 (10)	12.0 (3)	11.2 (25)
Living and Life	12.7 (9)	30.9 (22)	21.2 (15)	35.2 (25)	31.8 (71)
Physical Events	18.7 (14)	25.3 (19)	34.7 (26)	21.3 (16)	33.6 (75)
Matter and Nature	11.5 (6)	25.0 (13)	30.8 (16)	32.7 (17)	23.4 (52)
Total	16.1 (36)	26.5 (59)	30.1 (67)	27.3 (61)	100 (223)

In the next step, documents containing TIMSS-2019 mathematics and TIMSS-2019 science evaluation frameworks published by TIMSS & PIRLS international study center were saved in PDF formats. In these documents, there is information for each course in which the cognitive domain and its subdimensions are explained in detail. In this context, in the cognitive domain of knowing for mathematics; there are sub-dimensions of recalling, recognizing, classifying-ordering, computing, retrieving, and measuring. In the cognitive domain of applying; there are sub-dimensions of determining, representing modeling and implementing. In the cognitive domain of reasoning; there are sub-dimensions of analyzing, synthesizing, evaluating, drawing conclusions, generalizing, and justifying. On the other hand, in the cognitive domain of knowing for science; there are sub-dimensions of recalling-recognizing, describing and providing examples. In the cognitive domain of applying; there are sub-dimensions of comparing-classifying, relating, using models, interpreting information and explaining. In the cognitive domain of reasoning there are sub-dimensions of analyzing, synthesizing, formulating questions hypothesizing-predicting, designing investigations, evaluating, drawing conclusions, generalizing, and justifying (Centurino & Jones, 2017; Lindquist et al., 2017). In this context, the tables with detailed explanations of the cognitive domains and sub-dimensions included in the TIMSS-2019 mathematics and science evaluation frameworks published in 2017 are presented below (Table 2 & Table 3).

Table 2. TISS-2019 Mathematics Framework

1. Knowing
1.1. Recall: Recalling descriptions, terminology, number attributes, geometry attributes, and notation (e.g., a *x* b = ab, a + a + a = 3a).
1.2. Recognize: Recognizing mathematical objects, such as shapes, numbers, statements and quantities. Recognizing mathematical concepts that are mathematical equations.
1.3. Classify/Order: Classifying/grouping objects, shapes, numbers and expressions according to their common characteristics; making the right decision about group members and sorting objects and numbers according to their properties.
1.4. Compute: Carrying out algorithmic procedures for +, −, ×, ÷ or their combinations with all numbers, decimals, percentages, and integers. Telling approximate numbers for estimated calculations, performing routine algebraic methods.
1.5. Retrieve: Reading simple scales from charts, tables, or other sources.
1.6. Measure: Using measurement tools, choosing appropriate measurement units.
2. Applying
2.1. Determine: Identifying strategies, tools, and effective and appropriate procedures that are frequently used to solve problems.
2.2. Represent/Model: Showing data in tables or graphs, creating equations, inequalities, geometric figures or diagrams for solving problems, generating equations for given mathematical elements or relationships.
2.3. Implement: Implementing strategies to solve problems involving similar mathematical concepts and operations.
3. Reasoning
3.1. Analyze: Using, explaining or deciding on relationships between objects or variables in mathematical situations and making valid inferences from this information.
3.2. Synthesize: Making connections between different information and related representative elements and related mathematical ideas. Combining mathematical methods, concepts and facts to uncover results and achieve the next result.
3.3. Evaluate: Evaluating different problem-solving strategies and solutions.
3.4. Draw Conclusions: Making inferences based on knowledge and evidence.
3.5. Generalize: Expanding fields where the result of mathematical thinking and problem solving is correct by restating the results in more general and broadly acceptable terms.
3.6. Justify: Supporting solutions and strategies to provide mathematical discussions.

Note: "TIMSS 2019 assessment frameworks". I. V. S. Mullis & M. O. Martin (Eds.), by M. Lindquuist., R. Philpot., I. V. S. Mullis and K. E. Cotter, 2017, pp. 23-24, taken exactly from study (https://timssandpirls.bc.edu/timss2019/frameworks/), Copyright, 2017 by the International Association for the Evaluation of Educational Achievement (IEA).

Table 3. TIMSS-2019 Science Framework

1. Knowing
1.1. Recall/ Recognize: Distinguishes between facts, relationships and concepts. Defines the characteristics of certain living things, materials and processes; defines the use of scientific tools and uses scientific words, scientific notation, abbreviations, units and scales where appropriate.
1.2. Describe: Defines terms related to the tasks, structures and characteristics of living things and materials. It also defines the bonds between facts.
1.3. Provide Examples: Gives examples of living things, matter and tools that have certain qualities. Explains concepts or facts with appropriate examples.
2. Applying
2.1. Compare/Classify: Distinguishes differences and similarities between living things, matter or processes. Distinguishes or groups matter, living things, objects, and processes according to their characteristics.
2.2. Relate: Associates the observed characteristics of objects, living things or tools with science concepts.
2.3. Use Models: Diagrams or different models are used to show the information. With the help of these models, the representation of a process, cycle, relationship and system is made. At the same time, these models help to solve science problems.
2.4. Interpret Information: Uses science concepts when interpreting information in the form of text, pictures, tables or graphics.
2.5. Explain: Can make an observation using any science concept or method, or introduces a phenomenon by explaining or distinguishes it from others.
3. Reasoning
3.1. Analyze: Defines the elements of problems. Uses information, concepts, relationships, and data to solve problems.
3.2. Synthesize: Can answer questions that require multiple concepts to be considered together.
3.3. Formulate Questions/Hypothesize/Predict: Creates a research problem and generates assumptions based on the information provided, while at the same time making assumptions in the light of past experiences, observations and information obtained from different data sources. Uses evidence to make predictions about the effects of changes in biological and physical conditions.
3.4. Design Investigations: Plans appropriate research and methods for seeking answers to scientific questions or checking hypotheses; understands and explains the features of well-designed reviews.
3.5. Evaluate: Evaluates explanation options; decides by comparing the positive and negative aspects of alternative processes and tools. Evaluates whether the data is sufficient on the basis of its results.
3.6. Draw Conclusions: Makes assumptions using observations, evidence and other sources of information. Draws conclusions that address questions or hypotheses and takes into account cause-and-consequence relationships.
3.7. Generalize: Makes inferences about general results beyond data or experimental conditions. Tries the obtained results under new conditions.
3.8. Justify: Uses evidence for scientific suitability of explanations, solutions and review results.

Note: "TIMSS 2019 assessment frameworks". I. V. S. Mullis & M. O. Martin (Eds.), by V. A. S. Centurino and L. R. Jones, 2017, pp. 53-54, taken exactly from study (https://timssandpirls.bc.edu/timss2019/frameworks/), Copyright, 2017 by the International Association for the Evaluation of Educational Achievement (IEA)

Data Analysis

Within the scope of this study, 215 learning outcome expressions were analyzed in the mathematics curriculum and 223 learning outcome expressions were analyzed in the science curriculum. In the analysis of learning outcome expressions, first of all, it was determined according to which criteria the learning outcome expressions in the curricula will be evaluated. Accordingly, it was decided to evaluate the learning outcomes in the curricula according to the grade levels and learning fields. In another step, considering the framework steps in the TIMSS-2019 cognitive domain (knowing, applying, and reasoning), it was determined in which cognitive domains the learning outcome expressions were included. The learning outcome expressions in the curriculum were classified under five learning fields, four class levels and three cognitive domains for each course. In this context, coding in determining the place of learning outcome expression in cognitive domains was made by three researchers. While coding the learning outcome expressions, the course code, grade level, learning field, sub-learning field and learning outcome number were used, respectively (MoNE, 2018a, 2018b). The structure of the learning outcome expressions is shown schematically below (Figure 1).

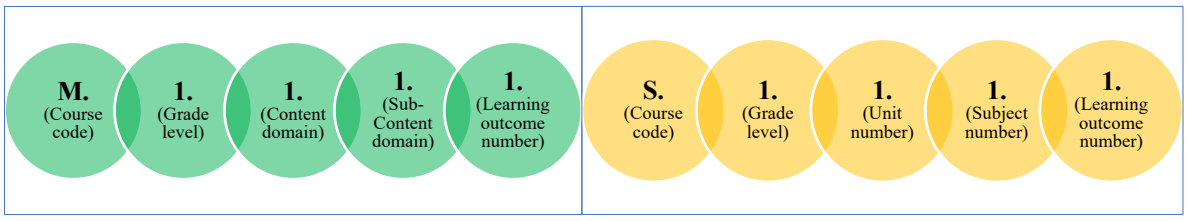

Figure 1. *Schematic Representation of Mathematics and Science Learning Outcomes*

In the other step of the research, codings were made to determine the cognitive domains of the learning outcome expressions in middle school mathematics and science curricula according to the evaluation criteria used. While coding, the code of the learning outcome expressions, the whole of the learning outcome expression, the cognitive domain code and the sub-domain code were written, respectively. For example, in the mathematics curriculum [M.5.1.6.4] "finds the amount corresponding to a specified percentage of a majority" (MoNE, 2018a, p. 54), the learning outcome expression is coded in the cognitive domain of knowing [1] and in the sub-dimension of computing [1.4]. Similarly, in the Science curriculum [S.5.1.1.1] "explains the characteristics of the sun" (MoNE, 2018b, p. 25), the learning outcome expression is coded in the cognitive domain of knowing [1] and recalling-recognizing [1.1]. However, since some learning outcomes contain more than one verb expression, these learning outcomes are coded under more than one cognitive domain and sub-dimension. For example, in the mathematics curriculum [M.5.1.2.2], "it determines and uses strategy in addition and subtraction from the mind with two-digit natural numbers" (MoNE, 2018a, p. 51) was coded in the cognitive domain of applying of learning outcome [2], determining [2.1] and implement [2.3] dimensions. Similarly, in the science curriculum [S.5.2.1.1], "it classifies according to its similarities and differences by giving examples to living things" (MoNE, 2018b, p. 26) learning outcome is coded in the dimensions of [1] giving examples in the cognitive domain of knowing [1.3] and [2] comparing-classifying in the cognitive domain of applying [2.1]. In this respect, the total number of learning outcomes in the mathematics curriculum containing more than one verb expression was 303 and the total number of learning outcomes in the science curriculum was 247. Thus, a total of 550 learning outcome expressions were included in the analysis of the data. Example codings of learning outcome expressions in mathematics and science curricula are presented below (Table 4).

Table 4. Coding Examples of Some Learning Outcomes in Mathematics and Science Curricula

Learning Outcome Number	Outcome Expression	Cognitive Domain	Sub-Dimension
M.5.1.6.4	Finds the amount that corresponds to a specified percentage of a quantity.	1	1.4
M.6.1.2.4	Determines the prime factors of natural numbers.	2	2.1
M.7.1.4.4	Expresses the relationship between two directly proportional multiplicities.	3	3.1
M.8.2.1.3	Explains identities with models.	2	2.2
S.5.1.1.1	Explains the properties of the sun.	1	1.1
S.6.5.3.1	Compares the speed of sound in different environments.	2	2.1
S.7.4.5.2	Designs a project related to the recycling of domestic solid and liquid waste.	3	3.4
S.8.2.4.1	Explains the adaptation of living things to the environment they live in, by observing.	2	2.5

Validity And Reliability of The Data

In the study, 82 learning outcome expressions at the fifth-grade level, 85 learning outcome expressions at the sixth-grade level, 62 learning outcome expressions at the seventh-grade level, and 74 learning outcome expressions at the eighth-grade level were analyzed in the mathematics curriculum. On the other hand, 38 learning outcomes at the fifth-grade level, 74 at the sixth-grade level, 72 at the seventh-grade level and 63 at the eighth-grade level in the science curriculum were analyzed. In order to ensure the reliability of the data obtained, three experts from the fields of mathematics education, science education, measurement, and evaluation took part in the coding of the learning outcomes. The learning outcome expressions were coded by three independent experts and the formula [Reliability Coefficient=Consensus÷ (Consensus + Disagreement) x100] proposed by Miles and Huberman (1994) was used to determine the percentage of compromise. Accordingly, consensus between the coders was determined as 80% and above for each curriculum. According to coding control that gives the internal consistency of the data, the consensus between the coders is expected to be at least 80% (Miles & Huberman, 1994). In this respect, it can be said that the encoder reliability of the data is ensured. On the other hand, in order to eliminate the differences in the coding of the learning outcome expressions in the curricula, the coders evaluated again and reached a common consensus. In order to ensure the validity of the study, care was taken to explain the procedures performed by the researchers in detail, to define the process correctly, to process and interpret the obtained data correctly. In addition, it was aimed to contribute to the validity of the study by including the detailed contents and access addresses of the documents used in the study (Sandelowski & Barrosa, 2007).

Research Ethics

Since the data of the study is not in the data group that requires ethical committee approval, it does not require ethics committee approval. The article has been prepared in accordance with research and publication ethics.

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FINDINGS

You can add empty lines to move a section title to the start of the next page. In this section, the findings obtained for the purpose of the study are explained in three parts. In the first part, the learning outcome expressions in the middle school mathematics curriculum have been discussed in terms of the cognitive domain and sub-dimensions within the framework of TIMSS-2019 evaluation according to the grade levels. At the same time, the distribution of the learning outcome expressions according to the learning domain in the mathematics program is presented with the help of graphics. In the second part, the learning outcome expressions in the middle school science curriculum are discussed in terms of the cognitive domain and sub-dimensions within the framework of TIMSS2019 evaluation according to the grade levels. At the same time, the distribution of learning outcome expressions according to the learning domain in the science program is shown in the graph. In the last part, the distribution of the learning outcome expressions in the field of mathematics and science curriculum has been presented according to TIMMS-2019 cognitive domain with the help of graph. In addition, the learning outcome expressions in middle school mathematics and science curricula are associated with the cognitive domains determined within the framework of the TIMSS-2019 program according to grade levels and learning domains, and the results are given in frequencies and percentages. In this part of the findings section, the answer to the question of "What is the distribution of the learning outcome expressions in the middle school mathematics curriculum according to the TIMSS-2019 cognitive domain levels?" was sought. In this context, when the middle school mathematics curriculum is examined according to grade levels, the distribution of learning outcome expressions at each grade level in TIMSS-2019 cognitive domain skills is presented below (Table 5).

Table 5. Cognitive Domain Distribution of Learning Outcomes in Mathematics Curriculum by Grade Levels

Cognitive Domain	Sub-Dimensions of Cognitive Domains	Grade Levels			
		5. Grade	6. Grade	7. Grade	8. Grade
		% (f)	% (f)	% (f)	% (f)
1. Knowing	1.1. Recall	9.8 (8)	4.7 (4)	1.6 (1)	2.7 (2)
	1.2. Recognize	8.5 (7)	4.7 (4)	12.9 (8)	10.8 (8)
	1.3. Classify/Order	6.1 (5)	3.5 (3)	1.6 (1)	1.4 (1)
	1.4. Compute	20.7 (17)	23.5 (20)	27.5 (17)	16.2 (12)
	1.5. Retrieve	3.7 (3)	9.4 (8)	1.6 (1)	4.1 (3)
	1.6. Measure	3.7 (3)	5.9 (5)	-	-
2. Applying	2.1. Determine	9.8 (8)	10.6 (9)	11.3 (7)	12.2 (9)
	2.2. Represent/Model	13.4 (11)	3.5 (3)	8.1 (5)	24.4 (18)
	2.3. Implement	10.9 (9)	16.5 (14)	17.7 (11)	9.3 (7)
3. Reasoning	3.1. Analyze	10.9 (9)	10.6 (9)	14.5 (9)	13.5 (10)
	3.2. Synthesize	2.5 (2)	5.9 (5)	3.2 (2)	5.4 (4)
	3.3. Evaluate	-	1.2 (1)	-	-
	3.4. Draw Conclusions	-	-	-	-
	3.5. Generalize	-	-	-	-
	3.6. Justify	-	-	-	-
	Total	100 (82)	100 (85)	100 (62)	100 (74)

When Table 5 is examined, according to the TIMSS cognitive domain evaluation framework, it is seen that a large proportion of the fifth-grade learning outcomes in the mathematics curriculum overlap with the sub-dimensions of cognitive domains of computing (20.7%) in the domain of knowing and represent model (13.4%) in the domain of applying. These sub-dimensions are followed by the sub-dimensions of cognitive domains of implement in the domain of applying (10.9%), analysis in the domain of reasoning (10.9%), and recall in the domain of knowing (9.8%), respectively. Considering the learning outcomes at the sixth-grade level, compute the most in the domain of knowing (23.5%) and implement it in the domain of applying (16.5%) are in the sub-dimensions of cognitive domains. These steps are followed by the sub-dimensions of cognitive domains of determine in the domain of applying (10.6%), analyzing in the domain of reasoning (10.6%) and retrieve in the domain of knowing (9.4). The learning outcomes at the seventh-grade level are more in the sub-dimensions of compute (27.5%) in the domain of knowing and implement (17.7%) in the domain of applying. These sub-dimensions are followed by analysis in the domain of reasoning (14.5%), recognition in the domain of knowing (12.9%) and determine in the domain of applying (11.3%). Finally, when looking at the eighth-grade level learning outcomes, it is seen that present/model (24.4%) in the domain of applying and computing in the domain of knowing (16.2%) are more in the sub-dimensions of cognitive domains. The sub-dimensions of this cognitive domain are followed by analysis in the domain of reasoning (13.59%), determination in the domain of applying (12.2%) and

recognition in the domain of knowing (10.8%), respectively. The change in the learning outcomes in the middle school mathematics curriculum in the cognitive domains of TIMSS according to the grade levels is presented below as a percentage (Figure 2).

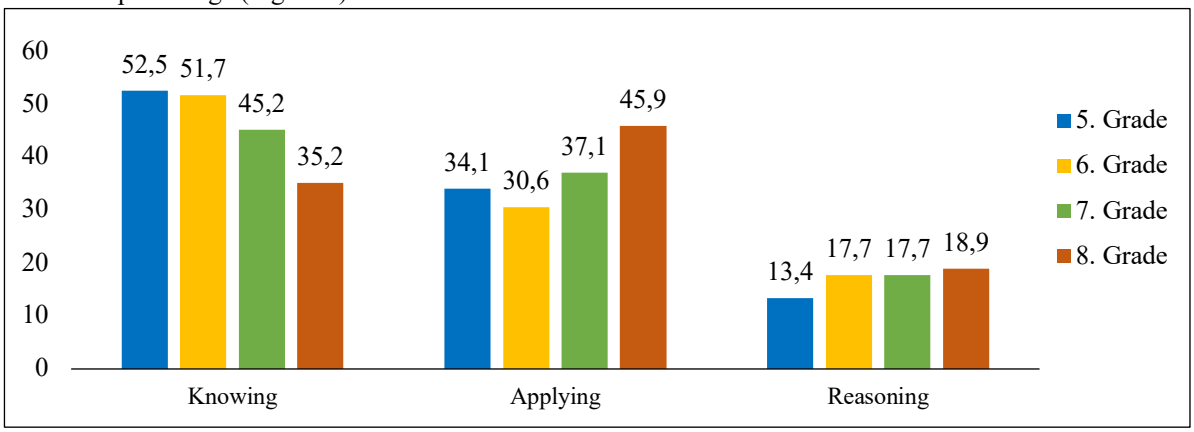

Figure 2. *Changes in the TIMSS Cognitive Domains of the Learning Outcomes in the Mathematics Curriculum*

When Figure 2 is examined, it is seen that there are mostly fifth-grade (52.5%) learning outcomes in the cognitive domain of knowing, but the sixth-grade (51.7%) learning outcomes are also high. The grade level with the least learning outcomes in this cognitive domain was the eighth-grade (35.2%). In the cognitive domain of the applying, there are eighth-grade (45.9%) learning outcomes the most. The grade level with the least learning outcome in this cognitive domain was the sixth-grade (30.6%). While the grade level with the most learning outcomes in the cognitive domain of reasoning was the eighth-grade (18.9%), there were equal learning outcomes in the sixth-and seventh-grade (17.7%) levels. In this context, when the change of TIMSS cognitive domains according to grade levels is examined in general, it is noteworthy that the majority of the learning outcomes in the mathematics curriculum are related to the cognitive domain of knowing. On the other hand, the domain with the least learning outcome among cognitive domains has been the cognitive domain of reasoning. In this part of the study, answers to the question "When the middle school mathematics curriculum is examined according to learning domains, how are the learning outcome expressions in each learning field distributed according to TIMSS-2019 cognitive domain skills?" were sought and the findings obtained are presented in the table below (Table 6).

Table 6. TIMSS Cognitive Domain Distribution of Learning Outcomes in Mathematics Learning Fields

Cognitive Domain	Sub-Dimensions of Cognitive Domains	Content domain				
		Numbers and Operations	Algebra	Geometry and Measurement	Data Processing	Probability
		% (f)	% (f)	% (f)	% (f)	% (f)
1. Knowing	1.1. Recall	7.9 (11)	3.4 (1)	2.8 (3)	-	-
	1.2. Recognize	7.9 (11)	10.3 (3)	11.1 (12)	-	16.7 (1)
	1.3. Classify/Order	6.5 (9)	-	0.9 (1)	-	-
	1.4. Compute	28.8 (40)	24.3 (7)	12.1 (13)	23.8 (5)	16.7 (1)
	1.5. Retrieve	7.2 (10)	10.3 (3)	0.9 (1)	-	16.7 (1)
	1.6. Measure	-	-	7.4 (8)	-	-
2. Applying	2.1. Determine	12.2 (17)	3.4 (1)	12.9 (14)		16.7 (1)
	2.2. Represent/Model	2.9 (4)	20.7 (6)	18.6 (20)	28.6 (6)	16.7 (1)
	2.3. Implement	11.5 (16)	13.8 (4)	17.6 (19)	9.5 (2)	-
3. Reasoning	3.1. Analyze	13.7 (19)	6.9 (2)	8.3 (9)	28.6 (6)	16.7 (1)
	3.2. Synthesize	1.4 (2)	6.9 (2)	6.5 (7)	9.5 (2)	-
	3.3. Evaluate	-	-	0.9 (1)	-	-
	3.4. Draw Conclusions	-	-	-	-	-
	3.5. Generalize	-	-	-	-	-
	3.6. Justify	-	-	-	-	-
	Total	100 (139)	100 (29)	100 (108)	100 (21)	100 (6)

When Table 6 is examined, it is seen that there are more cognitive domain-related learning outcomes in the cognitive sub-dimensions of computing in the domain of knowing (28.8%) and analysis in the domain of reasoning (13.7%) among the learning outcomes in the domain of numbers and operations learning. These sub-dimensions are followed by determining (12.2%) and implementing (11.5%) in the domain of applying, recalling (7.9%), recognizing (7.9%), and retrieving (7.2%) in the domain of knowing. When the learning outcomes in the domain of algebra are examined, there are more learning outcomes in the cognitive sub-dimensions of computing (24.3%) and representing-modeling (20.7%) in the domain of knowing. These cognitive sub-dimensions are followed by the sub-dimensions of implementing in the domain of applying (13.8%) and recognizing in the domain of knowing (10.3%) and retrieving (10.3%) respectively. When the learning outcomes in the field of geometry and measurement are examined, it is seen that the learning outcomes associated with more cognitive domains overlap in the sub-dimensions of representing-modelling (18.6%) in the domain of applying and implementing in the domain of applying (17.6%). These dimensions are followed by the sub-dimensions of determining in the domain of applying (12.9%), computing in the domain of knowing (12.1%) and recognizing (11.1%). When the data processing learning field is examined, there are more learning outcomes in the cognitive sub-dimensions of representing/modeling (28.6%) in the applying domain and analysis (28.6%) in the reasoning domain. These sub-dimensions are followed by the cognitive subdimensions of computing in the domain of knowing (23.8%), performing in the domain of applying (9.5%), and synthesis in the domain of reasoning (9.5%). Finally, learning outcome expressions (16.7%) in the cognitive sub-dimensions of recognizing computing, retrieving, determining and representing-modeling in the domain of learning, and synthesis in the domain of reasoning show equal distribution. The change in learning outcomes in the mathematics curriculum by learning domains is presented below as a percentage (Figure 3).

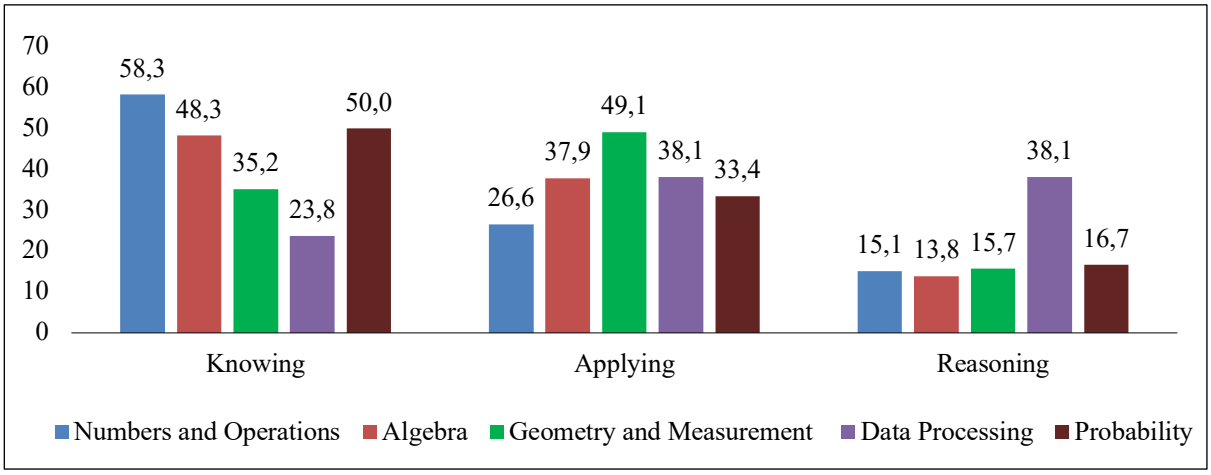

Figure 3. *TIMSS Cognitive Domain Change of Learning Outcomes in Mathematics Learning Fields*

When Figure 3 is examined, it is seen that the majority of the learning outcomes in the field of numbers and operations (58.3%) among the learning outcomes in the middle school mathematics curriculum overlap with the cognitive domain of knowing. Similarly, the learning field of algebra (48.3%) and the learning outcomes within the learning field of probability (50.0%) are largely in the cognitive domain of knowing. On the other hand, one third (35.2%) of the learning outcomes in the field of geometry and measurement and close to one fourth (23.8%) of the learning outcomes in the field of data processing are in the cognitive domain of knowing. The learning field with the highest acquisition rate in the applying cognitive domain is the learning field of geometry and measurement (49.1%), followed by data processing (38.1%) and algebra learning domains (37.9%), respectively. The learning field with the highest acquisition rate in the domain of reasoning is data processing learning (38.1%). The learning ratio of the numbers and operations (15.1%), algebra (13.8%), geometry and measurement (15.7%) and probability (16.7%) in this cognitive domain are also very close to each other. In this part of the study, answers were sought to the question "How are the learning outcome expressions in the middle school science curriculum distributed according to TIMSS-2019 cognitive domain levels?". Accordingly, when the middle school science curriculum is examined according to the grade levels, the distribution of learning outcome expressions at each grade level in TIMSS-2019 cognitive domain skills is presented below.

Table 7. Cognitive Domain Distribution of Learning Outcomes in the Science Curriculum by Grade Levels

Cognitive Domain	Sub-Dimensions of Cognitive Domains	Grade Levels			
		5. Grade	6. Grade	7. Grade	8. Grade
		% (f)	% (f)	% (f)	% (f)
1. Knowing	1.1. Recall/Recognize	21.2 (8)	5.4 (4)	15.3 (11)	7.9 (5)
	1.2. Describe	-	14.9 (11)	4.2 (3)	6.4 (4)
	1.3. Provide Examples	5.2 (2)	8.1 (6)	9.7 (7)	9.5 (6)
2. Applying	2.1. Compare/Classify	5.2 (2)	12.2 (9)	11.1 (8)	4.7 (3)
	2.2. Relate	-	-	1.4 (1)	6.4 (4)
	2.3. Use Models	10.6 (4)	13.5 (10)	5.5 (4)	4.7 (3)
	2.4. Interpret Information	5.2 (2)	-	-	3.2 (2)
	2.5. Explain	15.8 (6)	6.7 (5)	12.5 (9)	12.8 (8)
3. Reasoning	3.1. Analyze	13.2 (5)	9.5 (7)	20.8 (15)	15.9 (10)
	3.2. Synthesize	2.6 (1)	6.7 (5)	8.3 (6)	6.4 (4)
	3.3. Formulate Questions/Hypothesize/Predict	5.2 (2)	10.8 (8)	2.8 (2)	4.7 (3)
	3.4. Design Investigations	2.6 (1)	8.1 (6)	2.8 (2)	4.7 (3)
	3.5. Evaluate	2.6 (1)	2.7 (2)	-	3.2 (2)
	3.6. Draw Conclusions	10.6 (4)	1.4 (1)	5.6 (4)	9.5 (6)
	3.7. Generalize	-	-	-	-
	3.8. Justify	-	-	-	-
	Total	100 (38)	100 (74)	100 (72)	100 (63)

When Table 7 is examined, according to the TIMSS cognitive domain evaluation framework, it is seen that the fifth-grade learning outcomes in the science curriculum are mostly associated with the subdimensions of recalling-recognizing (21.2%) in the domain of knowing and explaining (15.8%) in the domain of applying. These dimensions are followed by analysis in the domain of reasoning (13.2%), using models in the domain of applying (10.6%), and drawing conclusions in the domain of reasoning (10.6%). On the other hand, when the learning outcomes at the sixth-grade level are examined, it is seen that the description (14.9%) in the domain of cognition and the using models in the domain of applying (13.5%) overlap with the sub-dimensions of cognitive domains. These sub-dimensions are followed by comparing-classifying (12.2%) in the domain of applying, formulating questions-hypothesis-prediction (10.8%), and analyzing (9.5%) in the domain of reasoning. When the learning outcomes within the seventh-grade level are examined, it is seen that the most learning outcomes are associated with the subdimensions of cognitive domains analysis in the domain of reasoning (20.8%) and recalling-recognizing in the domain of knowing (15.3%). These sub-dimensions are followed by explaining (12.5%) and comparing-classifying (11.1%) in the domain of applying and giving examples in the domain of knowing (9.7%) in the sub-dimensions of cognitive domains. These sub-dimensions are followed by explaining (12.5%) and comparing-classifying (11.1%) in the domain of applying and giving examples in the domain of knowing (9.7%) in the sub-dimensions of cognitive domains. When the eighth-grade level learning outcomes are examined, it is seen that the sub-dimensions of the cognitive domains are intensive in the domain of analysis (15.9%) and explanation in the domain of applying (12.8%). These sub-dimensions are followed by providing examples in the domain of knowing (9.5%) and drawing conclusions in the domain of reasoning (9.5%). The change in the learning outcomes in the middle school science curriculum in the cognitive domains of TIMSS according to the grade levels is presented below as a percentage (Figure 4).

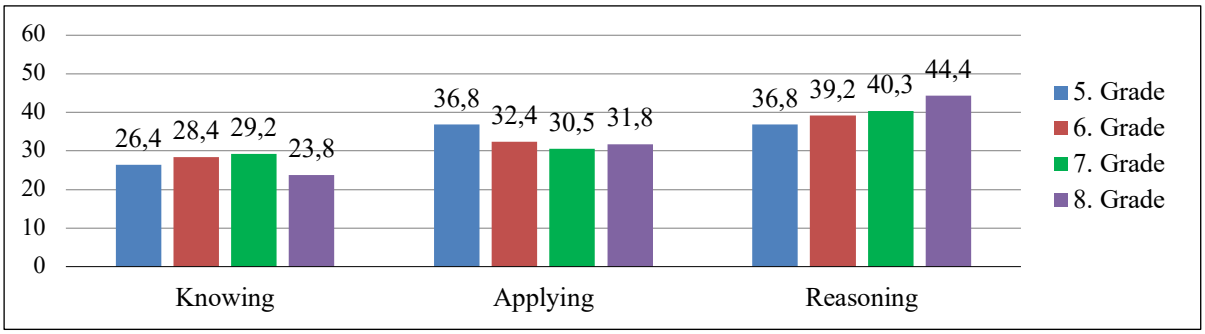

Figure 4. *Changes in TIMSS Cognitive Domains of Learning Outcomes in Science Curriculum*

When Figure 4 is examined, it is seen that there are similar learning outcomes in the cognitive domain of knowing at the levels of fifth-grade (26.4%), sixth-grade (28.4%), seventh-grade (29.2%), and eighth-grade (23.8%). In the cognitive domain of applying, there are fifth-grade (36.8%) level learning outcomes the most,

followed by the sixth-grade (32.4%), eighth-grade (31.8%) and seventh-grade (30.5%) levels, respectively. In the cognitive domain of the applying, there are the most fifth-grade (36.8%) level learning outcomes, followed by the sixth-grade (32.4%), eighth-grade (31.8%), and seventh-grade (30.5%) levels, respectively. In the cognitive domain of reasoning, there are the most eighth-grade (44.4%) level learning outcomes, followed by seventh-grade (40.3%), sixth-grade (39.2%) and fifth-grade (36.8%) levels. When the change of TIMSS cognitive domains according to grade levels is examined in general, it is noteworthy that the majority of the learning outcomes in the science curriculum are related to the cognitive domain of reasoning. On the other hand, the domain with the least learning outcome among cognitive domains has been the cognitive domain. In this part of the study, the findings obtained from the question "When the middle school science curriculum is examined according to learning domains, how is the distribution of learning outcomes in each learning field according to TIMSS-2019 cognitive domain skills?" are presented in the table below (Table 8).

Table 8. TIMSS Cognitive Domain Distribution of Learning Outcomes in Science Learning Fields

Cognitive Domain	Sub-Dimensions of Cognitive Domains	Content Domain			
		Earth and universe	Living life	Physical events	Matter and nature
		% (f)	% (f)	% (f)	% (f)
1. Knowing	1.1. Recall/Recognize	33.3 (9)	7.4 (6)	6.1 (5)	14.2 (8)
	1.2. Describe	-	16.1 (13)	3.6 (3)	3.6 (2)
	1.3. Provide Examples	-	6.1 (5)	14.4 (12)	7.2 (4)
2. Applying	2.1. Compare/Classify	11.1 (3)	4.9 (4)	8.5 (7)	14.2 (8)
	2.2. Relate	-	1.3 (1)	1.2 (1)	5.4 (3)
	2.3. Use Models	18.5 (5)	11.1 (9)	7.2 (6)	1.8 (1)
	2.4. Interpret Information	-	1.3 (1)	-	5.4 (3)
	2.5. Explain	-	6.1 (5)	19.2 (16)	12.5 (7)
3. Reasoning	3.1. Analyze	11.1 (3)	19.7 (16)	14.4 (12)	10.7 (6)
	3.2. Synthesize	3.7 (1)	4.9 (4)	6.1 (5)	10.7 (6)
	3.3. Formulate Questions/Hypothesize/Predict	14.8 (4)	6.1 (5)	7.2 (6)	-
	3.4. Design Investigations	-	2.6 (2)	6.1 (5)	8.9 (5)
	3.5. Evaluate	-	3.8 (3)	1.2 (1)	1.8 (1)
	3.6. Draw Conclusions	7.4 (2)	8.6 (7)	4.8 (4)	3.6 (2)
	3.7. Generalize	-	-	-	-
	3.8. Justify	-	-	-	-
	Total	100 (27)	100 (81)	100 (83)	100 (56)

When Table 8 is examined, it is seen that the learning outcomes related to more cognitive domains overlap in the cognitive sub-dimensions of recalling-recognizing (33.3%) in the domain of knowing and using models in the domain of applying (18.5%) among the learning outcomes in the field of earth and universe learning. This is followed by the sub-dimensions of formulating question-hypothesize-predict (14.8%), comparing-classifying in the domain of applying (11.1%), and analysis in the domain of reasoning (11.1%). On the other hand, it is seen that more cognitive domain-related learning outcomes are included in the cognitive sub-dimensions of analysis in the domain of reasoning (19.7%) and definition in the domain of knowing (16.1%) within the learning outcomes in the domain of living and life learning. These sub-dimensions are followed by the use of models in the domain of applying (11.1%), drawing conclusions in the domain of reasoning (8.6%), and recalling-recognition (7.4%) in the domain of knowing. Among the learning outcomes in the domain of physical events, it is seen that there are more cognitive domain-related learning outcomes in the cognitive sub-dimensions of explaining in the domain of applying (19.2%), analyzing in the domain of reasoning (14.4%), and giving examples in the domain of knowing (14.4%). These dimensions are followed by the sub-dimensions of comparing-classifying in the domain of applying (8.5%), using models in the domain of applying (7.2%), formulating question-hypothesize-predict (7.2%) in the domain of reasoning. Among the learning outcomes in the domain of matter and nature learning, there are learning outcomes mostly related to the cognitive domain in the cognitive sub-dimensions of recalling-recognizing (14.2%) in the domain of knowing, comparing, classifying (14.2%) in the domain of applying (12.5%). These sub-dimensions are followed by analysis (10.7%), synthesizing (10.7%) and designing investigations (8.9%) in the domain of reasoning, respectively.

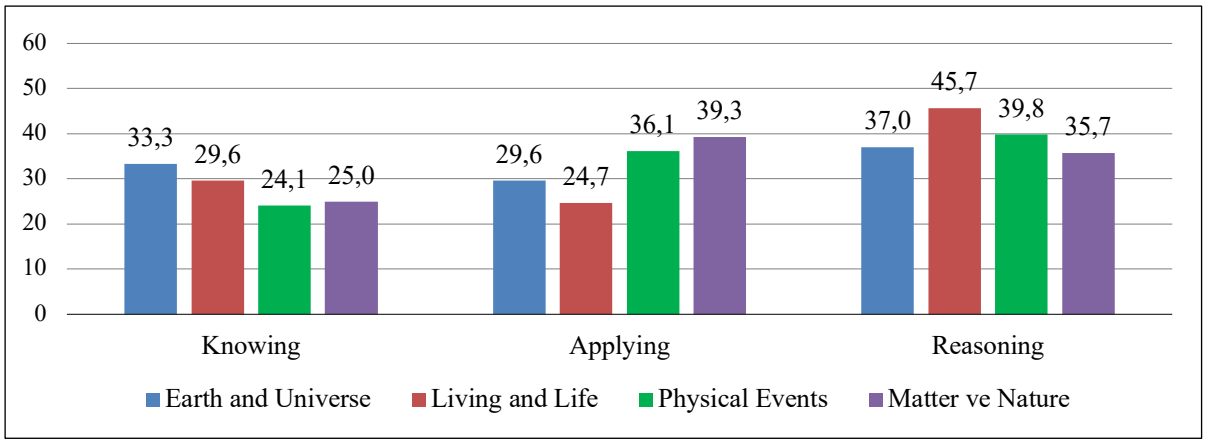

Figure 5. TIMSS Cognitive Domain Change of Learning Outcomes in Science Learning Fields

When Figure 5 is examined, it is seen that the majority of the learning outcomes in the field of earth and universe (33.3%) are within the cognitive domain of knowing among the learning outcomes in the middle school science curriculum. Similarly, a large proportion of learning outcomes related to living and life (29.6%), matter and its nature (25.0%) and physical events (24.1%) overlap with the cognitive domain of knowing. Nearly half of the learning outcomes (39.3%) in the field of matter and nature are within the applying cognitive domain. More than one-third of the physical events (36.1%) learning domain-related learning outcomes were associated with the cognitive domain of applying. In the learning domains of earth and the universe (29.6%) and living and life (24.7%), the learning outcomes related to the cognitive domain of applying were largely included. Finally, nearly half of the learning outcomes in living and life (45.7%) are within the cognitive domain of reasoning. In addition, a large proportion of the learning outcomes in the fields of physical events (39.8%), the earth and the universe (37.0%), and matter and nature (35.7%) are also in the domain of cognitive reasoning.

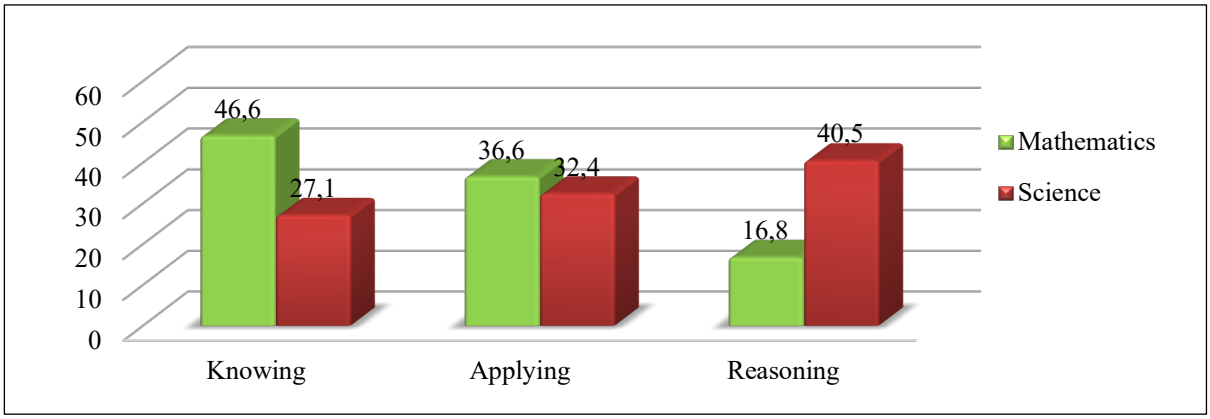

Figure 6. *Cognitive Domain Distribution of Learning Outcomes in Mathematics and Science Learning Fields*

When Figure 6 is examined, it is seen that 46.6% of the total learning outcome expressions in the mathematics curriculum are related to the cognitive domain of knowing, 36.6% to applying, and 16.8% to reasoning. In this context, while almost half of the learning outcomes in the mathematics curriculum are in the cognitive domain of knowing, low rates of learning outcomes are included in the cognitive domain of reasoning. On the other hand, it is seen that 27.1% of the total learning outcome expressions in the science curriculum are related to the cognitive domain of knowing, 32.4% to applying, and 40.5% to reasoning. Accordingly, while most of the learning outcomes in the science curriculum are related to the cognitive domain of reasoning, fewer learning outcomes are included in the cognitive domain of knowing.

DISCUSSION & CONCLUSION

In this study, according to the cognitive domain skills specified in the TIMSS-2019 evaluation frameworks, the learning outcome expressions in middle school mathematics and science curriculum were examined in terms of grade levels and learning domains. In this context, first of all, the learning outcome expressions at each grade level of the middle school mathematics curriculum were associated according to the TIMSS-2019 cognitive domain framework. More than one fifth of the learning outcomes in the fifth-grade level of the mathematics curriculum were in the sub-dimension of computing in the cognitive domain of knowing. The least associated

learning outcome at this grade level is in the synthesizing subdimension of the cognitive domain of reasoning. At the sixth-grade level, there were more learning outcomes in the sub-dimension of computing in the cognitive domain of knowing. Less learning outcomes were associated with the evaluation sub-dimension in the cognitive domain of reasoning at this grade level. Similarly, at the seventh-grade level, while more learning outcomes were associated in the sub-dimension of computing of the cognitive domain of knowing fewer learning outcomes were associated in the sub-dimensions of recalling, retrieving, and classifying-ordering in the cognitive domain of knowing. The field where the most learning outcomes were associated with the eighth-grade level was the representing-modeling sub-dimension of the applying cognitive domain. The area where the least learning outcome was associated at this grade level was the classifying-ordering sub-dimension of the cognitive domain of knowing. On the other hand, it was determined that there was no learning outcome associated with the sub-dimensions of the reasoning cognitive domain, which are inference, generalization, and verification. According to these findings, it can be said that the majority of the learning outcomes in mathematics curricula are in the cognitive domain and sub-dimensions of knowing. The least learning outcomes are mostly found in the cognitive domain and sub-dimensions of reasoning. These findings differ with the explanations of the students, who are among the special objectives of the mathematics curriculum, for the development of metacognitive knowledge and skills (MoNE, 2018a). Therefore, the learning outcomes included in the mathematics curriculum should contribute to the development of students' high-level cognitive thinking skills and be able to move their reasoning skills further. However, the fact that the tasks in mathematics textbooks are mostly concentrated in the domain of cognition and applying makes it difficult for students to learning outcome high-level knowledge and skills (Yılmaz et al., 2021).

In addition, the findings of the study are in line with the findings of the study in which primary school mathematics curriculum learning outcomes are examined according to the TIMSS 2019 evaluation framework and fewer learning outcomes are associated with the domain of reasoning. (Delil et al., 2020). Similarly, it overlaps with the findings of the study in which it was determined that the learning outcomes were not sufficient at the metacognitive level in the middle education mathematics program (Çil et al., 2019). In this respect, it is necessary to include more learning outcomes in the domain of reasoning in both primary and middle school and middle school mathematics curricula. Because it is very important that mathematical knowledge is used to solve more complex problems and is integrated with other disciplines and daily life around values, skills, and competencies (Mullis et al., 2020). In addition, similar findings were obtained in the study in which the mathematics curriculum was examined according to the TIMSS 2015 evaluation framework. (İncikabı et al., 2016). One of the remarkable findings of the research is that the eighth-grade learning outcomes in the mathematics curriculum are mostly related to the applying cognitive domain. While this situation was in favor of the seventh-grade in the TIMSS-2015 evaluation, it changed in favor of the eighth-grade in the TIMSS-2019 evaluation (Incikabı et al., 2016). In the TIMSS 2019 evaluation of the primary school mathematics curriculum, more learning outcomes related to the applying cognitive domain were matched at the fourth-grade level (Delil et al., 2020). Based on these findings, individuals need to develop and implement mathematical thinking in order to overcome the problems they encounter in daily life (MoNE, 2018a). In this respect, considering that the learning outcomes play an important role in achieving the determined goals, it would be beneficial to associate the learning outcomes in mathematics curricula with the cognitive domain of reasoning.

Another finding obtained from the research was obtained from the distribution of learning outcomes of mathematics curriculum according to TIMSS-2019 cognitive domain skills. Accordingly, almost one-third of the learning outcomes in numbers and operations were associated with the sub-dimension of knowing, and computing in the cognitive domain. There are few learning outcomes associated with the synthesizing sub-dimension in the cognitive domain of reasoning. When the learning outcomes in the field of algebra were examined, it was determined that the most cognitive domain was related to the sub-dimension of computing, and the least cognitive domain was related to the sub-dimensions of recalling and determining the applying cognitive domain. When the learning field of geometry and measurement is examined, while there are more learning outcomes in the representation-modeling subdimension of the applying cognitive domain, fewer learning outcomes have been associated with the classification/ordering of the cognitive domain of knowing and with the evaluation sub-dimensions of the cognitive domain of reasoning. When the data processing learning field is examined, it has been determined that the highest number of learning outcomes is in the cognitive sub-dimensions of presentation-modeling in the applying domain and analysis in the reasoning domain. Finally, a total of six learning outcome expressions in the domain of probability learning, which are only included at the eighth-grade level, were associated with the sub-dimensions of recognition of the cognitive domain, inference by computing, determining, making, and presentation-modeling of the cognitive domain, reasoning and synthesis of the cognitive domain. According to these findings, it is noteworthy that the learning outcome expressions in the learning domains are

mostly in the cognitive domain of knowing, and fewer learning outcome expressions are associated with the cognitive domain of reasoning. Another important finding of the research is that nearly half of the learning outcomes in the field of geometry and measurement are associated with the cognitive domain of applying. In addition, more than one-third of the learning outcomes in the domain of data processing has occurred in the cognitive domain of reasoning. More than half of the learning outcomes in the fields of numbers and operations and probability learning are concentrated in the domain of cognition. According to these findings, it can be said that as the cognitive level increases, the number of learning outcomes decreases. A similar finding was obtained in the study in which the questions in mathematics textbooks were examined according to TIMSS cognitive domains, and it was determined that there were few questions in the textbooks related to the cognitive domain of reasoning (Sümen, 2021). On the other hand, the findings obtained are similar to the results of the study examining the distribution of primary school mathematics curriculum according to TIMSS-2019 cognitive domains (Delil et al., 2020). In the study in which the learning outcomes were evaluated according to TIMSS-2015 cognitive domains, the learning outcomes within the fields of numbers and operations in the domain of cognition, algebra in the domain of applying cognition, and data processing in the domain of reasoning cognitive learning were more matched (Incikabı et al., 2016). In this context, it is noteworthy that the learning outcomes paired with cognitive domains differ according to learning domains. The most important reason for this situation is the different number of learning outcomes. For example, in the mathematics curriculum, more learning outcomes were included in numbers and operations, geometry, and measurement learning domains compared to other domains. In addition, while the probability learning field is only at the eighth-grade level, the learning outcomes related to the algebra learning field are not included in the fifth-grade curriculum. Especially the numbers and processes that require four processing skills and the high number of learning outcomes in algebra learning domains also affect the distribution in cognitive domains.

In the other step of the research, the learning outcome expressions at each grade level of the middle school science curriculum were associated according to the TIMSS-2019 cognitive domain framework. According to the findings, more than one-fifth of the learning outcomes at the fifth-grade level of the science curriculum are in the recalling-recognizing sub-dimension of the cognitive domain of knowing. Fewer learning outcomes have been matched in the sub-dimensions of reasoning, synthesizing, designing investigations, and evaluating the cognitive domain. At the sixth-grade level, the most learning outcome was in the definition sub-dimension of the cognitive domain of knowing, while the least learning outcome was in the inference sub-dimension of the cognitive domain of reasoning. At the seventh-grade level, the most learning outcome was in the sub-dimension of analyzing the cognitive domain of reasoning, while the least learning outcome was in the sub-dimension of associating the applying cognitive domain. When the eighth-grade level learning outcomes were examined, it was determined that the most learning outcomes were matched in the sub-dimension of analyzing in the cognitive domain of reasoning, and the least learning outcomes were matched in the sub-dimensions of interpreting knowledge in the cognitive domain of applying and evaluating in the cognitive domain of reasoning. According to these findings, it can be said that there is a partial increase in cognitive levels due to the increase in the grade level in the science curriculum. It is noteworthy that more learning outcomes related to the cognitive domain of reasoning are associated, especially at the eighth-grade level. On the other hand, while most learning outcomes related to the cognitive domain of applying are at the fifth-grade level, the distribution of the learning outcomes in the cognitive domain of knowing according to the grade levels is quite close to each other. On the other hand, it was determined that there was no associated learning outcome in the generalizing and justifying sub-dimensions of the cognitive domain of reasoning. According to these findings, it can be said that the science curriculum, which has been renewed due to the increase in grade levels, tries to focus on the learning outcomes that include more metacognitive skills. As a matter of fact, it is noteworthy that the Turkish MoNE tries to focus on the use of metacognitive skills, which are among the general objectives of the curricula, and to reflect the understanding of integration around skills and competencies in the learning outcomes (MoNE, 2018b). As the grade levels progress, while it is expected that the learning outcomes within the cognitive domains will progress at an increasing level, a homogeneous distribution is observed (Avcı et al., 2021). Although there are fewer questions and tasks related to metacognitive domains in textbooks and national exams, unlike TIMSS exams, it can be said that science curriculum learning outcomes have gathered momentum towards metacognitive levels (Bostan-Sarıoğlan et al., 2021; Böyük, 2017; Güven, 2014; Pedük, 2019; Pektaş et al., 2015; Sağlamöz & Soysal, 2021; Türkoğuz et al., 2019). Drawing attention to this situation, Avcı et al. (2021) emphasizes that as the grade level increases, the number of learning outcomes in the metacognitive knowledge subgroup should be increased.

Another finding obtained from the research was obtained from the distribution of learning outcomes of the science curriculum according to TIMSS-2019 cognitive domain skills. Accordingly, it has been determined that

the learning outcomes in the field of earth and universe learning are distributed in a balanced way within the cognitive domains of knowing, applying, and reasoning. Nearly one-fifth of the learning outcomes in the field of living and life learning was associated with the sub-dimension of analyzing the cognitive domain of reasoning. At least, the applying was associated with the subdimension of interpreting information in the cognitive domain. While physical events are in the explanatory sub-dimension of the cognitive domain with the highest number of learning outcomes in the learning field, the least number of learning outcomes is in the sub-dimensions of associating cognitive domain and reasoning is in the sub-dimensions of assessment of cognitive domain. In the domain of matter and nature learning, the highest number of learning outcomes are in the domain of cognitive recalling-recognizing of the domain of cognitive knowledge is associated with the cognitive classifying-ordering dimensions of the domain of applying. While one-third of the cognitive domain of knowing includes learning outcomes in the earth and universe, more than one-third of the cognitive domain of applying consists of learning outcomes in the domain of matter and nature. One of the remarkable findings of the study is that nearly half of the cognitive domain of reasoning has been associated with learning outcomes in the field of living and life. According to these findings, it can be said that the learning outcomes in science learning domains do not show a balanced distribution and the number of learning outcomes at metacognitive levels is not at the desired level. Although it has been observed that the rates of learning outcomes allocated for students to experience higher cognitive demands remain low at all grade levels (Sağlamöz & Soysal, 2021), it is striking that the understanding that focuses on students' 21st-century learning skills tries to dominate in the renewed curricula. As a matter of fact, in the study conducted by Pedük (2019), it was concluded that reasoning learning outcomes are higher at the eighth-grade level. On the other hand, in the study conducted by Avcı et al. (2021), it is emphasized that the number of learning outcomes in the high-level steps is not sufficient and it is stated that it is important to develop more high-level cognitive skills with the constructivist approach adopted in the program. As a matter of fact, it has been stated that course learning outcomes have an important position in the development of scientific, life, engineering, and design skills, which are among the field-specific skills in the science curriculum of the Turkish MoNE (MoNE, 2018b). So, it is very important to revise the learning outcomes towards higher cognitive steps.

Finally, the learning outcomes included in mathematics and science curricula were examined according to their rates in TIMSS-2019 cognitive domains. According to the findings, among the total learning outcomes in the mathematics curriculum, there were the most learning outcomes associated with the cognitive domain of knowing, while the least learning outcomes were associated with the cognitive domain of reasoning. When the total learning outcomes in the science curriculum were examined, it was observed that the number of learning outcomes associated increased as they progressed towards metacognitive domains. In this context, while the most learning outcome was associated with the reasoning domain, the least learning outcome was associated with the cognitive domain of knowing. On the other hand, the learning outcomes in the curricula include more than one action. Therefore, it will be beneficial to make an arrangement from simple to complex in order to better understand the learning outcomes in the program and to prevent structural disorders (Kuzu et al., 2019). In addition, the learning outcomes in the cognitive domains should be included as more balanced. Because introducing individuals to learning outcomes at the level of applying and reasoning without having sufficient knowledge also restricts access to learning outcomes (Miller et al., 2008). Mathematics and science are the most effective branches of science in raising individuals with questioning, problem-solving, creative, critical, analytical, spatial, and logical thinking skills (Sarıer, 2020). Therefore, the learning outcomes in both mathematics and science learning should be qualified to serve the education of individuals with high-level knowledge and skills. For this, it is necessary to focus more on metacognitive learning outcomes in curricula. The learning outcomes concentrated in lower-level cognitive steps should change towards higher-level cognitive steps (Aktan, 2020). Otherwise, students are not provided with higher-level skills such as problem-solving, decision making, prediction, reasoning, logical and algorithmic thinking, which are a necessity of the 21st-century information age (Olkun & Toluk Uçar, 2014). In addition to all these statements, the study has certain limitations. The most important limitation of the study is that the obtained data consist of the learning outcomes in mathematics and science curricula. Another limitation is that the evaluation framework used in the study covers the TIMSS-2019 cognitive domains.

Suggestions

In the study, the learning outcome expressions in middle school mathematics and science curricula were examined according to the TIMSS-2019 evaluation frameworks. Similarly, primary and middle education programs can be handled according to the cognitive domains within the framework of TIMSS2019 evaluation and comparisons can be made. Not only mathematics and science curricula but also the learning outcomes of curricula at all levels of education can be analyzed according to this framework. Qualitative and quantitative studies can be conducted not only on the axis of curricula but also on the basis of teachers, students and textbooks and evaluations

can be made according to cognitive domains. In addition, a contribution can be made to the relevant literature by comparing it with the results of this study. The quality of the learning outcomes in the curricula directly affects both the success of students in international exams and their metacognitive competencies. Therefore, the learning outcomes need to be updated to include more metacognitive skills. Utilizing the evaluation frameworks of international evaluation institutions (TIMSS, PISA, etc.) in the preparation of curriculum learning outcomes can open the door to both the development of an innovative understanding and the achievement of better results in exams. The target learning outcomes in the curricula of the countries that are successful in the TIMSS exam can be examined according to the cognitive domains of TIMSS and comparisons can be made with our curriculum.

Statements of Publication Ethics

Since the data of the study is not in the data group that requires ethical committee approval, it does not require ethics committee approval. The article has been prepared in accordance with research and publication ethics.

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Author 1	☒	☒	☒	☒	☒	☒
Author2	☒	☒	☒	☒	☒	☒

Conflict of Interest

There is no conflict of interest in the study.

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Analysis of Middle School Mathematics Applications Textbook Activities Based on Model-Eliciting Principles

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Abstract

Model-eliciting activities (MEA) represent a distinct form of problem-solving exercises that deviate from conventional problem-solving approaches. They encompass complex real-life scenarios characterized by multiple feasible solutions, demanding non-routine thinking with open-ended possibilities. Lesh and Doerr (2003) posit that MEA conform to specific principles, encompassing model construction, reality, self-evaluation, model externalization (construct certification), model generalization, and effective prototype principles. This study examines the compatibility of tasks in Turkey's middle school mathematics applications textbooks (grades 5-8) with the principles of model-eliciting activities (MEA). The analysis focuses on five principles: reality, model construction, self-evaluation, model documentation, and model generalization. The findings reveal varying degrees of compatibility across different grades. The reality and model generalization principles show more robust compatibility, while the model construction and model documentation principles have mixed levels of compatibility. The self-evaluation principle demonstrates varied compatibility. The study highlights strengths and areas for improvement in the tasks' alignment with MEA principles and emphasizes the importance of real-life relevance and model application. Suggestions are made to enhance explicit guidance in model construction and documentation. The study provides implications for curriculum design, teacher professional development, instructional strategies, student engagement, assessment practices, and future research in mathematics education. However, limitations, such as the absence of student perspectives and contextual factors, should be considered when interpreting the findings.

Keywords: Middle school, Mathematical modeling, Model-eliciting activities, Modelling principles, Textbook

Ortaokul Matematik Uygulamaları Ders Kitabı Etkinliklerinin Model Oluşturma Prensiplerine Dayalı Analizi

Öz

Model-oluşturma etkinlikleri (MOE), geleneksel problem çözme yaklaşımlarından farklı olan özel bir problem çözme yöntemini temsil eder. Bu etkinlikler çoğunlukla birden fazla doğru çözüme sahip karmaşık gerçek hayat problemlerini kapsar. Model-oluşturma etkinlikleri açık uçlu ve rutin olmayan problemlerdir. Lesh ve Doerr (2003), MOE'nin gerçeklik, model oluşturma, öz-değerlendirme, model dokümantasyon (model belgelendirme), model genelleme ve etkili prototip prensiplerine uygun olması gerektiğini belirtmektedir. Bu çalışma, Türkiye'deki ortaokul matematik uygulamaları ders kitaplarında (5-8. Sınıfla) yer alan etkinlilikleri model-oluşturma prensipleriyle uyumluluğunu incelemektedir. Etkinliklerin analizi, gerçeklik, model oluşturma, öz-değerlendirme, model dokümantasyon ve model genelleme olmak üzere beş prensibe odaklanmaktadır. Bulgular, farklı sınıf seviyelerinde model oluşturma prensipleri ile farklı derecelerde uyumluluk ortaya koymuştur. Etkinliklerde gerçeklik ve model genelleme prensipleri daha güçlü bir uyumluluk gösterirken, model oluşturma ve model dokümantasyon prensipleri zayıf uyumluluk düzeylerine sahiptir. Öz-değerlendirme prensibi çeşitli uyumluluk dereceleri göstermektedir. Bu çalışma, matematik uygulamaları ders kitaplarındaki etkinliklerin model oluşturma prensipleriyle uyumunda güçlü yönleri ve iyileştirmeye açık alanlarını vurgulamakta ve etkinliklerin gerçek hayatla ve model uygulaması ile ilişkili olmasının önemini vurgulamaktadır. Etkinliklerin model oluşturma ve dokümantasyon prensiplerine göre geliştirilmesi gerektiği ve bunun için öneriler sunulmaktadır. Bu çalışma, müfredat geliştirme, öğretmen gelişimi, öğretim stratejileri, öğrenci katılımı, değerlendirme uygulamaları ve gelecek araştırmalar için çıkarımlar ve öneriler sunmaktadır. Ancak bulguların yorumlanması sırasında, öğrenci perspektiflerinin ve bağlamsal faktörlerin eksikliği gibi sınırlamalar dikkate alınmalıdır.

Anahtar Sözcükler: Ders kitapları, Matematiksel modelleme, Model oluşturma etkinlikleri, Modelleme prensipleri, Ortaokul

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INTRODUCTION

The investigation of the teaching and learning of mathematical modeling holds considerable significance within mathematics education research (Borromeo Ferri, 2017; Niss & Blum, 2020). However, using mathematical modeling activities in educational settings and examining their compatibility still need to be expanded (Frejd, 2012).

Mathematical modeling activities aim to establish meaningful connections between mathematical concepts and real-world scenarios (Lesh, Doerr, Carmona, & Hjalmarson, 2003). Within the field of mathematics education, the overarching objective is to equip students with the capacity to effectively employ their mathematical knowledge, skills, and abilities in order to address problems that arise within authentic contexts (Blum & Leiß, 2007).

Mathematical modeling serves as a pivotal approach in forging a bridge between real-life problems and the realm of mathematics. It entails the translation of real-world phenomena into mathematical representations (Bukova Güzel, 2016). Numerous countries participating in international comparative assessments, such as the Programme for International Student Assessment and the Third International Mathematics and Science Study, endeavor to evaluate students' aptitude for applying mathematical principles to authentic situations and successfully resolving related problems. The outcomes of these evaluations have prompted participating nations to undertake substantial modifications within their educational systems and curricular frameworks (English, 2006).

Turkey is counted among those countries that have enacted significant revisions to their mathematics curricula in direct response to the findings yielded by these assessments. In response to its low ranking in education, Turkey has undertaken measures to address this issue by implementing reforms within the mathematics education system. The revised curriculum recognizes the need for more than relying solely on rote memorization to develop strong mathematical abilities, encompassing mathematical interconnections, the practical application of concepts, and effective problem-solving (Ministry of National Education [MoNE], 2018a). Consequently, thoughtfully crafted activities incorporating textbooks and multimedia resources are introduced, explicitly focusing on fostering authentic problem-solving and modeling experiences that cater to students' levels and interests (MoNE, 2018b). Notably, the curriculum for the Mathematics Applications course in middle grades adopts a student-centered approach that places significant emphasis on conceptual understanding. Within this course, the modeling approach is embraced, highlighting the practical application of mathematics in everyday life contexts.

This study examined the mathematics textbooks for the Mathematics Applications course prepared by the Ministry of National Education for middle school (grades 5-8) within the model eliciting activities principles defined by Lesh et al. (2000).

LITERATURE REVIEW

Mathematical modeling is prominent in mathematics education, giving students opportunities to articulate their thoughts, engage in decision-making during problem-solving, and construct their own mathematical structures within real-world contexts. This iterative process enhances students' motivation to learn and nurtures their logical and spatial reasoning abilities (Korkmaz, 2010).

Mathematical modeling entails translating real-life situations into mathematical solutions and using mathematical models. Its integration into the pedagogical process is indispensable, as the National Council of Teachers of Mathematics (NCTM, 2000) and the Ministry of National Education (MoNE, 2018a) underscored. Careful planning is imperative to ensure the effective implementation of mathematical modeling, involving the creation and resolution of modeling activities to enhance instructional efficacy. Consequently, mathematical modeling should be viewed as an enduring experience throughout mathematics education (Bracke & Geiger, 2011).

Since 2013, mathematical modeling has been incorporated into the mathematics education programs in Turkey, prioritizing the cultivation of logical and spatial reasoning skills and employing formulas, models, tables, plots, and graphs to articulate mathematical concepts (MoNE, 2018b). Through the medium of mathematical modeling, students acquire a profound comprehension of mathematics, apply logical and analytical thinking to real-life situations, and develop a positive disposition toward the subject (Blum & Borromeo Ferri, 2009; Galbraith, 2007; Gould, 2013; Suh et al., 2017).

Textbooks serve as indispensable instruments for bridging the gap between educational program content and classroom environments. They facilitate the dissemination of curriculum-based knowledge to students and

guide educators in the instructional process (Thompson, 2014; Stylianides, 2014). Consequently, well-designed textbooks that align with the curriculum are expected to offer comprehensive and accurate lesson content (Altun, Arslan, & Yazgan, 2004). Modeling activities embedded within textbooks provide valuable insights into classroom practices associated with mathematical modeling.

Given the pivotal role of textbooks in facilitating the integration of mathematical modeling into instructional settings, it is imperative to investigate how the emphasis on mathematical modeling in the curriculum is reflected in these educational resources. While mathematical modeling encompasses diverse interpretations within the curriculum, textbooks may also present modeling in various formats (Alacacı, 2015).

Mathematical modeling presents a distinct perspective compared to conventional problem-solving approaches (Lesh & Doerr, 2003). Traditional problems typically present prepackaged data and often possess a single solution method. However, real-life situations seldom conform to such straightforward scenarios. In modeling activities, students are challenged to independently comprehend the given problem, establish relationships between mathematical concepts and operations, and generate reusable, shareable, and debatable models as problem solutions. These characteristics differentiate mathematical modeling problems from conventional problems, thereby furnishing students with diverse perspectives (Niss, Blum, & Galbraith, 2007; Lesh & Harel, 2003; Mousoulides, Christou, & Sriraman, 2008; Stillmann, 2019).

Traditional problem-solving approaches typically involve interpreting symbolically expressed questions to extract meaning. In contrast, modeling activities adopt a distinct process whereby students mathematize meaningful real-life situations by creating symbolic representations (Lesh et al., 2000).

Modeling activities can be characterized as collaborative endeavors that facilitate the logical representation of real-life situations, enabling students to generate and refine their own mathematical structures, and develop modeling competencies and creativity (Kaiser & Sriraman, 2006; Lu & Kaiser, 2022). Unlike traditional mathematics education, these activities do not rely on specific formulas for problem-solving. Instead, students construct mathematical models tailored to real-life situations, extending beyond the confines of traditional mathematical concepts (Chamberlin & Moon, 2005; Lesh & Zawojewski, 2007). The models developed by students are not solely utilized to solve the immediate problem but also serve as valuable tools for addressing similar problems (Lesh & Harel, 2003). Through the construction of models that apply to real-life contexts, are shareable among peers, and are reusable for future problem-solving, students engage in processes of explanation, evaluation, and revision of their mathematical thinking (Chamberlin & Moon, 2005; Doerr & O'Neill, 2011; Dominguez, 2010; Eric, 2008; Lesh et al., 2000; Lesh & Caylor, 2007; Yoon, Dreyfus, & Thomas, 2010).

In model-building activities focused on real-life problems, students assume the role of assisting individuals in decision-making. Throughout this process, they employ mathematical interpretation to make sense of the real-life situation. As students construct their models, their solutions reveal their thoughts and reasoning about the problem. Consequently, model-building activities are often characterized as "thought-revealing activities" and promote knowledge construction by students (Chamberlin & Moon, 2005; Meerwaldt, Borromeo Ferri, & Nevers, 2023).

The creation of model-building activities involves six principles that contribute to their effectiveness. These principles include the reality principle, the model construction principle, the self-assessment principle, the model documentation principle, the model generalization principle, and the effective prototype principle. These principles assist teachers in selecting and developing appropriate activities that cater to students with varying levels of achievement, including those with average or low performance (Lesh et al., 2000).

The reality principle emphasizes the importance of problem situations reflecting students' real lives, allowing them to interpret the situation based on their knowledge and experiences. Textbooks and tests often offer problems that align with this principle.

The model construction principle entails presenting problem situations that require students to construct a model for their solution. Students should recognize the need to construct, modify, expand, or simplify a model based on the given problem. They must engage in activities that involve constructing, defining, explaining, manipulating, predicting, and controlling a structurally significant system.

The self-assessment principle emphasizes students' ability to make decisions and find solutions to problem situations independently, without relying on teacher support. Students should be able to evaluate the sufficiency of their solutions. Throughout each modeling cycle, students should assess whether existing solutions require revision, determine the appropriate direction, and select the most practical alternative solution for a specific purpose.

The model documentation principle necessitates that the problem situation contains expressions that prompt students to explain their solution process to others (such as an advisor or customer) comprehensibly. The problem should require students to articulate their thoughts about the problem situation, including goals, potential solution approaches, and more. This principle is crucial as it supports learning and documenting while facilitating self-assessment and metacognitive reflection.

The model generalization principle stipulates that the problem situation should guide students in creating a generalizable model. The conceptual model developed should apply to other situations with specific modifications. However, textbooks and test problems often provide models or tools for traditional problems, with students being directed to produce and apply single solution paths. Even applied problems that incorporate real-life situations frequently demand only specific answers, limiting opportunities for model generation.

The effective prototype principle states that the model employed to solve the problem situation should be memorable to students, allowing them to recall it even after a significant period of time.

In conjunction with using models, model-eliciting activities enable students to apply their acquired knowledge and imbue the topic with personal meaning by transforming real-life situations into mathematical ones (Yoon, Dreyfus, & Thomas, 2010). Consequently, model-eliciting activities enhance students' learning and play a crucial role in teachers' effective instructional planning and communication with students (Lesh et al., 2000; Mousoulides, Christou, & Sriraman, 2008). Given their significance, model-eliciting activities are essential for effective mathematics instruction (Borromeo Ferri, 2017).

The Significance of the Study

Existing research has acknowledged the incorporation of mathematical modeling within mathematics education programs (Güç, 2015; Bukova-Güzel, Tekin-Dede, Hıdıroğlu, Kula-Ünver & Özaltun-Çelik, 2016). However, there is a notable gap in the literature concerning comprehensive examinations of mathematics textbooks from the perspective of mathematical modeling. Consequently, conducting a study in this area presents an opportunity to contribute significantly to the existing body of knowledge. The primary objective of this study is to evaluate the extent to which middle school mathematics textbooks, aligned with the mathematics applications course curriculum currently implemented, integrate mathematical modeling. Additionally, the study aims to assess the degree of alignment between the modeling activities included in the textbooks and the principles of model creation. The anticipated outcomes of this investigation hold substantial value for curriculum developers, program designers, researchers, and teachers.

By considering the outcomes and insights related to mathematical modeling highlighted in the curriculum, curriculum designers and program developers can enhance the inclusion of detailed explanations pertaining to mathematical modeling. Similarly, curriculum developers have the opportunity to make appropriate modifications to the course content and textbooks, specifically with regard to mathematical modeling. This process may entail reevaluating the understanding of modeling and incorporating necessary revisions. Ultimately, the findings obtained from this study possess the potential to provide valuable guidance to these educational stakeholders, enabling them to enhance the integration of mathematical modeling within the domain of mathematics education.

The Aim of the Study

The primary objective of this study was to investigate the model-eliciting activities incorporated within the mathematics applications textbooks designed for middle school students (grades 5-8) by the Ministry of National Education, with the specific intention of enhancing mathematical modeling skills. These activities were examined according to the model-eliciting principles defined by Lesh et al. (2000).

The study addressed the following research questions:

1. What is the level of compatibility between the problems presented in the middle school mathematics applications textbook and the principles underlying model-eliciting activities?

2. How does the degree of compatibility between the problems and the principles of model-eliciting activities vary across the grade levels of 5th to 8th?

By investigating these research questions, the study aimed to provide valuable insights into the extent to which the model-eliciting activities in mathematics applications textbooks align with the model-eliciting principles. Additionally, the study aimed to shed light on any variations in the level of compatibility across different grade levels within the middle school context

METHOD

Research Design

This study employed the qualitative research method of document analysis to systematically scrutinize and assess the content of written documents (Wach, 2013). Document analysis is a systematic and rigorous approach that facilitates the comprehensive evaluation and examination of various types of documents, irrespective of their format as printed or electronic materials. The primary objective of document analysis is to develop a profound understanding, derive meaningful interpretations, and generate valuable knowledge pertaining to the specific research topic under investigation (Corbin & Strauss, 2008).

Documents encompass a wide array of recorded texts and images without the researcher's intervention. They serve as invaluable data sources for researchers and encompass diverse materials such as advertisements, agendas, notes, books, brochures, maps, tables, newspapers, artworks, survey data, radio-TV program scenarios, and other relevant sources (Labuschagne, 2003). By meticulously examining and interpreting these documents, researchers can glean insightful perspectives and obtain pertinent information that aligns with their research objectives.

Data Collection

The data for this research were collected from the textbooks used in the elective course "Mathematical Applications" taught in middle schools (MoNE, 2018b). This course aims to provide students with opportunities to practice math applications suitable for their grade level, enhance their mathematical knowledge and skills, foster a love for mathematics, and develop a positive attitude toward the subject. Five textbooks were examined as part of this study, namely: "5th Grade 1st Semester Mathematical Applications" and "5th Grade Mathematical Applications" for 5th graders, "6th Grade Mathematical Applications" for 6th graders, "7th Grade Mathematical Applications" for 7th graders, and "8th Grade Mathematical Applications" for 8th graders. As the 5th-grade curriculum comprises two semesters, both textbooks were considered. However, only one textbook per grade level was analyzed for the 6th, 7th, and 8th grades.

Each problem in the textbooks was assigned a unique code indicating the grade level and its order of appearance in the book. For example, the code "6.P.3" represents the third problem in the "6th Grade Mathematical Applications" textbook, while "5.1.P.2" corresponds to the second problem in the "5th Grade 1st Semester Mathematical Applications" textbook. Problems that appeared in both the "5th Grade 1st Semester Mathematical Applications" and "5th Grade Mathematical Applications" textbooks were excluded from the study. The codes for these repeated problems were as follows: 5.P.3, 5.P.4, 5.P.5, 5.P.6, 5.P.7, 5.P.8, 5.P.10, 5.P.12, 5.P.13, 5.P.14, 5.P.15, and 5.P.16, totaling 12 problems that were not examined. Additionally, the problem coded as "5.P.27" in the "5th Grade Mathematical Applications" textbook was excluded as it did not meet the study's criteria, describing only a game and its rules. Hence, 13 problems from the "5th Grade Mathematical Applications" textbook were not included. In total, there were 21 problems examined in the "5th Grade 1st Semester Mathematical Applications" textbook, 23 remaining problems after excluding the 13 problems from the "5th Grade Mathematical Applications" textbook, 32 problems in the "6th Grade Mathematical Applications" textbook, 41 problems in the "7th Grade Mathematical Applications" textbook, and 40 problems in the "8th Grade Mathematical Applications" textbook. Consequently, a total of 157 problems were analyzed in this study.

Data Analysis

This research analyzed problems within the framework of Lesh et al.'s (2000) model-eliciting principles. The focus of the investigation was to assess the alignment of the problems with five specific principles: the reality principle, the model construction principle, the self-assessment principle, the model documentation principle, and the model generalization principle. The effective prototype principle was excluded from evaluation due to the requirement for a sufficient time interval for assessment (Dost, 2019; Urhan & Dost, 2018).

The evaluation process employed three distinct categories to determine the compatibility of the problems: "compatible," "partially compatible," and "incompatible." However, for the principles of reality and model generalization, no "partially compatible" category was used, and the evaluation was based solely on the criteria of "compatible" or "incompatible."

Concerning the reality principle, a problem was deemed compatible if it involved a situation that students were likely to encounter daily. Conversely, it was considered incompatible if the problem did not reflect real-life scenarios (Dost, 2019).

Regarding the model construction principle, a problem was considered compatible if students were explicitly instructed to create a coherent model related to the given problem situation, such as by formulating an

equation or constructing a mathematical expression. Problems that indirectly required students to develop a model or provided a given model for problem-solving were categorized as partially compatible. Problems falling outside of these criteria were regarded as incompatible with the principle of model building (Dost, 2019).

For the self-assessment principle, a problem was considered compliant if it included instructions for students to engage in group discussions, explain their solution approaches, evaluate their own reasoning, and review the accuracy of their solutions without relying on teacher support. If no instructions or similar support were provided, a problem was categorized as partially compliant if the data provided was clear and adequate for finding a solution and the problem situation was appropriate for the student's level. Problems failing to meet any of these criteria were deemed non-compliant with the principle of self-assessment (Dost, 2019).

The model documentation principle was assessed based on whether problems contained instructions for students to explain their models in detail to others, such as friends or customers. Problems requiring students to express their ideas and explanations without mandating formal documentation were partially compliant. Problems that did not prompt students to explain their ideas or share their models with an institution, individual, or group were classified as non-compliant with the principle of model documentation (Dost, 2019).

Regarding the model generalization principle, a problem was considered compliant if the model established to solve a specific problem could be applied to different criteria or individuals. In such cases, the solution obtained could be utilized by others facing similar situations. Model-eliciting activities inherently adhere to this principle, as the models created during the problem-solving process should apply to comparable problem situations. Problems failing to meet these criteria were deemed non-compliant with the principle of model generalization (Dost, 2019).

The second author conducted the coding procedure and subsequently shared the data and coding criteria with the first author. Following this, the researchers compared their respective codes and found a high level of agreement, reaching 92%. The researchers thoroughly reviewed instances where divergent coding was identified, with careful consideration of the coding criteria. Through a process of negotiation, consensus was achieved. Any inconsistencies or discrepancies identified in the coding were resolved.

Research Ethics

In the present study, publicly accessible mathematics applications textbooks for grades 5 to 8 were examined concerning the principles of model-eliciting activities. As such, the nature of this study did not necessitate approval from an ethics committee.

FINDINGS

This section presents the findings of the compatibility of the tasks in Turkey's middle school mathematics applications textbook for grades 5-8 with the principles of model-eliciting activities (MoNE, 2018b).

Table 1 shows the number of tasks in the 8th-grade mathematics applications textbook and their compatibility with the model-eliciting principles.

Table 1. Principle-based Evaluation of Tasks in 8th Grade Mathematics Applications Textbook

Principles	Fully Compatible	Partially Compatible	Incompatible
Reality	8.P.1, 8.P.2, 8.P.3, 8.P.4, 8.P.6–8.P.22, 8.P.24–8.P.40		8.P.5, 8.P.23
Model Construction	8.P.5, 8.P.16, 8.P.17, 8.P.19, 8.P.23, 8.P.25, 8.P.40	8.P.1, 8.P.2, 8.P.3, 8.P.4, 8.P.6– 8.P.15, 8.P.18, 8.P.20, 8.P.21, 8.P.22, 8.P.24, 8.P.26–8.P.35, 8.P.37, 8.P.38, 8.P.39	8.P.36
Self-Evaluation	8.P.2, 8.P.3, 8.P.4, 8.P.5, 8.P.10, 8.P.15, 8.P.16, 8.P.17, 8.P.18, 8.P.20, 8.P.22–8.P.28, 8.P.30, 8.P.33, 8.P.34, 8.P.38, 8.P.39	8.P.1, 8.P.6, 8.P.7, 8.P.11, 8.P.12, 8.P.13, 8.P.14, 8.P.19, 8.P.29, 8.P.31, 8.P.32, 8.P.35, 8.P.40	8.P.9, 8.P.21, 8.P.36, 8.P.37
Model Documentation	8.P.25	8.P.1, 8.P.2, 8.P.3, 8.P.4, 8.P.5, 8.P.6, 8.P.8, 8.P.10–8.P.20, 8.P.22, 8.P.23, 8.P.24, 8.P.26, 8.P.27, 8.P.30, 8.P.33, 8.P.34, 8.P.35, 8.P.38, 8.P.39, 8.P.40	8.P.7, 8.P.9, 8.P.21, 8.P.29, 8.P.31, 8.P.32, 8.P.36, 8.P.37
Model Generalization	8.P.1–8.P.40		

Note: The symbol "–" denotes the inclusive of numbers between the specified values surrounding that symbol.

As seen in Table 1, the 8th-grade mathematics applications textbook contained 40 problems. All the problems (40 problems) were found to be fully compatible with the model generalization principles, and 38

problems were fully compatible with the reality principle. As for the model construction principle, 32 problems were found to be partially compatible. 23 problems were fully compatible with the self-evaluation principle. However, only one problem was fully compatible with the model documentation principle.

Figure 1 displays task 8.P.16, and it has been classified as fully compatible with the reality, model construction, self-evaluation, and model generalization principles and partially compatible with the model documentation principle. The scenario presented in the problem pertains to the number of words a professional printer could write per minute, which is a situation that students could encounter in their daily lives. Thus, the problem was fully compatible with the reality principle.

The students have been asked to construct a model that illustrates how the quantity of words evolves with time, with the instruction to "Write an equation that gives the number of words (W) written per minute (M). What do the numbers in the equation tell you? Explain your answer." As a result, the task has been classified as fully compatible with the model construction principle.

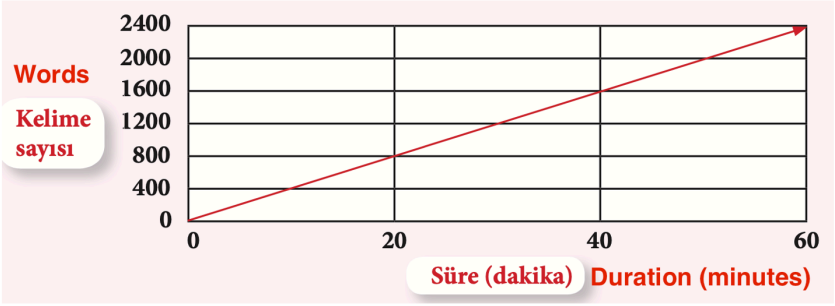
In this problem, with the statement "Determine whether the following statements are true or false. Provide evidence to support whether the statements are correct or incorrect in the context of the problem. Explain your reasoning." Students are prompted to reflect on their own concepts and techniques while solving the problem, resulting in an explicit expression of their thought processes. Since the task requires students to scrutinize their own thinking while solving it, the problem is fully compatible with the self-evaluation principle. The problem requires students to articulate their ideas while constructing the model, but it does not require them to provide documentation of their actions. As a result, the problem was categorized as partially compatible with the model documentation principle. Finally, the task was classified as fully compatible with the principle of model generalization since the model developed for the problem can be applied to different numbers of words with varying durations.

A professional printer can write 50 words per minute.

Question 1: Draw the graph of the above statement.

Question 2: Write an equation that gives the number of words (W) written per minute (M). What do the numbers in the equation tell you? Explain your answer.

Question 3: The following graph shows the number of words that Mehmet wrote for 60 minutes. Write an equation that gives the number of words written per minute according to this graph. Support your answer with mathematical reasoning.



Question 4: Determine whether the following statements are true or false. Provide evidence to support whether the statements are correct or incorrect in the problem context. Explain your reasoning.

a: A person can decide whether someone is faster or slower than Mehmet by comparing both of their graphs.
b: A person can decide whether someone is faster or slower than Mehmet by comparing both of their equations.

Figure 1. *Model Eliciting Activity 8.P.16 in 8th Grade Mathematics Applications Textbook.*

In the 7th-grade mathematics applications textbook, 41 problems existed, and they were categorized regarding their compatibility with the model-eliciting principles (Table 2). Although most of the problems (38 problems) were fully compatible with the reality principle, three were found to be incompatible with it. 12 problems were fully compatible, and 12 problems were partially compatible with the model construction principle. As for the self-evaluation principle, 29 problems were found to be fully compatible. However, 11 problems were partially compatible, and one problem was incompatible with the self-evaluation principle. Regarding the model documentation principle, 3 problems fully conformed to the principle, 29 problems partially conformed, and 9 did not conform. All the problems were fully compatible with the model generalization principle.

Table 2. Principle-based Evaluation of Tasks in 7th Grade Mathematics Applications Textbook

Principles	Fully Compatible	Partially Compatible	Incompatible
Reality	7.P.1- 7.P.12, 7.P.14-7.P.22, 7.P.24–7.P.31, 7.P.33–7.P.41		7.P.13, 7.P.23, 7.P.32
Model Construction	7.P.4, 7.P.5, 7.P.7, 7.P.8, 7.P.9, 7.P.10, 7.P.12, 7.P.16, 7.P.18, 7.P.20, 7.P.21, 7.P.22, 7.P.23, 7.P.27, 7.P.29, 7.P.30, 7.P.31, 7.P.33, 7.P.37, 7.P.41	7.P.1, 7.P.2, 7.P.3, 7.P.6, 7.P.11, 7.P.13, 7.P.14, 7.P.17, 7.P.19, 7.P.24, 7.P.25, 7.P.26, 7.P.28, 7.P.32, 7.P.34, 7.P.35, 7.P.36, 7.P.38, 7.P.39, 7.P.40	7.P.15
Self-Evaluation	7.P.1, 7.P.2, 7.P.4–7.P.12, 7.P.15, 7.P.17, 7.P.18, 7.P.21, 7.P.22, 7.P.23, 7.P.24, 7.P.25, 7.P.29, 7.P.30, 7.P.32–7.P.38, 7.P.41	7.P.3, 7.P.13, 7.P.14, 7.P.16, 7.P.19, 7.P.20, 7.P.26, 7.P.27, 7.P.28, 7.P.31, 7.P.39	7.P.40
Model Documentation	7.P.8, 7.P.19, 7.P.33	7.P.1, 7.P.2, 7.P.4, 7.P.5, 7.P.6, 7.P.7, 7.P.9, 7.P.10, 7.P.11, 7.P.12, 7.P.15, 7.P.16, 7.P.17, 7.P.18, 7.P.21, 7.P.22, 7.P.23, 7.P.24, 7.P.25, 7.P.29, 7.P.30, 7.P.32, 7.P.34, 7.P.35, 7.P.36, 7.P.37, 7.P.38, 7.P.39, 7.P.41	7.P.3, 7.P.13, 7.P.14, 7.P.20, 7.P.26, 7.P.27, 7.P.28, 7.P.31, 7.P.40
Model Generalization	7.P.1–7.P.41		

Task 7.P.13 from the 7th-grade mathematical applications textbook is illustrated in Figure 2. This problem was classified as incompatible with the reality principle because students may not face similar circumstances in their lives. In this problem, no direct expression leads students to construct a model. However, the data on the problem is clear and sufficient for a solution. Since this activity indirectly requires students to construct a model, it was categorized as partially compatible with the model construction principle. In terms of the self-evaluation principle, the data in the problem are clear and sufficient for a solution, and the problem situation is appropriate for the level of the students. As a result, the problem is partially compatible with the self-evaluation principle. The activity does not prompt or imply that students should provide a record or explanation of their solution process. Thus, it was classified as not compatible with the model documentation principle. Finally, the problem scenario in this activity involves a model that can be applied to various criteria and individuals. Therefore, the activity was classified as fully compatible with the model generalization principle.

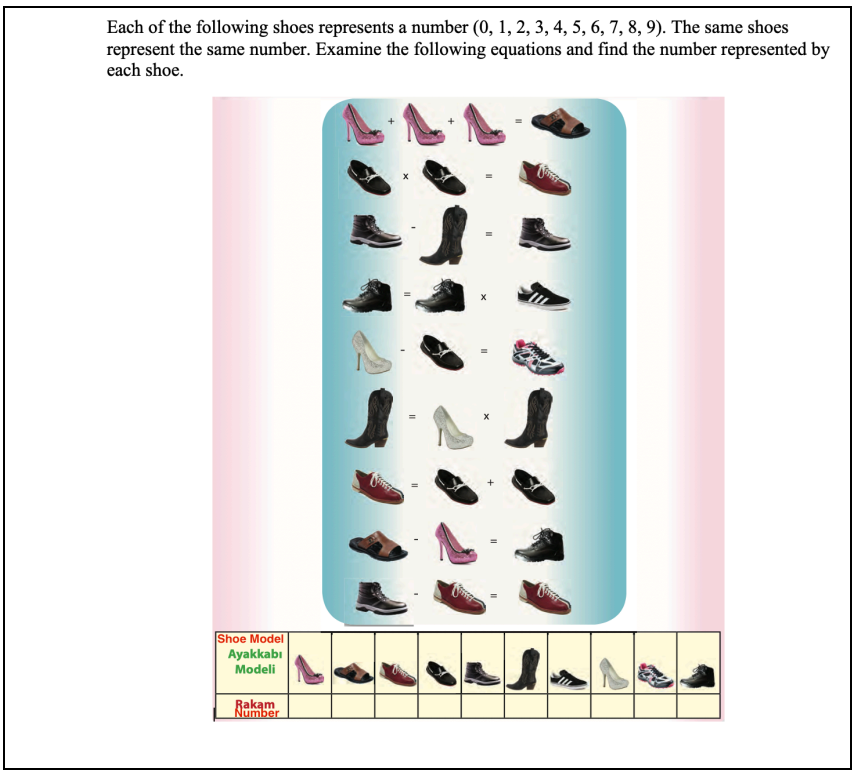


Figure 2. *Model Eliciting Activity 7.P.13 in 7th Grade Mathematics Applications Textbook.*

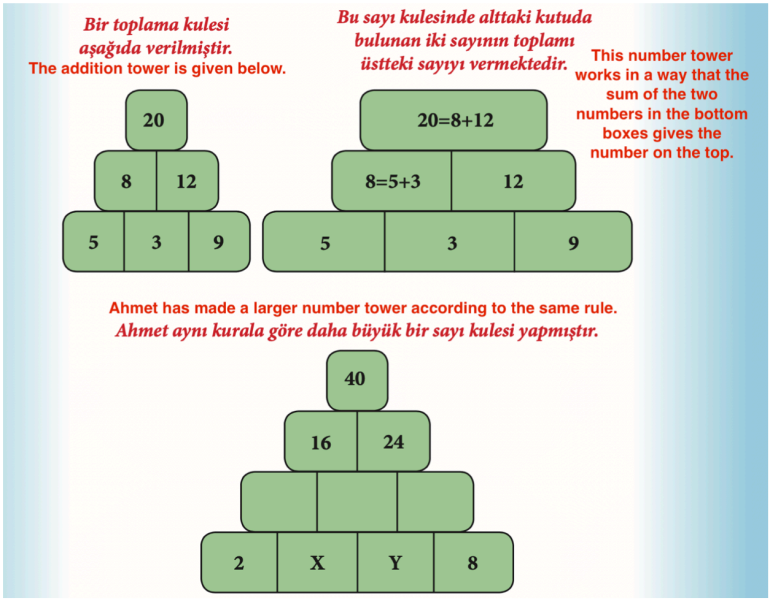
Table 3 displays the results of the compatibility analysis of the model-eliciting problems in the 6th-grade mathematics applications textbook with each principle. The table shows the problems categorized as fully, partially, or incompatible with each principle. A total of 32 problems existed in the textbook. 27 problems were fully compatible with the reality principle, even though 5 problems did not meet its requirements. 4 problems met the requirements of the model construction principle entirely, and the remaining problems only partially met the criteria. With respect to the self-evaluation principle, 22 problems met all the requirements, but 10 problems only partially complied. As for the model documentation principle, 3 problems were fully compatible, 21 problems partially conformed, and 8 failed to conform. All the problems were determined to be fully compatible with the model generalization principle.

Table 3. Principle-based Evaluation of Tasks in 6th Grade Mathematics Applications Textbook

Principles	Fully Compatible	Partially Compatible	Incompatible
Reality	6.P.1, 6.P.2, 6.P.3, 6.P.4, 6.P.5, 6.P.7–6.P.13, 6.P.15, 6.P.16, 6.P.18–6.P.24, 6.P.27–6.P.32		6.P.6, 6.P.14, 6.P.17, 6.P.25, 6.P.26
Model Construction	6.P.14, 6.P.15, 6.P.23, 6.P.32	6.P.1–6.P.13, 6.P.16–6.P.22, 6.P.24–6.P.31	
Self-Evaluation	6.P.1- 6.P.9, 6.P.12, 6.P.14, 6.P.15, 6.P.18, 6.P.20–6.P.25, 6.P.27, 6.P.30, 6.P.32	6.P.10, 6.P.11, 6.P.13, 6.P.16, 6.P.17, 6.P.19, 6.P.26, 6.P.28, 6.P.29, 6.P.31	
Model Documentation	6.P.18, 6.P.23, 6.P.32	6.P.1–6.P.9, 6.P.12, 6.P.14, 6.P.15, 6.P.17, 6.P.20, 6.P.21, 6.P.22, 6.P.24, 6.P.25, 6.P.27, 6.P.30, 6.P.31	6.P.10, 6.P.11, 6.P.13, 6.P.16, 6.P.19, 6.P.26, 6.P.28, 6.P.29
Model Generalization	6.P.1–6.P.32		

The activity depicted in Figure 3 is called 6.P.17 in the model-eliciting problems, where an addition and multiplication tower are given, and students are asked to find the empty boxes in the number towers using algebraic operations. Figure 3 represents the addition tower, how it works, and related questions. The problem was deemed incompatible with the reality principle as it does not involve a real-life situation. The problem requires students to use algebraic operations to fill in the empty boxes in the number tower, indirectly asking them to construct a model to solve the problem. Therefore, the problem was classified as partially compatible with the model construction principle. The task only mentions something about students assessing and reflecting on their problem-solving strategies with the teacher's assistance. However, the data presented in the activity are adequate and unambiguous for arriving at a solution. Thus, the problem was partially aligned with the self-evaluation principle.

The task requires students to demonstrate their understanding of whether the equations $2x+y=14$ and $x+2y=16$ are valid or not using a table. However, no specific instruction asks them to document their solution process in detail and share it with others. Therefore, the problem was partially compatible with the model documentation principle. Moreover, the number tower in the problem situation can be adjusted to represent the addition of various numbers, indicating that the solution can be utilized in comparable problem situations. Hence, the activity was categorized as fully compatible with the model generalization principle.



Question 1: Complete the empty boxes in the number tower using algebraic operations.

Question 2: After completing the number tower, use the table to show whether the equations 2x+y=14 and x+2y=16 are true or not.

Figure 3. *Model Eliciting Activity 6.P.17 in 6th Grade Mathematics Applications Textbook.*

Finally, Table 4 and Table 5 present the problems in the 5th-grade mathematics applications textbook and their compatibility with the model-eliciting principles. As indicated earlier in the methodology section, there are two textbooks for fifth-grade students, one containing 21 problems (Table 4). The other contains 36 problems (Table 5), but problem 5.P.27 was not included in the analysis since it was the same problem as a problem in the other 5th-grade textbook. The findings are provided in both tables.

Both tables show that most problems in both textbooks are fully compatible with the reality principle. Only two problems were incompatible with the reality principle in each textbook. As for the model construction principle, the problems in both textbooks were found to be either fully or partially compatible. Similarly, in one textbook, most of the problems were entirely compatible, and the rest were partially compatible with the self-evaluation principle. However, in the other 5th-grade textbook, the problems' compatibility with the self-evaluation principle was vice versa. Regarding the model documentation principle, some problems were found to be fully compatible; however, most of the problems in both textbooks were either partially compatible or incompatible. Lastly, it was concluded that all the problems were fully consistent with the model generalization principle.

Table 4. Principle-based Evaluation of Tasks in 5th Grade* Mathematics Applications Textbook

Principles	Fully Compatible	Partially Compatible	Incompatible
Reality	5.1.P.1–5.1.P.8, 5.1.P.10–5.1.P.15, 5.1.P.17–5.1.P.21		5.1.P.9, 5.1.P.16
Model Construction	5.1.P.1, 5.1.P.2, 5.1.P.3, 5.1.P.8, 5.1.P.11, 5.1.P.12, 5.1.P.13, 5.1.P.14, 5.1.P.15, 5.1.P.17	5.1.P.4, 5.1.P.5, 5.1.P.6, 5.1.P.7, 5.1.P.9, 5.1.P.10, 5.1.P.16, 5.1.P.18, 5.1.P.19, 5.1.P.20, 5.1.P.21	
Self-Evaluation	5.1.P.1, 5.1.P.2, 5.1.P.3, 5.1.P.4, 5.1.P.5, 5.1.P.8, 5.1.P.11, 5.1.P.12, 5.1.P.13, 5.1.P.15, 5.1.P.16, 5.1.P.17, 5.1.P.18, 5.1.P.20	5.1.P.6, 5.1.P.7, 5.1.P.9, 5.1.P.10, 5.1.P.14, 5.1.P.19, 5.1.P.21	
Model Documentation	5.1.P.1, 5.1.P.2, 5.1.P.3, 5.1.P.8, 5.1.P.12, 5.1.P.18, 5.1.P.20	5.1.P.4, 5.1.P.5, 5.1.P.11, 5.1.P.13, 5.1.P.15, 5.1.P.16, 5.1.P.17	5.1.P.6, 5.1.P.7, 5.1.P.9, 5.1.P.10, 5.1.P.14, 5.1.P.19, 5.1.P.21
Model Generalization	5.1.P.1–5.1.P.21		

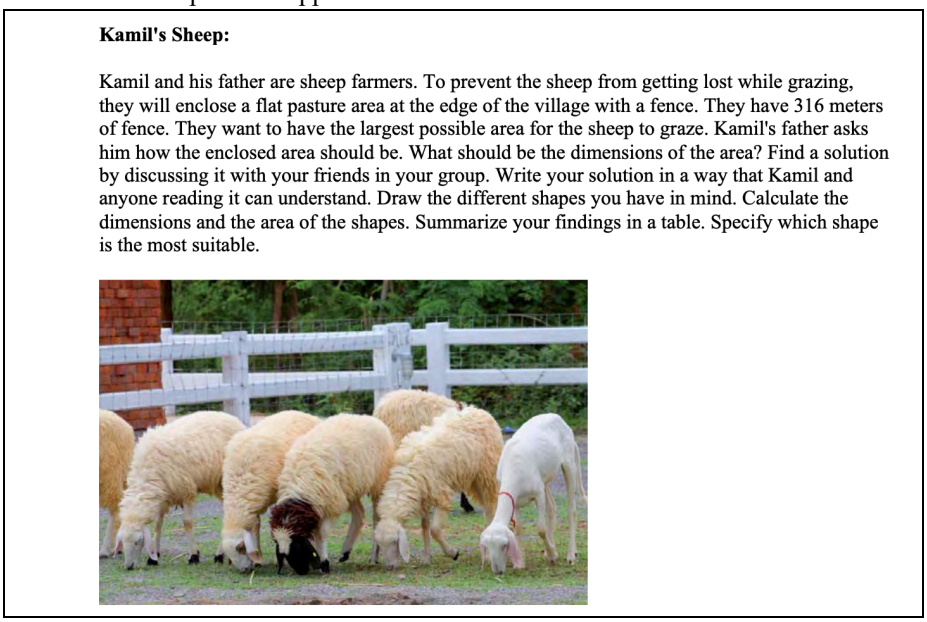
Table 5. Principle-based Evaluation of Tasks in 5th Grade Mathematics Applications Textbook

Principles	Fully Compatible	Partially Compatible	Incompatible
Reality	5.P.1, 5.P.9, 5.P.11, 5.P.17, 5.P.18, 5.P.19, 5.P.21–5.P.36*		5.P.2, 5.P.20
Model Construction	5.P.9, 5.P.17, 5.P.18, 5.P.21, 5.P.29, 5.P.33, 5.P.34	5.P.1, 5.P.2, 5.P.11, 5.P.19, 5.P.20, 5.P.22–5.P.28*, 5.P.30, 5.P.31, 5.P.32, 5.P.35, 5.P.36	
Self-Evaluation	5.P.9, 5.P.17, 5.P.18, 5.P.28, 5.P.36	5.P.1, 5.P.2, 5.P.11, 5.P.19–5.P.26, 5.P.29–5.P.35	
Model Documentation	5.P.9, 5.P.18	5.P.17, 5.P.28, 5.P.36	5.P.1, 5.P.2, 5.P.11, 5.P.19–5.P.26, 5.P.29–5.P.35
Model Generalization	5.P.1, 5.P.2, 5.P.9, 5.P.11, 5.P.17–5.P.36*		

*5.P.27 was not included in the analysis

Figure 4 shows 5.P.9 in the 5th Grade Mathematics Applications Textbook. When Figure 4 is examined, it is understood that this problem aims to help students discover that shapes with the same perimeter can have different areas. The problem was classified as fully compatible with the reality principle because the situation examined in the activity is likely to happen in real life. The problem requires students to determine the maximum area possible for a specified perimeter and explicitly instructs them to develop a model demonstrating the area's dimensions. Because this requirement is clearly stated, the activity was classified as entirely consistent with the model construction principle.

The activity has a statement that directly asks students to evaluate their own thoughts during the solution process by discussing them with their friends in their group. Due to this explicit expectation, the activity was classified as fully aligned with the self-evaluation principle. As for the model documentation principle, the statement "Write your solution in a way that Kamil and anyone reading it can understand" mandates that students elucidate the principle. Thus, the problem was classified as partially consistent with the model documentation principle. The activity was categorized as fully compatible with the model generalization principle because the model can be adapted and applied to similar situations.



Kamil's Sheep:

Kamil and his father are sheep farmers. To prevent the sheep from getting lost while grazing, they will enclose a flat pasture area at the edge of the village with a fence. They have 316 meters of fence. They want to have the largest possible area for the sheep to graze. Kamil's father asks him how the enclosed area should be. What should be the dimensions of the area? Find a solution by discussing it with your friends in your group. Write your solution in a way that Kamil and anyone reading it can understand. Draw the different shapes you have in mind. Calculate the dimensions and the area of the shapes. Summarize your findings in a table. Specify which shape is the most suitable.

Figure 4. *Model Eliciting Activity 5.P.9 in 5th Grade Mathematics Applications Textbook.*

Table 6 summarizes the findings regarding how much the model-eliciting activities in the 5-8 grades mathematics applications textbook align with the principles. The table provides the total number of activities classified as fully, partially, or incompatible with each principle.

Table 6. Compatibility of Problems in 5-8 Grades Mathematics Applications Textbook with Model-eliciting Principles

Principles		Total number of activities in 5-8 grade mathematics applications textbook				
		5.1.	5.	6.	7.	8.
Reality	Fully compatible	19(%90)	21(%91)	27(%84)	38(%93)	38(%95)
	Partially compatible	–	–	–	–	–
	Incompatible	2(%10)	2(%9)	5(%16)	3(%7)	2(%5)
Model Construction	Fully compatible	10(%47)	7(%30)	4(%12.5)	21(%51)	7(%17.5)
	Partially compatible	11(%53)	16(%70)	28(%87.5)	19(%47)	32(%80)
	Incompatible	–	–	–	1(%2)	1(%2.5)
Self-Evaluation	Fully compatible	14(%67)	5(%22)	22(%69)	29(%71)	23(%57.5)
	Partially compatible	7(%33)	18(%78)	10(%31)	11(%27)	13(%32.5)
	Incompatible	–	–	–	1(%2)	4(%10)
Model Documentation	Fully compatible	7(%33)	2(%9)	3(%9)	3(%7)	1(%2.5)
	Partially compatible	7(%33)	3(%13)	21(%66)	29(%71)	31(%77.5)
	Incompatible	7(%33)	18(%78)	8(%25)	9(%22)	8(%20)
Model Generalization	Fully compatible	21(%100)	23(%100)	32(%100)	41(%100)	40(%100)
	Partially compatible	–	–	–	–	–
	Incompatible	–	–	–	–	–

According to the findings presented in Table 6, although a few problems do not conform to the reality principle at each grade level, most of the problems in the textbook are fully aligned with the reality principle. Likewise, all problems in the textbook at each grade level are found to be fully compatible with the model generalization principle. Regarding the model construction principle, most problems are partially compatible at each grade level. However, the 7th-grade textbook has the highest percentage rate regarding fully compatible problems with the model construction principle. Moreover, the model construction principle is completely compatible; however, in the 7th and 8th-grade textbooks, one problem is found to be incompatible with the principle.

As for the self-evaluation principle, most problems are partially compatible with the principle in the 5th-grade textbook. However, in 6th, 7th, and 8th-grade textbooks, the majority of the problems are fully compatible with the self-evaluation principle. In the 8th-grade textbook, four problems were found to be incompatible with the self-evaluation principle. While some problems were fully compatible with the model documentation principle at each grade level, most of the problems in each textbook were either partially or not compatible with the principle. Especially in the 5th-grade textbook, a considerable number of problems (78%) were incompatible with the model documentation principle. It can be seen from Table 7 that at each grade level, the textbook includes problems that fail to fully align with each model-eliciting principle

DISCUSSION & CONCLUSION

In this study, the tasks in Turkey's middle school mathematics applications textbooks (grades 5-8) were analyzed in terms of their compatibility with the principles of model-eliciting activities (MEA). The analysis focused on five principles: reality, model construction, self-evaluation, model documentation, and model generalization.

In the 8th-grade mathematics applications textbook, it was found that all 40 problems were fully compatible with the model generalization principle, indicating that the models developed for these problems could be applied to various scenarios. Most of the problems were also fully compatible with the reality principle, suggesting they were relevant to students' daily lives. However, only one problem was fully compatible with the model documentation principle, indicating a need for more emphasis on documenting the problem-solving process. Most activities were partially compatible with the model construction principle, indicating room for improvement in guiding students to construct explicit models. While more than half of the problems were fully compatible with the self-evaluation principle, some problems were only partially aligned, suggesting the need for more explicit prompts for reflection and reasoning.

The 7th-grade mathematics applications textbook contained 41 problems, with most problems fully compatible with reality and model generalization principles. However, three problems were found to be incompatible with the reality principle, indicating a potential lack of relevance to students' lives. While twelve problems were fully compatible with the model construction principle, several problems were only partially aligned. The self-evaluation principle was mostly fulfilled, but some problems were only partially aligned or were incompatible. Similarly, most problems partially conformed to the model documentation principle, with nine problems not conforming at all.

In the 6th-grade mathematics applications textbook, most of the 32 problems were fully compatible with the reality principle, indicating relevance to students' lives. However, five problems did not meet the requirements. Four problems fully met the requirements of the model construction principle, while the remaining problems were only partially aligned. Most problems fully met the requirements of the self-evaluation principle, but some problems were only partially compatible. The model documentation principle had limited fulfillment, with three problems fully conforming and the majority partially conforming or not conforming at all. All problems were fully compatible with the model generalization principle.

Based on the findings, it is evident that there is variability in the compatibility of the tasks in the mathematics applications textbooks with the MEA principles across different grades. Reality and model generalization principles generally showed better compatibility, indicating a stronger focus on the relevance and application of models. However, the principles of model construction and model documentation had mixed compatibility, suggesting the need for more explicit guidance and an emphasis on constructing models and documenting problem-solving processes (Lesh & Doerr, 2003; Stillman et al., 2007). The self-evaluation principle had varied compatibility, with some problems fully aligned but others only partially aligned.

The compatibility analysis revealed strengths and areas for improvement in the tasks of Turkey's middle school mathematics applications textbooks in relation to the MEA principles. The findings provide insights into the design and alignment of the tasks with these principles.

The textbooks generally demonstrated a strong emphasis on reality and model generalization principles, indicating a recognition of the importance of real-life relevance and the application of models to different scenarios (Bracke & Geiger, 2011; Lesh, Doerr, Carmona, & Hjalmarson, 2003). This highlights the positive aspects of the textbooks in providing students with opportunities to connect mathematical concepts to their everyday lives and generalize their learning (Niss, Blum, & Galbraith, 2007; Lesh & Harel, 2003; Mousoulides, Christou, & Sriraman, 2008).

However, there is room for improvement in certain areas. The model construction principle requires further attention, as most activities are only partially compatible. Providing explicit guidance and instructions for students to construct models can enhance their problem-solving abilities and promote a deeper understanding of mathematical concepts (Bukova Güzel, 2016).

The model documentation principle was the least fulfilled across all grade levels, indicating a need to enhance students' ability to articulate and document their problem-solving processes (Kaiser & Sriraman, 2006; Lesh et al., 2000). Encouraging students to explain their reasoning, provide evidence, and justify their solutions since they foster a deeper understanding of concepts, promote higher-order thinking skills and creativity, and allow individuals to apply their knowledge and skills meaningfully (Chamberlin & Moon, 2005; Korkmaz, 2010; Lu & Kaiser, 2022).

Implications

The study on the compatibility analysis of tasks in Turkey's middle school mathematics applications textbooks with the principles of model-eliciting activities (MEA) has several implications:

1. Curriculum design: The study provides insights for curriculum designers to inform the design of future mathematics textbooks and materials. Emphasizing model construction and documentation principles while focusing on reality and model generalization can enhance mathematics education.

2. Teacher professional development: Teachers can benefit from professional development opportunities to guide students in constructing models and documenting problem-solving processes. Developing teachers' knowledge and skills in these areas can promote deeper mathematical understanding.

3. Instructional strategies: Teachers can incorporate explicit guidance to help students construct models, document processes, and engage in self-evaluation, reflection, and reasoning. This enhances metacognitive skills and promotes a deeper understanding of mathematical concepts.

4. Student engagement: Incorporating real-life contexts and examples into mathematics tasks improves students' engagement by highlighting the relevance of mathematics in their everyday lives.

5. Assessment and feedback: Teachers can design assessments targeting MEA principles, assessing students' model construction, documentation, and self-evaluation skills. Providing feedback in these areas further develops problem-solving and metacognitive abilities.

6. Research opportunities: The study encourages further research in mathematics education, exploring the impact of task compatibility with MEA principles on learning outcomes, problem-solving abilities, and long-term retention of mathematical concepts.

Overall, the study has implications for curriculum design, teacher development, instructional strategies, student engagement, assessment practices, and future research in mathematics education. Addressing areas for improvement and leveraging strengths identified in the analysis can enhance mathematics instruction, promoting a more profound understanding and application of mathematical concepts.

Limitations

Limitations of the study on the compatibility analysis of tasks in Turkey's middle school mathematics applications textbooks with the principles of model-eliciting activities include:

1. Lack of student perspectives: The study primarily focuses on analyzing the tasks in the textbooks without considering students' perspectives or experiences. Student feedback and input could provide valuable insights into their engagement, understanding, and preferences regarding the tasks and their compatibility with MEA principles.

2. Lack of contextual factors: The analysis solely focuses on the tasks within the textbooks and does not consider contextual factors such as instructional practices, classroom environment, or teacher characteristics. These factors can influence the implementation and effectiveness of the tasks in promoting MEA principles.

These limitations should be considered when interpreting the study's findings and their implications for curriculum design and instructional practices.

Statements of Publication Ethics

We declare that we obey the principles of publication ethics.

Researchers' Contribution Rate

First author 60%, the second author 40%.

Conflict of Interest

This study has no conflict of interest.

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Well-being of Academics Teaching at Faculties of Education in Türkiye: A Qualitative Analysis

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Abstract

Higher levels of education and well-being are the indicators of the prosperity of nations and consequently the world. The academics that work at faculties of education are among the building blocks that contribute to the well-being of nations through the teachers they educate. The main purpose of this study is to explore the views of academics teaching at faculties of education on how their well-being is affected by their marital status, administrative duties, and professional seniority. In this qualitative phenomenological study, the data were collected through in-depth interviews. The quota sampling technique was adopted to ensure the diversity of participants and the richness of data. The participants were A total number of 20 academics teaching at 7 different faculties of education in Turkey. The data were analyzed by content analysis and findings are discussed in relation to prior research in the literature. The results of the study suggest that; for marital status, that sharing life and having support in a balanced relationship, being a parent, and motivation provided by the partner increase academics' well-being while having to spare time to family and the negative social attitude towards single individuals negatively affect it. Regarding the administrative duties, taking responsibilities, being recognized for accomplishments, socialization, feeling of achievement, widening perspective, and reaching vast sources have a positive effect on well-being while the relationships based on self-interest and spending more time to administrative duties than academic studies reduce it. As for the professional seniority, accumulation of experience and knowledge, gaining titles, and widening social networks positively affect academics' well-being while injustice, not getting tenure, and bureaucratic obstacles have a negative effect.

Keywords: Well-being, faculty of education, academics, higher education, PERMA.

Eğitim Fakültesi Akademisyenlerinin İyi Oluşları: Nitel Bir Analiz

Öz

Yüksek eğitim ve iyi oluş düzeyi, ulusların ve dolayısıyla dünya refahının göstergesidir. Eğitim fakültelerinde görev yapan akademisyenler de yetiştirdikleri öğretmenlerle milletlerin iyi oluşlarına katkı sağlayan temel yapı taşlarındandır. Bu çalışmanın temel amacı, eğitim fakültelerinde görev yapan akademisyenlerin medeni durumlarının, idari görevlerinin ve mesleki kıdemlerinin iyi oluşlarını nasıl etkilediğine ilişkin görüşlerini araştırmaktır. Bu nitel fenomenolojik çalışmada, veriler derinlemesine görüşmeler yoluyla toplanmıştır. Katılımcıların çeşitliliğini ve veri zenginliğini sağlamak için kota örnekleme tekniği benimsenmiştir. Katılımcılar Türkiye'deki 7 farklı eğitim fakültesinde görev yapan toplam 20 akademisyendir. Veriler içerik analizi ile analiz edilmiş ve bulgular literatürde daha önce yapılan araştırmalarla ilişkilendirilerek tartışılmıştır. Araştırmanın sonucunda; medeni duruma ilişkin olarak hayatı paylaşma, dengeli ve destekleyici bir ilişkiye sahip olma, ebeveyn olma ve eş tarafından sağlanan motivasyonun akademisyenlerin iyi oluşlarını artırırken, aileye zaman ayırmak zorunda kalmaları ve bekar bireylere yönelik olumsuz sosyal tutumun iyi oluşu olumsuz etkilediği sonucuna ulaşılmıştır. İdari görevlerle ilgili olarak, sorumluluk alma, başarıların takdir görmesi, sosyalleşme, başarma duygusu, dünya görüşünün gelişmesi ve geniş kaynaklara ulaşma iyi oluş üzerinde olumlu bir etkiye sahipken, kişisel çıkara dayalı ilişkiler ve idari görevlere akademik görevlerden daha fazla zaman ayırmak zorunda kalmanın iyi oluşu olumsuz etkilediği bulgularına ulaşılmıştır. Mesleki kıdemin ise, deneyim ve bilgi birikimi, unvan kazanma, sosyal ağların genişlemesi sebebiyle akademisyenlerin iyi oluşunu olumlu etkilerken, adaletsizlik, kadro alamama ve bürokratik engellerin iyi oluşu olumsuz yönde etki ettiği sonucuna ulaşılmıştır.

Anahtar kelimeler: İyi oluş, eğitim fakültesi, akademisyen, yükseköğretim, PERMA.

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INTRODUCTION

Throughout the ages, various philosophers have tried to discover the concept of happiness, and many considered happiness to be the highest good and ultimate motivation for human action (Diener, 1984). However, instead of studying how people can improve their quality of life and be happy, psychology dealt with pathologies and how to heal them for a long time. Fortunately, with the emerging of positive psychology, its focus has shifted to promoting well-being and preventing pathologies (Seligman & Csikszentmihalyi, 2000). Well-being has been increasingly regarded as not only the absence of mental disorders but also the existence of positive psychological resources. However, since it is completely subjective, there is no one definition of well-being being consented upon by the researchers (Ryan et al., 2019).

Among various research, well-being has been defined as a state where the ratio of positive emotions is higher than negative ones (Bradburn, 1969); 'the global assessment of a person's quality of life according to his own chosen criteria' (Shin & Johnson, 1978, p.478); eudemonic experiences such as positive psychological functioning, having a sense of meaning and having positive relationships with others (Ryff, 1989); hedonic experiences such as happiness, life satisfaction, and the presence of more positive affect and less negative affect (Diener, Suh, Lucas, & Smith, 1999); actualization of human potential (Waterman, 1993; Ryff & Keyes, 1995); happiness plus meaningfulness (McGregor & Little 1998); a person's considering their own life as desirable, pleasing, and worthy (Diener, 2009); subjective evaluation of one's life (Diener & Ryan, 2009) and optimal psychological functioning and experience (Ryan & Deci, 2001).

Owing to the growing body of research in the field of positive psychology, a consensus appeared among scholars that well-being is not a single simple emotion (Diener & Kesebir, 2008) but a complex and multidimensional structure that can be affected by a variety of determinants (Huppert & So, 2013). Though scholars put forward various theories and models of well-being, most of the recent research discuss either psychological or subjective well-being theories (Ryan & Deci, 2001; Diener & Ryan, 2009; Lent, 2004). Assembling preceding theories into a single multidimensional model, Ryff (1989) introduced a six-dimensional (self-acceptance, personal growth, purpose in life, positive relations, environmental mastery, and autonomy) psychological well-being model as Diener et al. (1999) suggested a subjective well-being model consisting of three-dimensions (pleasant [positive] affect, unpleasant [negative] affect and life satisfaction).

Instead of comparing the two leading models of well-being, Seligman (2011) argues that his PERMA model of well-being integrates components of the prior theories. The PERMA acronym stands for the five dimensions of Seligman's (2011) multidimensional theory of well-being – positive emotions, engagement, (positive) relationships, meaning, and accomplishment. In the PERMA model of well-being, positive emotions refer to emotions like happiness, joy, enthusiasm, and contentedness. Engagement signifies being completely focused on an activity and losing the track of time, devoting oneself to an act or organization, or feeling engaged and absorbed in life. Positive relationships suggest having social and close interpersonal relationships, feeling accepted and cared for, and supported by others. Meaning refers to one's feeling that their life is valuable, having a purpose in life, and serving and feeling connected to something greater than oneself. Accomplishment refers to having goals, being ambitious, making progress, achieving, and experiencing mastery. As Seligman (2011) argues, although they contribute to overall well-being, each PERMA dimension is independent, and one pursues every one of them for their own sake. Contributing to Seligman's (2011) statement that each dimension can be defined and measured separately, Butler and Kern (2016) found that all dimensions of PERMA strongly relate to other indicators of well-being.

Predictors of well-being have been a major concern of the researchers and well-being has been extensively studied in relation to demographic factors. Research has shown that age (Diener & Ryan, 2009; Horley & Lavery, 1994; Mroczek & Spiro, 2005) and gender (Batz & Tay, 2017 ; Diener & Ryan, 2009; Fujita, Diener, & Sandvik, 1991) are not strong predictors of well-being while there is a positive link between marriage and well-being (Ben-Zur, 2012; Helliwell, Barrington-Leigh, Huang, & Harris, 2009; Shapiro & Keyes, 2008; Waite & Gallagher, 2000) as in the case with income and well-being (Diener, 1984; Easterlin, 1974). Additionally, studies suggest that employment is a predictor of well-being as unemployment affects it negatively (Clark, 2009; Diener & Ryan, 2009).

Diener (2009) suggested that there is no need in the literature for simple studies that investigate if the well-being of married people is higher than unmarried, but there is a need for more in-depth studies to understand the factors that affect the relationship between marital status and well-being. Since Diener's remark (2009), the well-being literature has grown enormously. However, besides some systematic reviews by the pioneers of the field

(De Neve, Diener, Tay, & Xuereb, 2013; Diener et al., 2018), the main methods of research are still quantitative including meta-analyses (Bücker, Nuraydin, Simonsmeier, Schneider, & Luhmann, 2018; Bowling, Eschleman, & Wang, 2010; Fischer & Boer, 2011; Klug & Maier, 2014; Luhmann, Hofman, Eid, & Lucas, 2012; Sánchez-Álvarez, Extremera, & Fernández-Berrocal, 2016; Yu, Levesque-Bristol, & Maeda 2018), developing measures (Seder & Oishi, 2012; Diener, Inglehart, & Tay; Deaton & Stone, 2016; Kern, Waters, Adler, & White, 2015; Benjamin, Cooper, Heffetz, & Kimball, 2017; Frey & Stutzer, 2012; Kern, Benson, Steinberg, & Steinberg), longitudinal studies (Steptoe & Wardle, 2011; De Neve & Oswald, 2012) and cross-cultural studies (Galinha, Garcia-Martin, Oishi, Wirtz, & Esteves, 2016; Diener, Helliwell, & Kahneman, 2010; Graham & Pouzelo, 2017; Church et al., 2013; Oishi, Graham, Kesebir, & Galinha, 2013).

Recently, the current well-being of people, the factors affecting well-being, and steps to take for future well-being has become a concern of many countries and institutions. It has been proved that the gross domestic product (GDP) is not the sole approximation of the prosperity of nations, and it needs to be complemented by assessing well-being (Seligman, 2011). In their longitudinal study, Fowler and Christakis (2008) have found that well-being is contagious as it spreads to neighbors, family, and friends in the social network of a person. Since high levels of well-being affect not only the person but also the community (Diener & Ryan, 2009), many countries and policymakers have started studying well-being to assess the public well-being to take necessary actions to prosper. In the US, the Centers for Disease Control and Prevention [CDC] has been conducting the Health-Related Quality of Life Program since 2007 to integrate well-being into health promotion. In the UK, Office for National Statistics [ONS] developed the Measuring National Well-being Programme [MNW] in 2010 to help people understand and monitor the well-being, and it has been measuring the well-being of the nation and publishing reports since then. In 2010, Organization for Economic Cooperation and Development [OECD] introduced OECD Better Life Index that compares well-being across countries based on eleven topics - including subjective well-being - while OECD's Programme for International Student Assessment [PISA] has been examining student well-being since 2015.

According to Ryan and Deci (2001), the well-being of a person affects those around them and develops a sense of collective well-being. As the well-being of an individual is a vital indicator of the well-being of the society, to improve and to help people to fulfill their potential (Diener, Oishi, & Tay, 2018), the well-being of the professions that has an undeniable influence over the public becomes more of an issue in well-being studies. Bearing the contagious and collective characteristic of well-being in mind (Ryan & Deci, 2001; Fowler & Christakis, 2009), it can be presumed that educators are important contributors to public well-being. As such, academics with high levels of well-being are likely to be effective teachers with competence in scholarship, pedagogical knowledge, skills, classroom leadership, and management (Walker & Hale, 1999; McCallum, 2008). It can be inferred that the academics who work at faculties of education set future educators a perfect example by fostering the well-being of their nation through the teachers they educate.

It has been reviewed that the studies concerning the well-being of academics are limited to studies such as work-related well-being (Kinman, Jones, & Kinman, 2006; Williams, Thomas, & Smith, 2017), the well-being and work-family conflict (Winefield, Boyd, & Winefield, 2014), well-being and work-related need satisfaction (Dogan &, Eryilmaz 2016), and predictors of research assistants' well-being (Koç & Keklik, 2020). To provide a more comprehensive and in-depth study of academics' well-being, this study aims to explore the views of academics on how their marital status, administrative duties, and professional seniority affect their well-being. This study is expected to contribute to the quality of teacher education by shedding light on the factors affecting the well-being of academics teaching at faculties of education. It will also provide the policymakers with more scientific data as the number of well-being research conducted with academics is limited in the literature. Also, the present research is believed to go beyond previous efforts by investigating the well-being of academics thoroughly and putting forward academics' views and experiences as well as providing valuable insight into the well-being literature.

To explore how the marital status, administrative duties, and the professional seniority affect academics' wellbeing, the following research questions were investigated in the research:

According to academics,

1. How does marital status affect positive emotions, engagement, relationships, meaning, and accomplishment dimensions of well-being?
2. How do administrative duties affect positive emotions, engagement, relationships, meaning, and accomplishment dimensions of well-being?

3. How does professional seniority affect positive emotions, engagement, relationships, meaning, and accomplishment dimensions of well-being?

METHOD

Research Design

In this study, the researchers utilized phenomenological qualitative research by conducting semi-structured in-depth interviews to explore the views and experiences of academics working at faculties of education on their well-being. Qualitative research aims to interpret phenomena in their natural setting by investigating peoples' understanding of them (Denzin & Lincoln, 2005) as phenomenology is the study of the phenomena that we are aware of but not thoroughly and deeply understand (Neubauer, Witkop, & Varpio, 2019). According to Creswell (2013), phenomenology is not just a descriptive process but also an interpretive method that is used to bring down individual experiences about a phenomenon into global statements. In phenomenological studies, researchers explain the phenomenon first, then they gather data from people who have experienced the phenomenon, and at last, they put forward a holistic description that comprises the essence of every experience (Creswell, 2013). The phenomenon in this study is the well-being of academics who work at faculties education. To gather in-depth information about the experiences and views of participants of the phenomena (Christensen, Johnson, & Turner, 2015) and to acquire a comprehensive understanding of the well-being of academics, semi-structured interviews were conducted in this research.

Participants of the Study

To make collecting information-rich data and analysis possible from a group of cases, Patton (2015) offers group characteristics sampling strategies. In this study, quota sampling – one of the group sampling strategies – was adopted. In quota sampling, a predetermined number of cases are selected to represent important categories of cases in a larger population and researchers make sure that certain categories are included regardless of their size and distribution in the population. Thus, in this study, for each academic title, four academics were chosen to ensure the representativeness and diversity of participants and to be able provide the richness of the data collected. The participants were twenty voluntary academics from faculties of education of seven different universities in four cities. The demographics of the participants are presented in Table 1.

Table 1. Demographics of Participants

Demographics		N	%
Marital Status	Single	6	30
	Married	14	70
Administrative Duty	Yes	9	45
	No	11	55
Professional Seniority	1-5 years	1	5
	6-10 years	5	25
	11-15 years	5	25
	16 years or more	9	45
Academic Title	Professor	4	20
	Associate Professor	4	20
	Assistant Professor	4	20
	Lecturer	4	20
	Research Assistant	4	20
	Total	20	100

Data Collection

The data of the research was collected through semi-structured interviews. Researchers prepared interpretative interview questions (Guba & Lincoln, 1981) based on five dimensions of PERMA well-being model by reviewing the prior studies in the literature and formed the first draft of the written interview guide. A researcher, who is an expert on qualitative research, checked the first draft, and according to the feedback taken, researchers reorganized the questions. To test the interview questions, a pilot study was conducted with four participants. The views of the pilot study participants were not included in the research data. There was no need for a revision after the pilot study and the written interview guide was used in the research. The interview guide consisted of questions such as:

- *How does your marital status affect your social relations?*
- *How do you explain the effect of administrative duties on positive emotions?*

In the study, the same researcher interviewed all the participants. In addition to the interview guide, to deepen the answers, the interviewer asked additional questions when needed.

The interviews were conducted in January and February 2019 as the time and place were determined by the participants. All the participants were interviewed at their offices in their universities during work hours. At the beginning of each interview, the researcher introduced the interview protocol and asked for participants' permission to record the interview. Eighteen of twenty participants agreed to audio recording; however, two participants asked the researcher to take notes. The notes were simultaneously typed in a word processor on a laptop computer. The interviews took 410 minutes in total - with 350 minutes of audio recording. One researcher transcribed audio recordings to text on a computer. Transcription of the audio recordings was repeated another time by the other researcher and the final data set was consented upon by both researchers in a meeting.

Data Analysis

The data were analyzed by deductive content analysis (Merriam, 2018). First, the researchers read the data to understand the gist and took notes. Then, they examined the data again and grouped them. The researchers revised the data again to determine the concepts for coding. After deciding on the concepts, the researchers manually coded the concepts and then generalized them into statements. The coding process was repeated another time and finally, the statements were interpreted, and findings are explained by associating them with prior research in the literature.

Reliability and Validity

To ensure the reliability and validity of the study, analyst triangulation (Patton, 2015) and independent observer analysis methods (Guba & Lincoln, 1981) were employed. Triangulation method was used to analyze the data as each researcher analyzed them independently and then compared their findings in a meeting on inter-coder reliability. The variation in the analysis was minor and consensus was reached. After the completion of data analysis, an independent observer judged the quality of the data collection, analysis procedures and processes.

Role of the Researchers

Both researchers are Turkish academics as one has been teaching at a faculty of education. At the time of research, the interviewer researcher was a master's student in education and a lecturer in a different institute. The interviews were conducted leisurely, and the interviewer strived to be as unbiased as possible.

Research Ethics

The approval of Kocaeli University Social Sciences Ethics Committee was obtained for ethical compliance with the research procedures. Verbal and written consent was obtained from the participants before the interviews.

FINDINGS

For each demographic variable, academics' views on their well-being have been converted into generalized statements under five PERMA dimensions – positive emotions, engagement, relationships, meaning, and accomplishment.

Statements on Well-being ond Marital Status

Academics' views on how their marital status affect their well-being and the generalized statements are presented in Table 2.

Table 2. Statements on Marital Status' Effect on Well-being Dimensions

	Generalized Statement	Statements of Participants
Positive Emotions	It feels good to share life and to support each other.	*P6: Life is a difficult process, and it is easier for two to fight. Being married increases the frequency of experiencing positive emotions.* *P16: When people are alone, there is always the risk of overthinking, and this affects them negatively. But, for example, when I go home in the evening, there are people with whom I can share my troubles and I can talk to. It is nice to have my children and my wife because I can easily share everything with them.*
	Having a good and balanced relationship promotes positive emotions and well-being.	*P1: It feels good not just to be married, but to have a good and balanced relationship.* *P19: It contributes to my well-being maybe because my marriage is going well or because we are a mutually understanding couple.*

	The feeling of trust that is experienced in marriage increases the frequency of positive emotions.	*P5: There is no one in life that you can fully trust when you are single. Of course, this can push you to more negative emotions.* *P13: I feel extremely safe in my marriage and that is the main criteria for me. So, I feel very good about my marriage, and it affects my well-being positively.*
	The cultural structure of society makes married people feel happier.	*P12: My marital status negatively affects my emotions because of the structure of Turkish society. Being single and not having children puts me under social pressure in our society. As a single individual, I am very happy with my life but sometimes, with some external interventions, my well-being and emotions are negatively affected.* *P13: There is a social expectation for women to be married. That's why I think being married has a positive effect on positive emotions.*
	Positive emotions are not related to marital status but to a person's self.	*P3: I don't think that positive emotions are related to marital status. People make themselves happy individually. It is not related to marital status but to the person himself. There is no such thing as being happy if you are married.* *P15: I don't think it has a very serious effect. Feeling positive depends on me regardless of my marital status.*
Engagement	Because marriage and the responsibilities it brings take time, it affects job engagement negatively.	*P2: Being married at least reduces the dedication because you share your time. Dedication decreases as you shift to other responsibilities.* *P15: Devotion is something that takes time, effort, and investment. I think that marital status is something that affects this issue negatively. I think being single is an advantage to be affiliated with an institution.*
	Engagement is related to personality traits and motivation.	*P1: I don't think marital status influence engagement. I am committed to my workplace and to corporate values. I try to connect wholeheartedly with every institution I work for.* *P20: Marital status does not affect my commitment at all because it is all about having work ethics. Being single or married doesn't affect your engagement.*
	Engagement is related to life experiences.	*P1: The academic incentive policies of recent years, not being able to get a tenure position, feelings of insecurity and problems with personal rights naturally reduce attachment. The institution is also starting to intimidate. Of course, this is about the academy, not being able to feel the sense of trust feels bad.* *P10: Engagement is related to experience rather than marital status. As you get older, you start to appreciate your family and friends more.*
Relationships	Marital status negatively affects single people regarding social acceptance.	*P4: Marriage greatly affects social relations culturally. But again, it's a cultural thing. Married people meet with married people, people with children meet with people with children. Singles are seen as one level lower than married ones. There is the concept, for example, that a man is married and can take care and responsibility of his family. It is said that he has become a man or something, there is such a respect. There is such a structure in culture.* *P8: I think marital status affects relationships due to some characteristics of our society. Even though I don't allow it to happen a lot, the society happens to perceive married people positively. Married people are more socially acceptable.*
	My marital status does not affect my social relations.	*P11: I think we are lucky to be a working population, I don't think being married or single in academia has an impact.* *P19: I don't think they are related. My marriage and my social relationships are different things, each standing in another corner. I don't think those two are related. My marital status has nothing to do with my friendships, my business relationships.*

Meaning	Being a parent and the parenting responsibilities have an impact on my making sense of life.	*P2: The search for meaning in a person's life is a cognitive process. It's part of self-actualization. You have to spend a lot of time on yourself. When you have a family, you can add meaning to your life through the child. In terms of the search for meaning and socially, the easiest way is to do this is through children.* *P5: Marital status obviously has a huge impact on meaning. Being single, one is always in search of belonging somewhere, trying to find the right person. You realize how deep this meaning really is in marriage, especially after having children. Taking the responsibility of children change the meaning of life. I can say that I found the meaning of my life in the way he grew up as a decent individual and I became a role model for him*
	The meaning of life is not related to marital status.	*P10: Most people seem to attribute their existence to marriage or having someone in their life. This is funny to me because everyone exists as an individual and no one's reason for existence should depend on another. Having a wife does not mean that my life is happier. In the end, it is also related to the person's point of view, but if I am a negative person, I would be unhappy whether I have a wife or not. I do not base my happiness on marriage or having someone in my life. Having someone in my life may add some meaning, but my life doesn't become meaningless just because I'm single.* *P15: Meaning is very subjective and personal, beyond being married or single. So, I don't think it's related to marital status.*
Accomplishment	Motivation and time-management skills that come along with a balanced relationship enhance success.	*P3: I think accomplishment and marital status are somehow related. I think marriage has a motivational effect. You have to support your family, so you have to hold on to something and you are more motivated. But when you're alone, you get untidier.* *P5: As my wife is also an academician, we did a lot of work together and it contributed a lot. Thus, marital status affects accomplishment. Since marriage requires a more stable life, time management becomes easier, and it brings success in every field.*
	Marriage affects success negatively.	*P8: Maybe that's the downside. Inevitably, I think that I had to take certain responsibilities with marriage. Those responsibilities cause me to postpone my work-related responsibilities from time to time. Maybe if I was single and alone, I might be more inclined to do what I want to do, of course, about my career. But this is where priorities come into play. I put the family first because I want to, but if it had never happened, maybe I would have felt a little more successful.* *P18: You find less time to work, so it can create pressure on academic success and emotions. Although marriage is a positive feeling, it is not a flower garden, and sometimes unexpected things happen. If I were single, for example, I would go home that day and work, but since I am married, I can find some very stressing and urgent matters at home. In this case, I must create time cutting from elsewhere. In this sense, I can say that maybe it reduces success.*
	Accomplishment is not related to marital status.	*P10: Marriage can be perceived as success for some. It's not that for me. Feeling successful is all about one's self-confidence. If you get something as a result of your hard work, that is success for me. I don't think success is related to marital status.* *P20: The concept of success is not about marital status, but about how you perceive life. In the course of time, the perception of how successful I have been in life changes. Life is a big thing, and it flows. You see that academic success is not a big deal. I think that success is about how beneficial I have been to people. Being successful is the feeling of how much I contribute to people's lives.*

For the positive emotions dimension, many of the participants stated that positive emotions are related to marital status. Many of them expressed that sharing the burdens of life and having support makes them feel good. It was also stated that having a balanced relationship increases positive emotions and well-being. Some participants stated that trusting a partner endorses positive emotions while some stated that societal norms tend to promote married people's happiness. There were a few participants suggesting that positive emotions are not related to marital status but to personal traits.

When it comes to the relationship between marital status and engagement, many of the participants stated that their marital status does not affect their well-being and they associated well-being with personality traits, motivation, or life experiences. Some participants suggested that marital status and engagement are related and that the time they spend fulfilling the responsibilities of marriage negatively affects their job engagement.

Regarding the relationships, a good number of participants indicated that their marital status did not affect their social relations, while a few of them declared that being single negatively influences social acceptance.

Concerning the meaning of life, many participants suggested that being a parent and taking the responsibility of raising an individual changed the way they comprehend life. A few of the participants stated that meaning is not related to marital status.

Most of the participants implied that accomplishment is related to marital status. While many of them stated that a balanced marriage enhances their success by motivating them and teaching how to manage their time effectively, a small number suggested that marriage affects success negatively. Some participants noted that accomplishment and marital status are not related.

Statements on Well-being and Administrative Duty

Academics' views on how their administrative duties affect their well-being and the generalized statements are presented in Table 3.

Table 3. Statements on Administrative Duties' Effect on Well-being Dimensions

	Generalized Statement	Statements of Participants
Positive Emotions	Administrative duties increase positive emotions.	*P5: There are some effects of administrative duties on positive emotions, of course, not everything is negative. I am a control freak. I am happy when I take things into my hands and work with people and see that the work is progressing smoothly. Sometimes I feel things like, if I don't do it, someone else can't do it as well as I would. When I am involved, the feeling that things are going smoothly creates positive feelings for me.* *P8: Having administrative duties mean having fun for me because it's related to my field. There may be appraisal. Due to my age and position here, having such an administrative task while I was a junior in the faculty adds an extra level of seniority to me. It makes me feel good because it gives me status.*
	Administrative duties negatively affect positive emotions.	*P10: When I was the head of the department, I had to work with many professors. And if they, for example, are hindering their work, after a while, my point of view towards them changes and I start to think negatively. Also, there is this thought that an administrator can never please everyone. After a while, administrators begin to become more distant and authoritarian. I think this also affects his perspective and thoughts towards life. I think it affects these feelings negatively.* *P16: I can say that it affects me more negatively*
	It depends on one's perceptions about administrative duty and to the meaning one attributes to the administrative duty.	*P12: I think it's about people's perception and what they expect from management. Some, for example, love status and it makes them happy.* *P20: It doesn't affect you if you're a giver, but if you're a perfectionist, it certainly does.*
	The feelings experienced while conducting administrative duty are not consistent and sustainable.	*P7: Regarding administrative duties, emotions are short lived, not sustainable.* *P13: You have a lot of negative feelings about the work process. You experience emotional destruction from time to time. It can be really tiring and boring because of a number of difficulties brought by the work. But these are periodic and occasional things.*

Engagement	Assuming responsibilities and being appreciated for success strengthens my organizational commitment.	*P6: We usually observe it in people undertaking administrative duties. It feels like home, the sense of belonging increases and the level of attachment increases considerably.* *P13: I have two tasks. I teach and I train teachers. Apart from that, this is the place for me to put the theoretical knowledge into practice. Of course, this also increases my commitment to my work. Being an administrator and carrying out academic studies are something that feeds me and increases my commitment to this place.*
	Administrative duties weaken organizational commitment.	*P15: Administrative duties negatively affect attachment. They make me question my institution, my being an academic, my teaching. I mean I question why I am here. Because the time I devote to my studies is very small. I must take long breaks or leave class early because I have to get work done during those breaks. I feel uncomfortable with my conscience due to reasons such as leaving the class early or coming in late.* *P19: I think that this task also wears out my bonds with the institution.*
	Engagement is not related to administrative duty.	*P4: Administrative duties didn't change anything for me. They just gave me extra responsibility.* *P20: I don't think administrative duties have anything to do with engagement. It's all about the respect you have for your job, which is about self-respect. It is always the same for me whether I am the dean, the rector, the head of the department, whether I am an academic who comes and goes straight to the class. Nothing changes for me. Only the value I give to my profession, the value I give to myself, and the value I give to my job affects my commitment.*
Relationships	Administrative duties have a positive effect on socializing.	*P6: Administrative duties are very effective on relationships. You must build positive or negative relationships with everyone you manage, and that brings great socialization. There are situations where people who are not in the administration do not have to establish a relationship at all, but after coming to the administration, they must establish relationships with everyone.* *P8: When conducting administrative duties, I need to establish relationships with people from different institutions. So, it has a positive effect. I relate more. Being together with different people makes a positive contribution.*
	Administrative duties negatively affect positive relationships.	*P10: Administrative duties seem to affect relationships negatively. Administrators can never be good; they always have a bad side regarded by the employees. That's why I think social relationships deteriorate over time. Of course, this also depends on the work culture. I think that having a certain status or being an administrator negatively affects social relations.* *P11: Actually, the social relations of many administrators are deteriorating. It is generally caused by the kind of chain of command.*
	Administrative duties have a two-way effect on positive relationships.	*P16: It has two dimensions in terms of social relations. You can compromise your social life because you work and it's negative. On the other hand, you meet new people there. It contributes positively.* *P18: Increasing. In general, to be a good manager, you need to have good social relations. It is necessary to understand people very well and to establish good relations. Of course, I see that administrative duty brings some social relations, but also takes away some others.*
	The effect of administrative duties on social relations is not permanent.	*P7: Administrative duty requires establishing dialogue and relationships with some misleading and ill-intentioned people. That's why it doesn't have a lasting effect on relationships.* *P19: Administrative duty didn't affect my relationships. I haven't even told many people; it's not even written on my door. But I think there will be a difference. I don't consider it positive or negative.*

Meaning	Administrative duties affect meaning as having administrative duties helps a person to gain a different viewpoint of life.	*P7: As the problems you deal with change, you are faced with problems of different dimensions, you see that the things you cared about before are unimportant, the priority of putting them in order of priority emerges. It makes you understand life differently.* *P14: Doing this at the administrative level has a very serious impact on the outlook on life, of course. The formation given to us when we were trained as teachers included everything about the child. At the administrative level, you see everything from a different angle and dimension, and it changes your perspective on life. Because at this level, there is a situation that is affected by everything from public health, family peace, traffic rules, social environment, nutrition. I think that my work is very important because it concerns the future of the country. Since I am in this position, I think it affects my perspective on life a lot, and it affects me positively.*
	Because meaning is a personal phenomenon, it is not related to administrative duties.	*P11: For the meaning, I think that it does not matter if a person is an administrator or not. This is a completely personal situation.* *P20: I think meaning is about one's perspective on life. Administrative duty has no effect on this issue.*
Accomplishment	Being recognized as successful and getting credit for my achievements increases the feeling of achievement.	*P3: Your motivation increases as your work is appreciated. I am somewhat extrinsically motivated. I get happy when someone tells me that I did a good job. If you're being credited as a successful manager, you'll want to keep it. It naturally affects your well-being.* *P11: I was happy and felt successful while I had administrative duties. It's amazing if you can do it. It has a positive effect of course.*
	As an administrator, being able to control and step into situations makes me feel successful.	*P4: If your criterion for success is to become an associate professor as soon as possible, administrative duties inhibit accomplishment. But, if I think about it in terms of taking it one step further in the episode, interfering with things that I think need to be fixed, I feel successful. Having the right to have the last word makes me feels accomplished.* *P10: Having many subordinates and being able to instruct may make you feel more successful. Of course, this is something that people feel. It also depends on the person's perception of success.*
	The resources that can be reached through administrative duties make me feel more productive and successful.	*P5: I see myself more productive now, instead of spending one unit of energy to do one unit of work, I can still do the same job with one-tenth of the energy since there is a team working with me. That's why I feel more productive and successful.* *P14: It is a fact that when you take the role of the dean or higher levels, your job may be easier in organizing. Now we run many organizations and we do them ourselves without any equity. We get support from other institutions, including municipalities or other corporations. When you, as an individual academic, make such demands, it is taken a little slow, but when you are an administrator, things change. I think being an administrator contributes to success.*
	Administrative duties decrease academic achievement since they cut down on the time I allocate to research.	*P11: It may decrease academic achievement. Academics and administration are two different concepts. As an administrator, you will inevitably allocate the time that you will devote to academic affairs during the day to administrative affairs. This will reduce your success.* *Code 15: Again, what I understand from success is publishing and working in academic terms. My administrative duty negatively affected it as well. There is a problem caused by not being able to allocate enough time, and this has negatively affected my academic success, social relations, and all sub-dimensions of well-being.*
	Accomplishment is not related to administrative duties.	*P20: The one who has administrative duty will not be more successful. But there are some who will be successful in administrative duties, there are others who will not be able to do it.*

Many of the participants suggested that positive emotions and administrative duties are related in different ways. Some of the participants stated that administrative duties either promote or hinder positive emotions, while some pointed out that the effect differs by the importance one attributes to administrative duties. Conversely, a few of the participants expressed that they are not related as the emotions related to administrative duties are temporary.

For engagement, many of the participants stated that taking responsibilities and being recognized for their accomplishments increase their loyalty and engagement. Few participants expressed that the administrative duties negatively affect engagement, while some stated that there are no relations between the two.

Concerning positive relationships and administrative duties, many of the participants implied that they are related, but the effect they suggested differs. While some of the participants proposed that administrative duties positively affect social relations, some others indicated an adverse impact caused by the unreliable affiliations required by the job.

About administrative duties and meaning, many of the participants stated that meaning is personal, and that it is not affected by administrative duties. On the contrary, other participants expressed that the administrative duties enable one to perceive the world from a different point of view and affect the meaning they attribute to their lives.

Most of the participants stated that accomplishment is related to administrative duties. Some of them suggested that being recognized and getting credited for their accomplishments promote their feeling of achievement, while others claim to be able to control the environment, get involved in situations and being able to reach resources make them feel successful. Contrariwise, some participants stated that administrative duties reduce accomplishment since they lessen the time spent on research. Only one of the participants suggested that accomplishment is not related to administrative duties.

Statements on Well-being and Professional Seniority

Academics' views on how their professional seniority affect their well-being and the generalized statements are presented in Table 4.

Table 4. Statements on Professional Seniority's Effect on Well-being Dimensions

	Generalized Statement	Statements of Participants
Positive Emotions	The experience and fund of knowledge that comes with professional seniority enhance positive feelings.	*P6: It works well, of course I feel better every year. I think experience is a factor that affects the well-being in this job. The process gets better with experience. You know what to do better than you used to. Negative emotions decrease.* *P20: Professional seniority makes me happy. Saying that I have spent so many years in the profession affects me positively. It raises one's self-confidence. You know, you have given your years, you have come a long way, you have written books, you have written articles during this time, and you feel that you have matured. You feel more competent. This increases your level of well-being. You will tell me, were you like this when you were a lecturer, no, now my self-confidence is higher. Because I have accumulated.*
	Achieving academic titles besides professional seniority heightens positive emotions.	*P11: The period of assistantship and the period when I got the title are different. Being a research assistant is a bit of a difficult job, the moral burden is more, and you get orders. It is a job where you must support everyone. It gets harder as you get older. But after you get the title, the pressure decreases, and you can focus on your own studies a little more. If you get a title with the seniority, positive emotions increase.* *P8: Positive emotions are linked to seniority. It affects me negatively because I couldn't get the title II deserve and I am stuck in this position. But of course, if I reach the position I deserve, it will have a positive emotional effect.*
	Positive emotions are not related to professional seniority.	*P4: In my opinion, there is no relation between professional seniority and positive emotions.*
Engagement	Professional seniority affects engagement positively.	*P5: Of course, seniority affects engagement. Since the job you did when you were a research assistant is not yours, you want to escape from that job. But when you have a title, it's your job and ownership increases.* *P15: Professional seniority affects engagement positively. You feel a sense of belonging to the institution, that is, you define yourself there for 15 years. It positively affects the bonds of belonging in that sense.*
	The accumulation of unfavorable experiences through the years affect engagement negatively.	*P8: Of course, it has a negative impact. I feel more isolated, isolated. I go out in search of new things. Institutionally, of course, not professionally. Sometimes I can feel intimidated and burnt-out.* *P9: I think engagement reduces over time. It may also be related to the negative experiences and situations you have faced in your life. For me, I can say that it has decreased.*

	Engagement is not related to professional seniority.	*P1: Seniority doesn't have a very strong effect on professional commitment. It's a physical thing, on the other hand, we start to get tired as the seniority increases.* *P4: My motivation has always been high. I have loved my department and the university. I still love it. That's why I don't think engagement and professional seniority are related.*
	Engagement is related to the sense of justice that is experienced in the institution.	*P11: It has a lot of impact. You meet certain conditions to get the title, and if someone in a position below you get the title before you do, it reduces your commitment and willingness to work. But if you see that your rights are respected here, it increases. The sense of justice is important for this reason.* *P20: Attachment is something different, I loved my job then, and I love it now. In fact, in this sense, it does not affect my work performance, my level of work, or my commitment to my institution. What affects my commitment? How fair the organization acts, how evenly it distributes what is available to us affect my engagement. There is only one thing that can reduce my commitment, and that is injustice. If you ask if it's happening, yes, it is. Does it affect me? I'm human, of course I'm affected.*
Relationships	The returns of the time spent in the academy - such as recognition, academic title, and various social networks - have a positive effect on relationships.	*P13: Having been doing this job for so many years has a facilitating effect on relationships when we meet a student or a parent. Things get a lot easier when talking to or working with people when they realize that there is 19 years of accumulation of knowledge behind me.* *P14: Professional seniority has had a huge impact. Through the years, I worked in many cities including Ankara, Marmara, Sakarya, and here. I think I understand the structure of Turkish universities. Our job also requires that we work within inter-university networks. We manage projects together with other academics rather than individually. In this sense, I can say that professional seniority has a positive contribution to social relations.*
	Negative experiences over time make a person individualized.	*P6: At first, people try to establish friendships because it is a new environment, but as time passes, it turns into an effort to defend themselves. With the seniority at work, more passive and asocial life is developing.* *P19: As the years pass, there comes fewer people, less social relations, less socialization. The last 10 years are never the same as the first 5-10 years of starting the profession for me.*
	Professional seniority does not affect positive relations.	*P11: Nothing has changed for me. I can't think of any negative effects of professional seniority on positive relations.* *P20: I don't know if my seniority affects my social relations a lot, but of course, I am in the highest status at the university right now. But of course, it is all about self-confidence, there is no final point you can go to, you can say everything confidently. You don't have any more reservations or big problems. In this sense, you can communicate and talk to people much more easily. It has an effect in that sense, but it doesn't have much effect in terms of establishing a relationship, maintaining friendships.*
Meaning	Over time, some changes – which cannot be distinguished as positive or negative - appear in meaning dimension.	*P5: Over time, of course, the work you do, the problems you encounter, etc. becomes more understandable. You can make more sense of your profession, but professional seniority has no effect on the meaning of my life in general.* *P9: With the professional seniority, you think more deeply at the level of meaning, but it is very difficult to call the meaning positive or negative. Your perspective and the meaning you give to life are developing. You start to think more socially and deeply.*
	Meaning is not related to professional seniority.	*P2: Professional seniority and meaning are unrelated to me.* *P20: Meaning is related to the person and the self.*
Accomplishment	As success requires a process and a fund of knowledge, it increases in direct proportion to professional seniority.	*P5: Success is of course something that occurs over time, it requires a lot of knowledge and time in the academic community to achieve.* *P10: There is a big difference between where I started and where am I now. I am more in control of my field, and I have more knowledge. It also facilitates the publishing process because I know more and better. I write more comfortably now, and I think I am more successful.*
	Receiving a recompense for my work and being satisfied over the years affect accomplishment positively.	*P4: If you're in the lower titles for a long time and you're a senior, it can make you feel like you failed. It's not good to stay at a certain level for too long. If the title is rising, you can be considered successful…* *P7: Sense of accomplishment depends on satisfaction. If the place you are in is sufficient, you feel successful*
	Accomplishment is not related to professional seniority.	*P12: So, this is subjective. A person my sit for 40 years, he may do nothing and stays the same. But you stay there for 3 years, your perceptions are clear, and you are success-oriented, in that time you do what the man could not do.* *P20: When I started this job at the age of 26, I considered myself very successful, and I still find myself successful. It's about what I do. My seniority doesn't affect it. My seniority allows me to speak more comfortably now. In this sense, it influences self-confidence, but it has no effect on success as I have already walked my way to success step by step through the years.*

Regarding relationship between positive emotions and professional seniority, most of the participants stated that the experience and knowledge gained over time boost positive feelings. Besides, some of the participants

expressed that achieving academic titles in due course increases positive emotions. Only one of the participants suggested that positive emotions and professional seniority are not related.

For some of the participants, professional seniority has a positive influence over engagement, while a few claimed that the accumulation of unfavorable experiences over the years affects it negatively. As some of the participants expressed that engagement and professional seniority are not related, a few of them implied that experiencing a sense of justice in the institution increases their engagement.

Most of the participants stated that acquisitions such as recognition, academic title, and social networks affect their relationships positively, while some expressed those prior negative experiences made them more individualized. Contrarily, a few participants stated that relationships are not related to professional seniority.

Concerning meaning, most of the participants indicated that there appear some changes in meaning over time but that they cannot differentiate between positive or negative. Contrariwise, some participants stated that meaning is not related to professional seniority.

As for the accomplishment, most of the participants stated that success increases with professional seniority because accomplishments require a course of time and extensive knowledge. A few of the participants claimed that getting rewarded and being satisfied throughout their years in the academy made them feel more successful, while some participants pointed out that accomplishment and professional seniority are not related.

DISCUSSION

The main finding of the research is that the well-being of academics teaching at faculties of education is affected by their marital status, administrative duty, and professional seniority. Discussed below are the relationship between those based on the views of the academics.

Well-being and Marital Status

In the study, academics stated that marriage improves positive emotions as it helps them to share the burdens of life, receive support, experience happiness, feel secure and confident. This can be attributed to the fact that having a partner diminishes the struggles in life, reduces the level of burnout and negative feelings while helping cope with difficulties (Coombs, 1991; Demir, Türkmen, & Doğan, 2015). There are many findings in the literature suggesting that the levels of well-being of married individuals are higher than those who are single (Lucas, Clark, Georgellis, & Diener, 2003; Stroebe & Schut, 2015.)

According to the academics, marital status affects the meaning of life, but it is highly related to having children through marriage. With the similar findings in the literature (Ardıç & Polatçı, 2008; Lee & Ashforth, 1993), it can be asserted that the feelings of wholeness, attachment, and bringing up an individual with a partner affect the meaning of life.

Academics suggested that the effect of marital status on accomplishment is related to the motivation emerging from a balanced relationship and managing the time effectively between work and private life. However, the findings of related research in the literature vary (Can & Tiyek, 2015; İraz & Ganiyusufoğlu, 2011). Suitably, some academics in this research stated that accomplishment and marital status are not related as accomplishment is a subjective feeling effected by the individual ambitions, urges, and differences.

Another dimension, engagement, can be identified as a subjective situation that emerges from an individual's interest in and engagement to what they are dealing with (Khaw & Kern, 2015), and in the literature, this dimension is associated with job satisfaction, job involvement, and work engagement. In the research, many of the academics stated that engagement is related to motivation and experiences – not to marital status. Similarly, in the literature, some studies found no relation between job engagement and marital status (Başıbüyük, 2012; Karakaya, 2015) while there are some findings that married academics have higher levels of work engagement (Çağlar, 2011). As Dost and Cenkseven (2008) stated, higher job satisfaction levels married academics may be the result of social, emotional, and financial advantages that marriage provides. However, some of the participants of this study stated that in general, the responsibilities and the time spent on those in a marriage negatively affects their job engagement. Correspondingly, Bakan, Taşlıyan, Taş, and Aka (2015) asserted that married academics have higher levels of job dissatisfaction and depressive behavior than those who are single, and this may be due to the conflict between the professional responsibilities of married academics and the responsibilities forced by the family institution.

Finally, it can be said that the dimension of positive relations is not directly related to marital status. Similarly, Shapiro and Keyes (2008) emphasized that there is no significant difference between married and single

individuals in terms of social relations. Surprisingly, academics in this study pointed out an important detail that married individuals receive more social support than singles. Correspondingly, there are findings in the literature that married individuals have access to wider social networks (Acock & Hurlbert, 1990) and receive more social support (Kessler & McLeod, 1985) than single ones.

Well-being and Administrative Duty

Although most of the academics in the study stated that administrative duties affect well-being in certain ways, some expressed that the positive feelings experienced during the administrative duties are not continuous and sustainable; thus, they do not affect well-being. In the literature, some studies found that the burnout levels of academics do not differ depending on whether they have administrative duties or not (Demir et al., 2015) while others revealed that the burnout levels of the academics with administrative duties are higher than those who do not have any (Azeem & Nazir, 2008; Lackritz, 2004). It can be inferred that diverse findings resulted from individual perceptions and the meaning attributed to administrative tasks, as stated by some participants of this study.

Regarding engagement, it was found that administrative duties tend to affect engagement positively when the academics encounter responsibility, increased visibility, and appreciation of success. There are findings in the literature that when their institutions give them responsibilities, the commitment of academics increase (Atakan & Ersoy, 2016). Also, being taken into consideration by the administrators is emphasized to increase the commitment to the organization (Yücel, 2006) and job satisfaction of the academics with administrative duties (Akman, Kelecioğlu, & Bilge, 2006).

Considering the quantity of social interaction faculty members are exposed to, it can be suggested that administrative duties have both positively and negatively affect relationships. Consequently, academics stated that administrative duties mislead and distort relationships and their business interactions do not permanently affect their social relations. On the other hand, some academics emphasized that the diversity of relations increase with administrative duties, and it positively effects social relations, while working overtime and having less time allocated to relationships may have negative effects.

Most of the academics in the study noted that meaning is not directly related to administrative duties. However, some of them stated that administrative duties influence the meaning as it provides individuals with a different perspective and allows them to comprehend things differently.

Finally, it can be said that accomplishment and administrative duties are related as the academics stated that being credited and appreciated for success, being able to control and intervene the work environment, and the abundance of resources accessed through administrative duties make them feel more productive and successful. These views of the academics are also supported by research findings suggesting that the levels of feeling successful of academics with administrative duties are higher than those without them (Derinbay, 2012; Gezer, Yenel, & Şahan, 2009). However, some of the academics in this study stated that the time allocated to administrative duties reduce academic success. According to Kutanis and Karakiraz (2013), academics who consume their energy with administrative duties during the day have difficulty in finding time to conduct research and publish, and their burnout levels are higher than those who do not have any administrative duties.

Well-being and Professional Seniority

In the study, most of the academics expressed that experience and knowledge gained through professional seniority and being able to get the well-deserved titles and duties improve positive emotions. Similarly, many studies in the literature found that professional seniority is one of the factors that reduce negative affect and burnout (Çiçek Sağlam, 2011; Demir et al., 2015; Ghorpade, Lackritz, & Singh, 2007). In this study, academics stated that as the time they spend in the profession increases, they gain experience, self-confidence, and professional competence which make their lives easier and increase their positive feelings.

When professional seniority is examined in relation to engagement, the academics associated it with professional or institutional commitment and stated that the opportunities brought about by professional seniority positively affect engagement. While there are studies in the literature concluded that there is no relationship between professional seniority and engagement (Boylu, Pelit, & Güçer, 2007; Çöl & Gül, 2005), some studies confirm that justice felt within the institution positively affects engagement (Cheng, 2014; Cohen-Charash & Spector, 2001). In this study, however, academics stated that through professional seniority, being a partner in the functioning of the institution and having the sense of belonging increased their level of engagement. In the study, a small number of academics stated that the experiences that come with professional seniority negatively affect

engagement. Their negative attitude may be the result of not being tenured, not having a say in management, and the institutions' undesired physical conditions. Therefore, it can be suggested that the negative relationship between professional seniority and engagement results from the experienced injustice and lack of opportunities in the institution.

Although some of the academics stated that professional seniority does not affect positive relationships, many stated that the time spent in the profession makes them recognized; the titles they acquire and the social networks they are involved in the process positively affect their relationships. As stated by academics, the organizational support and recognition resulted from professional seniority helps individuals to meet certain needs such as engagement, being respected, getting emotional support and approval (Armeli, Eisenberger, Fasolo, & Lynch, 1998). On the other hand, some of the academics stated that the negativities experienced over time individualized them and reduced their social relations to a lesser extent. The individual and competitive characteristics of academic duties cause faculty members to be isolated in professional life (Bell, Roloff, Van Camp, & Karol, 1990). In the literature, there are also studies showing that the isolation at work decreases subjective well-being of individuals (Erdil & Ertosun, 2011) as well as the job and life satisfaction (Mellor, Stokes, Firth, Hayashi, & Cummins, 2008; Wright, 2005; Yılmaz, 2008).

In the study, the academics stated that there were changes in their sense of meaning over the time resulted from their experiences in the profession. In addition, faculty members stated that achieving success requires a course of time and experience, and the feeling of achievement will increase with professional seniority. They also stated that the satisfaction of getting the reward of their efforts during the process increases their sense of accomplishment. In their research, Ardıç and Polatçı (2008) found that academics who were in the first five years of their academic career had the lowest level of personal achievement. Similarly, some studies in the literature found that the sense of accomplishment increases with professional seniority (Demir et al, 2015; Derinbay, 2012; Fadlelmula, 2014; İraz & Ganiyusufoğlu, 2011).

CONCLUSION

According to the findings of this study, well-being of academics who teach at faculties of education is affected by their marital status, administrative duties, and professional seniority. As for the marital status academics stated that sharing life and having support in a balanced relationship, being a parent, and motivation provided by the partner increase well-being while having to spare time to family and the societal norms that are disadvantageous to single individuals negatively affect well-being. Regarding the administrative duties, taking responsibilities, being recognized for accomplishments, socialization, feeling of achievement, widening perspective, and reaching vast sources increase well-being while the relationships based on self-interest and spending more time to administrative duties than academic studies reduce well-being. And lastly for the professional seniority, according to academics, accumulation of experience and knowledge, gaining titles, and widening social networks positively affect well-being while injustice, not getting tenure, and bureaucratic obstacles have a negative effect on well-being.

Consequently, supporting the personal development of academics, reducing their workload, ensuring that they allocate time for family and social life together with their work, protecting their rights, improving their physical conditions at work, implementing a fair administration when giving assignments and rewards, providing trust and peace, and resolving bureaucratic obstacles faced by many faculty members can positively affect their well-being. On the other hand, academics with administrative duties can be provided with the opportunity to distribute their workload and responsibilities, so that they can allocate time to their academic studies.

To help increase the well-being of academics and to raise awareness, preventive mental health education services can be provided by psychological counseling centers of universities to help increase the well-being of academics and to raise awareness. Also, well-being of the academics can be assessed on a regular basis and if needed, personal development can be provided through seminars, trainings, and workshops. Informing junior academics about the problems they will encounter in academic life and making their job descriptions clear can prevent them from experiencing negative conditions such as burnout, role ambiguity, and role conflicts. To expand our understanding of well-being, it may be valuable for future researchers to examine further the views of academics across different disciplines and from different countries regarding different demographic variables.

Statements of Publication Ethics

This paper is based on the first author's master's thesis, which was directed by the second author. Ethical permission of the research was approved by Kocaeli University Social Sciences Ethics Committee on December 10, 2019, by the document numbered 10017888-050.06/E.97645.

Researchers' Contribution Rate

Researchers' Contribution Rate (You may modify this table according to your article)

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Discussion	Conclusion
Gökçe Garip	☒	☒	☒	☒	☒	☒	☒
Zeynel Kablan	☐	☒	☐	☒	☒	☒	☒

Conflict of Interest

We confirm that there are no conflicts of interest associated with this research.

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A Study on Self-Regulated Learning in a Flipped Classroom Model of EFL Writing Instruction

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Abstract

This study explores the effect of flipped classroom on the self-regulation of learners in the Academic Writing Skills course at a state university in Turkey. The intervention lasted ten weeks within one academic term. Participants in the study were sophomores assigned to experimental (n=25) and control (n=26) groups. The study adopted a pre-test and post-test quasi-experimental design, wherein the control group was taught in a traditional method while the experimental group received flipped instruction. Writing Strategies for Self-Regulated Learning Questionnaire was adapted to apply in a different cultural context (Turkey), and the data from a sample (n=430) were analysed using confirmatory factor analysis. As pre- and post-tests, the adapted version of the questionnaire was conducted for both groups. The findings revealed that the experimental and the control groups significantly differed from each other in overall writing self-regulation favouring the experimental group. Relevant implications are discussed.

Keywords: Academic writing, flipped classroom, self-regulation, student-centred learning.

İngilizce Yazma Öğretiminin Ters Yüz Bir Sınıf Modelinde Öz-Düzenlemeli Öğrenme Üzerine Bir Araştırma

Öz

Bu çalışma, Türkiye'de bir devlet üniversitesindeki Akademik Yazma Becerileri dersinde ters yüz sınıf yaklaşımının öğrencilerin yazma öz düzenlemelerine etkisini araştırmaktadır. Ters yüz eğitimi bir akademik dönem içinde on hafta boyunca sürmüştür. Araştırma katılımcıları, deney (n=25) ve kontrol (n=26) gruplarına atanan ikinci sınıf öğrencileridir. Ön test ve son test yarı deneysel desenin uygulandığı bu çalışmada, deney grubuna ters yüz öğretim, kontrol grubuna ise geleneksel yöntemle öğretim uygulanmıştır. Öz-düzenlemeli Öğrenme için Yazma Stratejileri Anketi farklı bir kültürel bağlamda (Türkiye) uygulanmak üzere uyarlanmıştır ve bir örneklemden (n=430) alınan veriler doğrulayıcı faktör analizi kullanılarak analiz edilmiştir. Anketin uyarlanmış hali her iki gruba ön ve son test olarak uygulanmıştır. Sonuçlar, İngilizce yazmadaki bütün olarak öz-düzenlemede deney ve kontrol gruplarının anlamlı bir şekilde birbirlerinden farklılaştıklarını ve bunun deney grubu lehine olduğunu göstermiştir. İlgili çıkarımlar tartışılmıştır.

Anahtar kelimeler: Akademik yazma, öğrenci-merkezli öğrenme, öz-düzenleme, ters yüz sınıf.

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INTRODUCTION

Writing is one of the most challenging skills incorporating many component sub-skills for students to acquire. Specifically, the students in higher education have difficulties and experience failure in academic writing courses (Al Mubarak, 2017; Cakir, 2010; Lee & Tajino, 2008; Mwangi, 2017). Students who are enrolled in English-medium departments in particular are expected to master English language skills and to expand these skills in order to be successful in their disciplines. Academic writing is a distinctive style of writing that requires a certain skill to demonstrate, interpret and present knowledge with a specialized way of thinking, mastery of academic conventions, and even some experience. Many of the students are unable to cope with the difficulties that they face when they begin to study in their majors. In this sense, the gap between the instructions in high schools and universities may complicate students as the terminologies, genres, argument, process, and audience are quite different, and most of them do not have a clear idea of what an academic writing looks like (Crank, 2012). According to Dong (1997), academic writing is a field with a set of new rules and needs to be acted upon according to these rules, which may change according to the audience addressed and the aims across different fields. For non-native students, how similar these writing difficulties are to the expectations expected of them in their educational settings increases these challenges. Kellogg and Raulerson (2007) state that teachers should train students at the university level rather than only instructing them. For effective writing, mechanics of writing such as punctuation, structure, spelling, coherence, and cohesion within the paragraph, and organized structure of texts are required, but more should be employed. More to do is related to the efficient use of knowledge which enables the practice of writing by providing appropriate conditions after the transfer of knowledge.

To attain mastery in a specific field, Zimmerman (2006) proposes the steps including individual effort, attentiveness, and practice in particular. Practice matters in teaching writing as it triggers skill development and academic performance. In order to promote practice in writing courses, student-centred teaching is crucial because it facilitates a learning setting in which students get involved more and take more responsibilities during the learning process. In order for teachers to create such a learning environment, it is essential that they abandon the existing teacher-centred instruction and adopt student-centred approaches. Considering that technology is an important part of education, a large number of studies show that the use of technology with the approaches based on constructivism, student-centred learning, and feedback contributes to learning outcomes (McNaught et al., 2012; Lai & Bower, 2020; López-Pérez et al., 2013; Wekerle et al., 2022). In this sense, flipped classroom approach is an option to create educational settings including more student-centred activities and active learning. Flipped classroom makes time in class to apply student-centred tasks fostering collaboration among students (Caudill, 2014). Class time may be utilized for the exercises that enhance interaction through which the students can use their newly-learnt concepts with the help of their teacher. In-class activities in flipped classrooms embody features that help to be engaged in and incorporate the material into their own pre-existing knowledge with the assist of peers and the teacher. As a result, rather than being a standard classroom, it may be more participatory, dialogue-based, dynamic, and autonomous for students (Talbert, 2012).

Flipped classroom or inverted classroom is a pedagogical method in which asynchronous videos transmitting knowledge are delivered to students outside the class and more practice and high order skills such as analysing, synthesising and even evaluating processes are conducted in-class time. Flipped classroom is simply defined as follows: “Inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa” (Lage et al., 2000, p. 32). It is stated that this definition does not sufficiently relate to what researchers describe as flipped classroom and propose a more comprehensive definition regarding to flipped classroom: “interactive group learning activities inside the classroom, and direct computer-based individual instruction outside the classroom” (Bishop & Verleger, 2013, p. 5). Here, the most important point related to the flipped classroom approach is, contrary to expectation, not the power of instructional videos on their own, but how effectively the class time is used by teachers within an overall approach (Tucker, 2012). Bergmann, one of the prime movers of flipped classroom approach, highlights that the most beneficial point of a flipped classroom is to reach each student individually in every in-class meeting. He states that interaction in a traditional classroom is reverted as well when teachers adopt a flipped classroom model because he asserts he has an opportunity to interact with the students who are struggling in real but pretend to comprehend the content or stay back from asking questions to clarify their minds (Tucker, 2012).

The flipped classroom is based on a set of assumptions about how learning becomes more effective. Students are expected to use online resources to attain information about the content before coming to class. Use of instructional tools before class like textbooks assigned to the students as homework is not new, but through pre-

recorded videos, the process becomes more motivating and effective for students, especially for slow learners, as they have the opportunity to learn the course materials given at their own pace and review unclear points as often as they do (Mok, 2014; Yang & Chen, 2020). Zappe et al. (2009) report that students are reluctant to watch one-hour-long videos and prefer the videos to be short somehow.

Bishop and Verleger (2013) emphasize that flipped classroom draws upon student-centred learning theories of Piaget (1926) and Vygotsky (1978), which entail interaction concerning cognitive conflict and zone of proximal development. Damon (1984) compounds the perspectives of both Piaget and Vygotsky proposing an educational framework derived from peer cooperation. He states that providing feedback for each other and discussion motivate peers to find better solutions; through peer communication, a child is able to join socially interactive processes, such as involvement and debate, and cognitive ones in which they desire to confirm and critically think of concepts. Cooperation and interaction between peers can facilitate discovery learning and creative thinking, which lead to idea generation. A similar framework can be applied during in-class sessions of flipped classroom models as they allow students to get more feedback and clarification from their peers or teachers in a learning environment where most of the class time is dedicated to cooperative learning.

Student-centred learning approach to teaching academic writing can promote the improvement in self-regulatory behaviours of students in writing, which is an essential attribution, as being a skilful writer is positively correlated to high level of self-regulation with the processes of self-planning, self-initiating, and self-sustaining (Zimmerman & Kitsantas, 2007). Self-regulation refers to an overarching term that includes cognition, metacognition, motivation and social behaviour. In Dornyei's description, self-regulation is depicted as a multifaceted construct by which people can actively mediate their own learning (2005). Zimmerman (1986) states that regarding self-regulated learning various definitions have been provided by researchers based on their theoretical approaches, and under a broader definition, self-regulated learners control their learning metacognitively, motivationally, and behaviourally. The emphasis in Bandura's sociocognitive theory is on the fact that human behaviour and learning take place in social environments (Schunk & Usher, 2012). Dinsmore et al. (2012) point out that self-regulation highlights reciprocal interaction of the environment with people, influenced by behaviour, and thus the environmental or contextual factors are vital for self-regulation processes. Pintrich (2004) highlights that contextual control is a crucial part of regulatory processes, but in traditional classrooms it seems to be difficult to take control over the learning environment for students due to the dominant role of the teachers. Instead, student-centred learning environments can make room for students to work or perform a task collaboratively and cooperatively, which can create opportunities for receiving more feedback and peer learning.

In the literature, the studies focusing on flipped classroom approach display similarity in their research settings such as foreign language teaching, social sciences, health science, and science (Chen et al., 2017; Dehghanzadeh & Jafaraghaee, 2018; Van Vliet et al., 2015; Wilson, 2013). Most of these studies have aimed to investigate the effect of flipped classroom approach on academic achievement (Baepler et al., 2014; Chen Hsieh et al., 2017; McCallum et al., 2015; Moravec et al., 2010; Oznacar et al., 2019; Zappe et al., 2009).

There are a number of studies revealing the effect of flipped instruction on students' success across different fields in Turkey (Acarol, 2019; Alsancak Sirakaya & Ozdemir, 2018; Cakir & Yaman, 2018; Cetinkaya, 2017; Ekmekci, 2017; Saglam & Arslan, 2018; Sezer, 2017). Despite its positive effects on academic success, there are several studies revealing no significant effect on academic achievement as well. For example, Cabi (2018) found out there was no significant difference between the scores of control and experimental groups in a study conducted. The results of the study indicated that flipped classroom model did not show any significant effect on improving students' academic achievement. Similarly, Caliskan (2020) reported that experimental and control groups did not differ from each other in their post-test scores. Flipped classroom approach has drawn a considerable attention from scholars, and many have focused on the academic success while a few have revealed its effect on increasing motivation, enhancing self-efficacy, advantages, challenges, and effectiveness of the method. There have been several studies investigating the effect of flipped classrooms on self-regulated learning (Altas & Mede, 2020; Kustandi et al., 2020; Ozturk & Cakiroglu, 2021; Robbins et al., 2020); however, there is a single study among them that has focused on the effect of the flipped classroom models on self-regulated learning in writing courses. In the study (Altas & Mede, 2020), a scale consisting of two parts as self-regulated learning skills/ strategies and motivational dimension was used to collect data. The study revealed no significant effect of flipped classroom upon self-regulated learning in writing. The current study aims to explore the effect of flipped classrooms on writing self-regulation with a scale involving more comprehensive dimensions as cognitive, metacognitive, social behavioural, and motivational regulation. Considering that self-regulatory skills are crucial to school success and adjustment processes because it facilitates students to control their attention and behaviour at schools (Blair, 2002),

there is a gap in the literature regarding the effect of flipped classroom approach on writing self-regulation. Hence, this study aims to address the following questions:

1. What is the effect of flipped learning approach on EFL learners' writing self- regulation?
2. Is there a significant difference between the experimental group instructed through the flipped classroom and the control group taught in traditional method in terms of writing self-regulation?

METHOD

Research Design

This study employed a pretest-posttest quasi-experimental design. It is quasi-experimental because the groups were selected without random assignment (Creswell & Creswell, 2018). The groups were randomly assigned into classes by the administrative unit in a higher education institution at the beginning of the term. In experimental designs, as Johnson and Christensen suggest (2010), one way is the use of or non-existence of a technique, wherein an experimental group is exposed to intervention, while the control group is not. In the current study, the experimental group was taught through flipped classroom intervention whereas the control group was instructed in traditional way where the whole content was delivered in class, and homework was assigned to students to be completed outside the class. Experimental studies aim to explore casual relations between dependent and independent variables; in this term, flipped classroom and traditional method in teaching academic writing are independent variables while self-regulated learning strategy use in writing is a dependent variable in this study. Before the flipped classroom intervention was implemented, Writing Strategies for Self-Regulated Learning Questionnaire was delivered as a pre-test to both the experimental and the control groups. After the intervention process was completed, the scale was applied as a post-test to both groups.

Participants

The participants of the study consisted of fifty-one (n= 51) sophomores enrolled in English-medium departments at a state university in Turkey and took Academic Writing Skills as a compulsory course in the academic year of 2019-2020. The course is a three-hour course per week and lasts 14 weeks in one term. It is offered as Academic Writing Skills I and II in fall and spring terms respectively. Twenty-eight (n=28) students, three of whom did not attend the class during the fall term, compromised the experimental group while the control group included twenty-eight (n=28) students, two of whom did not attend the class during the fall term. There were 51 students in total, consisting of 25 in the experimental group and 26 in the control group. In the experimental group, there were 9 females (36%) and 16 males (64%); in the control group, there were 10 females (38.5%) and 16 males (61.5%). The average age of the experimental group was 22.3 (SD = 0.99), ranging from 21 to 26 whereas the average age of the control group was 22.2 (SD = 0.77), ranging from 21 to 25.

Table 1. Demographic Characteristics of the Groups

Group	Gender			
	Female		Male	
	N	%	N	%
Control	10	38.5	16	61.5
Experimental	9	36	16	64

Data Collection Tool

Data was collected by means of a 7-Likert-type scale titled Writing Strategies for Self-Regulated Learning Questionnaire (WSSRLQ) developed by Teng and Zhang (2016). WSSRLQ was chosen as an instrument to collect the data as it incorporated self-regulated learning strategies for L2 writing as a multifaceted construct in terms of cognition, metacognition, social behaviour, and motivational regulation (Zhou & Hiver, 2022). It is based on Zimmerman's (1989) conceptualization of self-regulated learning as a dynamic, multifaceted process in which learners are active agents who self-regulate their own learning. From this broader aspect, WSSRLQ conveys self-regulated learning as a high-order construct which includes 9 lower-order writing strategies belonging to cognitive, metacognitive, social behaviour, and motivational regulation aspects. Teng and Zhang (2016) reported Cronbach's alpha coefficient of the 9 strategies in self-regulated learning was higher than .70, showing a strong internal reliability for each dimension of WSSRLQ. After obtaining permission from its developers through contacting them and asking for their contest, WSSRLQ was adapted into the Turkish setting by taking necessary steps regarding reliability and validity processes. Firstly, it was translated into Turkish language by three experts, and then back translation into English language was done by three native speakers of Turkish language whose majors were English language teaching, translation and interpretation, and linguistics. The researcher compared the

original and back-translated versions of the scale and consulted experts in order not to have any ambiguity in the meanings of the items. Considering the suggestions, necessary revisions were made accordingly.

Confirmatory Factor Analysis

CFA is applied to test a factorial structure designed before and grounded on a theory (Byrne, 1998; Hoyle & Panter, 1993; Kline, 2011). The goal of CFA is to test the dimensionality of WSSRLQ in a new setting with different populations (DiStefano & Hess, 2005); to this end, CFA was conducted using SPSS 23.0 Inc package and SPSS AMOS 23.0. A pilot study was performed for the validity and reliability of WSSRLQ with 430 students. The participants consisted of the sophomores who took Academic Writing Skills in the academic term of 2019-2020. For one-factor structure of the Writing Strategies for Self-Regulated Learning Questionnaire, the CFA indicated a significant chi-square, $\chi 2$ (725, n = 430) = 1086.18, p = .00). Thus, other fit indices (NFI, TLI, CFI, and RMSEA) were checked. Based on maximum modification index, six pairs of error terms were covaried to improve the model fit. Fit indices for the revised model were found as follows: NFI= .87, TLI = .95, CFI= .95, GFI = .89, RMSEA = .034, indicating an acceptable fit. For the model fit index CFI, the acceptable values are .90 or above (Browne & Cudek, 1993), and for TLI, .85 or above indicates good fit (Carlback & Wong, 2018; Shadfar & Malekmuhammadi, 2013). Values for NFI .80 or above are acceptable (Hooper et al., 2013). The values between .05 and .08 for RMSEA are acceptable. The results between .00 and .05 reflect a good model fit (Hair, 2014). The reliability coefficient of WSSRLQ was found to be .93, indicating internal consistency (Cortina, 1993).

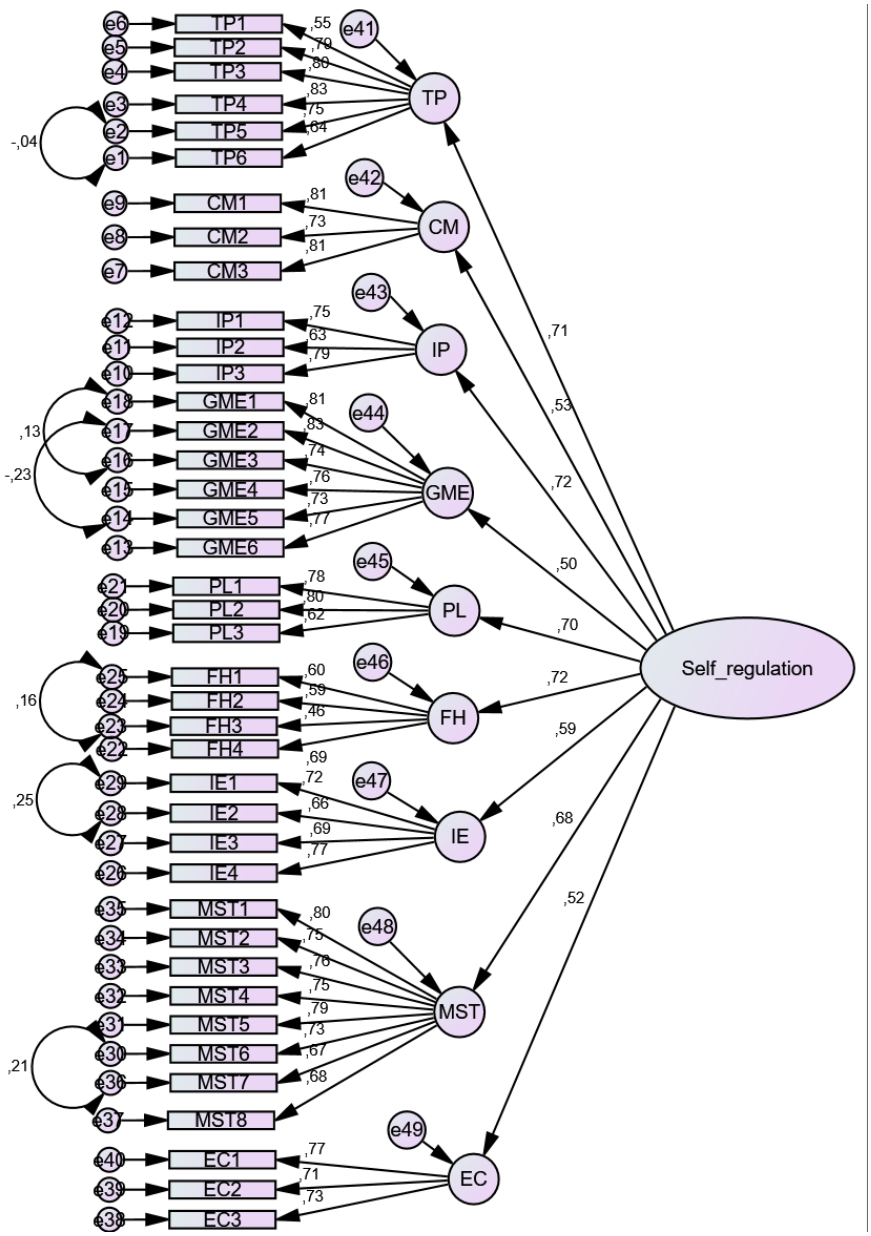

Figure 1. *One-factor second-order factor model of EFL writing strategies for self-regulated learning (N=430).* TP= Text processing; CM= Course memory; IP= Idea planning; GME= Goal-oriented monitoring; PL= Peer learning; FH= Feedback handling; IE= Interest enhancement; MST= Motivational self-talk; EC= Emotional control

Data Collection

The scale was delivered to the experimental and the control groups as pre- and post-tests. Flipped classroom design was employed in the experimental group through an average of 20 minute-video lessons created via one of the TechSmith software by the researcher, and shared via Edpuzzle, which is a video sharing platform assisting teachers to edit their videos and embed comprehension questions into videos when necessary. Edpuzzle videos included paragraph and essay writing, types, and examples. The intervention lasted 10 weeks in a 14-week academic term. The video contents were shared one week before each face-to-face class so that students could study them at their own pace and as often as they wished. Before the intervention, the participants in the experimental group were informed of the flipped classroom application, materials, and syllabus of the course. They watched an introductory video regarding the flipped class process. The control group was similarly informed about the materials, course content, and syllabus of the course, and was instructed by the traditional method during the term. After the introduction to the course, both groups were employed WSSRLQ as a pre-test at the beginning of the term.

Procedure

Both groups were taught the same contents and topics by doing the same activities and tasks. The experimental group completed assigned tasks in the class as the flipped classroom design required theoretically while the control group did the same tasks assigned outside the class. The content in the experimental group was delivered via average 20-minute-long video lessons prepared by the researcher outside the class one week before the class. Within the videos, several comprehension questions were embedded in order to check students' comprehension and help them to monitor their understanding and get engaged in the content recorded. When they came to class after watching the video lessons, the instructor made a 10 minute-class discussion on the misunderstood or misconceived points by the students while they were watching videos. After that, students were involved in the hands-on activities wherein more peer-to-peer and teacher-student interaction took place in the processes of brainstorming, generating ideas, outlining, drafting, second or final drafting after revision. In this sense, they received more feedback from their peers and teachers through social learning. The teacher had an active role by monitoring the discussions and scaffolding language learning with the help of grammar and vocabulary when they needed. At the end of the lesson, there was little to do with practice as homework outside the class. For the control group, the content of each week was lectured by the instructor directly through the traditional teacher-student question and answer technique in line with the syllabus of the course. The same questions which were embedded into videos watched by the experimental group were orally asked to the control group by means of teacher-led question and answer method during each class. After teaching content, brainstorming and outlining activities were conducted in pairs or individually. In most classes, drafting and second drafting were assigned as homework outside the class, and feedback and comments were provided in the following class meeting.

Data Analysis

Confirmatory Factor Analysis (CFA) was performed for WSSRLQ scale in order to test its factorial structure. The data obtained from WSSRLQ scale was analysed with descriptive statistical analysis. In addition, Multivariate Analysis of Variance (MANOVA), Paired Samples T-Test, Independent Samples T-Test were employed to examine the effect of flipped classrooms on self-regulated learning strategies in writing. SPSS 22.0 was used to analyse quantitative data based on the significance level of .05.

Research Ethics

Ethical considerations were taken into consideration during the research. The participants were informed about the research and the principle of voluntary participation. Consent forms from the voluntary participants were obtained. Personally-identifiable information from the participants were not collected, and coding was used in pre- and post-test data collection.

FINDINGS

Basic analysis of the data demonstrated the mean values of the 40 items varied from 3.85 to 5.30, and standard deviations went from .65 to 1.2. The skewness was between -.57 and .14, and the values for kurtosis were -1.3 and .03. According to the results of Shapiro-Wilk's test, one variable was significant; it might have been affected by sample size, however (Field, 2009). The fact that the values for skewness and kurtosis are between -1.5 and +1.5 indicates normally distributed data (Tabachnick & Fidell, 2013).

Independent Samples T-Test was used to explore if there was a significant difference between both groups before the flipped intervention. In Table 2, it is shown that there is no significant difference between both groups before intervention in overall scores of WSSRLQ.

Table 2. Independent Samples T-Test Results of Overall WSSRLQ Scale Before Intervention

	Pre	p
Experimental	4.28 ± .81	.732
Control	4.22 ± .33	

Multivariate Analysis of Variance (MANOVA) was utilized to investigate if two groups were significantly different with respect to subfactors of WSSRLQ before the flipped intervention. As Tabachnick and Fidell (2007) state, before MANOVA was conducted, the assumptions of homogeneity of variance and homogeneity of covariance were checked. Levene's test was conducted for homogeneity of variance. The test results showed error variance of the dependent variables were equal across groups ($p > .05$). In terms of homogeneity of covariance, the result of Box's M test indicates that covariance matrices are equal (Box's M= 74.54, p=.07).

Subfactors of WSSRLQ scale were examined through MANOVA showing that no significance with low effect size between the groups occurred before the intervention, $F(9,41)$ =.488, p=.874; Wilk's Λ=0.903, partialη^2=.097. Table 3 shows the results of MANOVA regarding the subfactors of WSSRLQ scale of the groups before intervention.

Table 3. Multivariate Analysis of Variance for the Results of Subfactors of WSSRLQ Scale Before Intervention

	Group	N	Mean	SD	p
TP	Experimental	25	4.86	.93	.887
	Control	26	4.90	.86	
CM	Experimental	25	4.19	.83	.912
	Control	26	4.16	.87	
IP	Experimental	25	4.27	.86	.830
	Control	26	4.32	.81	
GME	Experimental	25	4.32	.99	.785
	Control	26	4.25	.82	
PL	Experimental	25	3.91	1.06	.344
	Control	26	3.67	.88	
FH	Experimental	25	4.01	1.10	.720
	Control	26	4.10	.76	
IE	Experimental	25	4.10	1.11	.112
	Control	26	3.64	.91	
MST	Experimental	25	4.45	.89	.969
	Control	26	4.44	.91	
EC	Experimental	25	4.46	.96	.925
	Control	26	4.48	.89	

TP= Text processing; CM= Course memory; IP= Idea planning; GME= Goal-oriented monitoring; PL= Peer learning; FH= Feedback handling; IE= Interest enhancement; MST= Motivational self-talk; EC= Emotional control

Independent Samples T-Test was conducted to reveal whether both groups significantly differed from each other after the flipped intervention. Table 4 indicates that the experimental and control groups had a significant difference regarding the overall scores of WSSRLQ Scale after the intervention.

Table 4. Independent Samples T-Test Results of Overall WSSRLQ Scale After Intervention

	Post	p
Experimental	4.79 ± .36	.000
Control	4.29 ± .23	

MANOVA was run to investigate if these two groups significantly differed from each other regarding subfactors of WSSRLQ after the flipped intervention. For homogeneity of variance, Levene's test showed error variance of the dependent variable was equal in both groups ($p > .05$). Regarding homogeneity of covariance, the result of Box's M test indicates that covariance matrices are equal (Box's M= 76.63, p=.052).

The results of MANOVA showed the groups significantly differed from each other after the intervention with robust effect size, $F(9,41) = 4.242$, p=.001; Wilk's Λ=0.518, partialη^2=.48. As it is seen in Table 5, the post-test scores of self-regulated strategies in writing of experimental group increased in Text Processing, Course Memory, Idea Planning, Goal Monitoring and Evaluation, Peer Learning, and Feedback Handling. However, there was no significant difference between the groups in Interest Enhancement, Motivational Self-Talk, and Emotional Control.

Table 5. Multivariate Analysis of Variance for the Results of WSSRLQ Scale After Intervention

	Group	N	Mean	SD	p
TP	Experimental	25	5.30	.77	.024
	Control	26	4.84	.62	
CM	Experimental	25	4.74	.68	.027
	Control	26	4.25	.87	
IP	Experimental	25	4.96	.66	.000
	Control	26	4.23	.81	
GME	Experimental	25	5.00	.70	.002
	Control	26	4.25	.73	
PL	Experimental	25	4.54	.75	.002
	Control	26	3.91	.85	
FH	Experimental	25	4.59	.84	.022
	Control	26	4.00	.92	
IE	Experimental	25	4.28	.59	.085
	Control	26	3.94	.74	
MST	Experimental	25	4.82	.71	.469
	Control	26	4.67	.72	
EC	Experimental	25	4.71	.79	.567
	Control	26	4.59	.67	

TP= Text processing; CM= Course memory; IP= Idea planning; GME= Goal-oriented monitoring; PL= Peer learning; FH= Feedback handling; IE= Interest enhancement; MST= Motivational self-talk; EC= Emotional control

Paired Samples T-Test was conducted within groups so as to explore if there was a significant increase between pre-test and post-test scores of overall and subfactors of WSSRLQ scale. The results showed that the experimental group significantly increased the scores of overall and all subfactors except Interest Enhancement, Motivational Self-Talk, and Emotional Control whereas the control group's overall and subfactors' scores did not differ significantly as displayed in Table 6.

Table 6. Paired Samples T-Test Results of WSSRLQ Scale between the Groups

	Experimental			Control		
	Pre	Post	p	Pre	Post	p
TP	4.86 ± .93	5.30 ± .77	.000	4.90 ± .86	4.84 ± .62	.794
CM	4.19 ± .83	4.74 ± .68	.000	4.16 ± .87	4.25 ± .85	.712
IP	4.27 ± .86	4.96 ± .66	.000	4.32 ± .81	4.23 ± .67	.517
GME	4.32 ± .99	5.00 ± .70	.000	4.25 ± .82	4.35 ± .73	.421
PL	3.91 ± 1.06	4.54 ± .75	.000	3.65 ± .88	3.81 ± .85	.284
FH	4.01 ± 1.10	4.59 ± .84	.000	4.10 ± .76	4.00 ± .92	.339
IE	4.10 ± 1.11	4.28 ± .59	.373	3.64 ± .91	3.94 ± .74	.080
MST	4.45 ± .89	4.82 ± .71	.084	4.44 ± .91	4.67 ± .72	.095
EC	4.46 ± .96	4.71 ± .79	.111	4.48 ± .89	4.59 ± .67	.583
Overall	4.28 ± .81	4.79 ± .36	.000	4.22 ± .33	4.29 ± 23	.287

TP= Text processing; CM= Course memory; IP= Idea planning; GME= Goal-oriented monitoring; PL= Peer learning; FH= Feedback handling; IE= Interest enhancement; MST= Motivational self-talk; EC= Emotional control

DISCUSSION & CONCLUSION

The current study aimed to examine whether there was an effect of flipped classroom approach on EFL learners' writing self- regulation, if there were, whether there was a significant difference between the experimental group instructed via the flipped classroom and the control group taught in traditional method in terms of writing self-regulation. Regarding the first question, the findings revealed a positive effect of flipped classroom upon students' writing self-regulation since the means of post-test scores were greater than those of pre-test scores of the experimental group in writing self-regulation. The second research question was to explore whether the experimental and control groups significantly differed from each other with respect to their writing self-regulation. The results indicated there was an overall significant difference between the groups regarding their pre-test and post-test scores of writing self-regulation. The scale had four dimensions including nine subdimensions as cognitive (text processing, memory strategies), metacognitive (idea planning, goal-oriented monitoring and evaluation strategies), social behaviour (feedback handling, peer learning), and motivational regulation (motivational self-talk, interest enhancement, emotional control). The experimental and control groups significantly differed from each other in three dimensions of the WSSRLQ except motivational regulation dimension although an increase in the post-test scores was observed. The results attained in this study tie well with the previous studies wherein the positive effect of the flipped classroom on self-regulation across different contexts was observed. To illustrate, Jdaitawi (2019) aimed to investigate the effects of the flipped classroom approach to preparatory year instruction on students' self-regulation, and the results of the study showed the experimental group had a significantly higher level of self-regulation than the control group did. Likewise, Zarouk et al. (2020) suggested that problem-based learning activities in the flipped classroom improved cognitive and metacognitive abilities both in solitary and group work. Another research similarly showed flipped classrooms improved high school students' metacognitive learning strategies (Al-Abdullatif, 2020). On the other hand, Altas and Mede (2020) in their study reported no significant effect of flipped classroom approach on self-regulated learning in writing skills.

In the current study, the significant increase in the experimental group's cognitive, metacognitive, and social behaviour regulations in the academic writing course may be attributed to some conditions brought about the flipped classroom. Firstly, with respect to cognitive regulation, Jensen et al. (2018) in their study reported video lessons offered advantages over other types of content materials such as textbook style readings. As students were able to watch videos at their own pace, pause, and rewind (Battaglia & Kaya, 2015), it was found out that flipped classrooms could help students to regulate their learning cognitively. Similarly, Bishop and Verleger (2013) highlighted the importance of video lectures for out-of-class as a criterion of the flipped classroom. In the same vein, Smith (2013) stated the use of video lectures would be a better choice since students' preference was streaming content as an out-of-class activity. In the same way, In Battaglia and Kaya's study (2015), it was found that students mostly favoured seeing videos over reading materials outside the class. Secondly, in line with the previous studies, this study has shown flipped classrooms improved students' metacognitive regulation in learning (Kansizoglu & Comert, 2021; Limueco & Prudente, 2019; Van Vliet et al., 2015). Limueco and Prudente (2019) in their study emphasized that flipped classroom provided a learning environment in which metacognition would be promoted with the help of video lessons and embedded questions into them wherein they could learn at their own pace and monitor their own learning. In addition, through the pre-class content provided for the students in flipped classrooms, they can monitor their learning since they have already familiarized with the in-class content and can evaluate their own processes while completing them with respect to difficulty. As can be seen in the previous studies, during the in-class sessions of flipped classrooms, immediate feedback coming from peers and teachers as more knowledgeable agents can facilitate students to both monitor and evaluate their learning with respect to what extent they comprehend, and a realization of any misunderstandings about a concept or subject. In this way, they can overcome this conflict through collaborative work. The study conducted by Pressley and Ghatala (1990) reported that students who scaffolded their peers as tutors were inclined to enhance their declarative and procedural knowledge, and as a result of this, they could develop their cognitive awareness. Considering social behavioural regulation, flipped classrooms offer various opportunities for students to work with their peers (Nederveld & Berge, 2015). In engagement and application processes in classes, students work with their peers to solve problems or complete projects. By the same token, Foldnes (2016) argued that flipped classes in which students answered questions with their peers and received instant feedback from each other promoted peer learning as a powerful tool for learning. In flipped classrooms, peer learning and collaborative work are supported by teachers as a facilitator who supports students, scaffolds them, monitors their progress, and encourages them to participate in group work actively (Du et al., 2014).

The lack of a significant effect of flipped classrooms upon students' motivational regulation including motivational self-talk, interest enhancement, emotional control was not expected in the study. Motivational regulation strategies with the other dimensions of self-regulation considerably relate to student engagement and academic achievement (Pintrich, 2004; Wolters et al., 2011). In the study, motivational regulation was measured under three-subdimensional clusters as motivational self-talk, interest enhancement, and emotional control. Regarding this study, it may be concluded that it seems to be unlikely to change a situation in which students are unmotivated and unwilling to be engaged in their learning tools, materials, and activities at first into a positive condition wherein students are quite satisfactorily delighted with the flipped class approach to writing to learn in terms of motivation within a respectively short period of time. In addition, a behavioural change may occur by enhancing and maintaining motivation for a longer time. On the basis of interest enhancement, task difficulty can be a factor that may result in students' inability to regulate their motivation. The tasks in the coursebook may not relate to students' real lives or they do not know how to deal with them owing to the lack of metamotivational knowledge that helps them to identify the reason why students do not regulate their own learning when they are faced with an irrelevant task. In this sense, Kryshko et al. (2020) suggest that students can approach an irrelevant or a difficult task as if it were a game or chunking activity involving breaking the task into smaller units so that they can have a feeling of success.

The main conclusion drawn from this study is the fact that flipped classrooms promote the improvement of self-regulation in academic writing overall despite not causing a significant difference between the groups in motivational regulation. However, based on the review of literature, there is still a gap on the effect of the flipped class on the improvement of self-regulation. More studies on the effectiveness of flipped classroom in language learning, teaching writing in particular, need to be conducted. This study based on the mean scores of motivational regulation in the experimental group demonstrates there is an increase after the flipped intervention, which may be a question for future research to investigate the effect of flipped classroom on motivational self-regulated learning strategies in writing classes with a more inclusive approach to other aspects within a longitudinal study. Designing a flipped instruction with a comprehensive focus on motivational learning strategies in writing classes can be another basis for future research.

Even though the results obtained from this study are promising, some limitations need to be highlighted. Teacher's increased workload due to the fact that creating the contents and materials via videos can be a primary reason for avoiding a flipped class design for their courses. Teachers can be trained and become more equipped with the application of flipped class models in their courses regarding the online applications, video making platforms, and tutorials in developing contents. Teachers can be assisted in this aspect, which may increase their motivation and involvement in online digital processes. Another concern related to the flipped class model was the students' disengagement in learning outside the classroom, which required the teacher to frequently motivate and encourage them to watch video lessons in time by tracking their progress throughout the videos. This drawback may be overcome by increasing their awareness of the effectives of videos in learning processes.

Statements of Publication Ethics

The authors declare that this study has no unethical behaviour with respect to publication ethics. The study is based on the first author's Ph.D. dissertation (in progress). Thus, this study was approved by the Ethics Commission of the higher education institution where the study was conducted in the academic term of 2019-2020 with the document number 35853172-101.02.02.

Researchers' Contribution Rate

The first author was involved in each stage of the study as it was based on the first author's Ph.D. dissertation (in progress). The second author, the supervisor of the dissertation, made contributions to the study with guidance, instruction and continuous feedback.

Conflict of Interest

The authors have no conflict of interest.

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Hiding in Plain Sight: Pre-Service Teachers' Use of Web 2.0 Tools in Language Classes

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Abstract

In recent years, it has been witnessed that the incorporation of web-based tools for classroom instruction has brought several significant efficiencies in language classes. However, the research shows that even competent teachers may have difficulty coordinating these tools with specific learning goals and fail to reach the objectives of their lessons. Instructional gaps in lesson planning, delivery, and classroom management can be witnessed due to over-reliance on off-the-shelf digital materials or exercises. Therefore, this study aimed to figure out to what extent pre-service teachers use these tools, how much time they allocate to these implementations, which language skill they focus more on, and the perceived benefits of carrying out the courses. Thus, this study focuses specifically on 16 pre-service teachers' 12 week-long practicum days in which they were expected to deliver lessons once each week. The quantitative data were gathered by examining the frequency of digital materials used in classes, the time allocated for these materials in their lesson plans, and the actual time spent in the lesson delivery, and scores from the supervisor observation scale. The qualitative data were elicited from pre-service teachers' reflection notes for themselves and their peers, and structured open-ended questions regarding the use of digital tools in language classes. The results have shown that pre-service teachers rely heavily on vocabulary exercises through digital materials and use them until the end of the lesson without exerting extra effort into constructing knowledge together or engaging learners with more writing and speaking practices.

Keywords: Technology integration, pre-service teachers, teacher education, digital tools, teaching language skills.

Göz Önünde Gizlenmek: Öğretmen Adaylarının Dil Derslerinde Web 2.0 Araçlarını Kullanmaları

Öz

Son yıllarda, web tabanlı araçların sınıf içi etkinliklere dahil edilmesinin dil sınıflarında birçok önemli faydalar sağladığına tanık olunmuştur. Ancak araştırmalar, yetkin öğretmenlerin bile bu araçları belirli öğrenme hedefleri ile koordine etmekte zorlanabileceğini ve derslerinin hedeflerine ulaşamayabileceğini göstermektedir. Ancak, dijital materyallerin veya alıştırmaların sıkça kullanılması ders planlama, uygulama ve sınıf yönetiminde öğretim boşluklarına neden olabilir. Bu nedenle bu çalışma, öğretmen adaylarının bu araçları ne ölçüde kullandıklarını, bu uygulamalara ne kadar zaman ayırdıklarını, hangi dil becerisine daha fazla odaklandıklarını ve katılımcıların bu araçların kendi bakış açılarından olan yararlarını ortaya çıkarmayı amaçlamıştır. Bu nedenle, bu çalışma özellikle 16 öğretmen adayının haftada bir ders vermelerinin beklendiği 12 haftalık okul uygulaması günlerine odaklanmaktadır. Nicel veriler, derslerde kullanılan dijital materyallerin sıklığı, ders planlarında bu materyallere ayrılan süre ve ders işlenirken harcanan gerçek süre incelenerek toplanmıştır. Nitel veriler, üniversiteden gelen gözlemcilerin gözlem notlarından, öğretmen adaylarının kendileri ve akranlarına yönelik yansıtma notlarından ve dil derslerinde dijital araçların kullanımına ilişkin yapılandırılmış açık uçlu sorulardan elde edilmiştir. Sonuçlar, öğretmen adaylarının dijital materyaller aracılığıyla kelime alıştırmalarına büyük ölçüde dayandıkları ve bunları işlerken öğrencilerin farklı becerilerini geliştirmeye yönelmeye fazladan çaba harcamadan kullandıklarını göstermiştir.

Anahtar kelimeler: Teknoloji entegrasyonu, öğretmen adayları, öğretmen eğitimi, dijital araçları, dil becerileri öğretimi.

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INTRODUCTION

A typical teacher education context generally immerses students with theoretical knowledge and rationale behind technological pedagogical content knowledge by allocating less time to practice what they learn in classes (Johnson & Freeman, 2001), which gives rise to pre-service teachers' failure to translate theory into practice in the classroom (Bartels, 2005; Freeman & Johnson, 1998). Teacher learning has been viewed as front-loading, which means that they can be educated and be ready for all classroom demands at the start of their careers and keep using this knowledge throughout their career (Freeman, 1993). This perception has been proven wrong, with various research studies revealing that both pre-and in-service teachers fail to transmit their knowledge into practice in their classrooms. As Freeman and Johnson (1998) claimed, the real truth is that most teachers learn best when they start teaching with hands-on experiences, and less so in typical teacher education programs.

For the last two years, digital tools in language classes have become the center of teachers' classroom implementations due to distance and hybrid education in schools. Teachers can reach a plethora of authentic or ready-made instructional materials in the target language with a single mouse click. With the abundance of such sources, the efficient utilization of these sources to achieve course objectives calls for closer examination because technology should be incorporated into lessons with enough care and thought (Abbitt, 2011; Compton, 2009; Taghizadeh & Yourdshahi, 2020). Although recent research focuses on the benefits of technology in increasing students' engagement and motivation (Demirkan, 2019), some research studies reveal that only a few teachers can take advantage of technology applications by corresponding them with specific learning goals (Heitink, et al., 2016). Therefore, without connecting technology and learning goals, the expected profit from technology integration may not be driven appropriately, which means that let alone pre-service teachers, even experienced ones, may lose their time and energy with the wrong technology integrated instructions.

Several studies have shown that pre-service teachers integrate technology into their lesson deliveries (e.g., Beschorner& Kruse, 2016; Theiman, 2008; Tondeur et al., 2017). However, even experienced teachers still have insufficient knowledge about using them appropriately in their classrooms (Ertmer & Ottenbreit-Leftwich, 2010). As for pre-service teachers, the evidence from the literature indicates that the education they received on technology in classes cannot be transferred well into their classroom practices (Angeli & Valanides, 2009; Tondeur et al., 2013). In addition, some barriers such as lack of time, lack of ability to integrate content and digital tools in language teaching, and lack of professional development and experience in teaching have been reported to be debilitating factors in successful technology integration for pre-service teachers (Hutchison & Reinking, 2010). Although they are considered digital natives, it sounds interesting to hear that pre-service teachers feel inadequate when preparing lessons with technology (Sang et al. 2010). This feeling of insufficiency may come from their inexperience in integrating all technological pedagogical content knowledge into their teaching. Therefore, this chapter aims to shed more light on pre-service teachers' technology integration in their educational practices by answering the following research questions:

1. In which part of the lesson do pre-service teachers use digital tools most? In presentation, practice, or production part?
2. Is there any difference between the time allocated for digital tools in pre-service teacher's lesson plans and actual time spent on them in in-class activities?
3. Which language skills do pre-service teachers focus on most with digital tools? Vocabulary, Reading, Listening, Writing, or Speaking?
4. What do university supervisor observations reveal on their English lesson delivery?
5. What are pre-service teachers' perceptions on the use of digital tools in language classes?

METHOD

In the last decades, raising technology-literate teachers has consistently been emphasized, as teachers need to be sufficiently qualified to meet the demands of the twenty-first-century skills (Gudmundsdottir & Hatlevik, 2018; Foulger & Graziona, 2017; Rokenes & Krumsvik, 2016). In the early days of technology integration in classes, most teachers reported having computer anxiety, which was thought to be a debilitating factor in technology use in classes (McInerney et al., 1994). A very optimistic picture was drawn when digital natives, considered innovators and eager users of technology, started to be teachers at schools (Rideout et al., 2005). However, being proficient at technology use does not necessarily mean being able to use technology pedagogically in the classroom context. Teachers may sometimes fail to use technology critically or meaningfully by

demonstrating little understanding of the facilitative role of technological tools or materials. Therefore, more careful consideration should be given to the diversity of ICT tools and their classroom competencies (Lei, 2009). The pre-requisite for a complete and successful ICT integration in teacher training with which teachers' technological knowledge is enhanced to integrate it into their classroom implementations successfully. To achieve this, Göktaş, et al. (2009) emphasized the importance of redesigning teacher education programs, including instructional technology design courses that are continuously updated with current developments. By doing so, pre-service teachers will feel more qualified to teach with technology (Darling-Hammond et al., 2009; Hammond et al., 2011).

Effective technology integration in courses calls for a critical and wise combination of knowledge of content, technology, and pedagogy (Koehler et al., 2007). The relationship between these three knowledge types is introduced with a new framework called Technological, Pedagogical, and Content Knowledge (TPCK). To ease the memory and pronunciation of the acronym, TPCK was converted into TPACK in later studies (Koehler & Mishra, 2009; Thompson & Mishra, 2007). Many researchers have researched this construct (e.g, Archambault & Bernet, 2010; Chai et al., 2013; Crompton, 2015; Rosenberg & Koehler, 2015). Angeli and Valanides (2009) found that growth in one construct does not automatically lead to an increase in TPACK, which means that even experienced in-service teachers with some knowledge of computer programs may not perform well in their classes or a pedagogically qualified teacher may not carry out successful lessons with technology integration. However, it was found that when teachers are trained on how to teach with computers, teachers with stronger pedagogical skills, better content and student knowledge outperform teachers with less knowledge in the same areas (Angeli & Valanides, 2009). To shed more light on the components of TPACK and the relationship of each component to one another, Chai et al. (2013) examined the perceived development of pre-service teachers in each component and the synthesis of their knowledge. Their statistical analysis revealed that knowledge of all components is a predictor of pre-service teachers' TPACK, with pedagogical knowledge having the most significant impact. Therefore, field experiences, which are regarded as an essential preparation stage for teaching (Buck et al., 1992), should provide pre-service teachers with environments where they can transform what they have learned pedagogically into technology-integrated classes.

A review of recent teacher education research around technology shows various models which improve TPACK by providing teachers and teacher candidates with educational problems that must be solved by technology (Fulton et al., 2003; Hacker & Niederhauser, 2000). For instance, Koehler and Mishra (2005) developed an alternative approach to foster teachers' understanding of the interrelation of technological knowledge, pedagogical knowledge, and content knowledge. This approach is called "*learning by design,*" which is philosophically and pragmatically related to constructivists and project-based approaches such as learning by design, problem-based learning, collaborative learning frameworks, etc. Koehler et al. (2007) state that this approach affords opportunities for teachers and teacher candidates to encounter rich connections between technology, content, and pedagogy as they learn more about these variables by actually using and designing educational technology to teach specific content; therefore, this approach teaches teachers how to be designers of technology instead of consumers of technology. Depending on this framework, particular emphasis has been given to create ICT design projects, which will enable pre-service teachers to develop the connection between technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) (Mishra & Koehler, 2006).

METHOD

This is a descriptive mixed-method study that adopts a convergent parallel design. In such designs, both qualitative and qualitative data are gathered simultaneously but analyzed independently. As a result, overall results are combined for meaningful interpretation (Creswell & Plano Clark, 2011). The quantitative data was elicited from pre-service teachers' lesson plans (the number of technology-integrated materials and the duration given to them were elicited) and the actual time they allocated for technology-integrated materials in their lesson delivery (elicited from participants' after delivery reflections as they were specifically asked to write the time they occupied after lesson). Additionally, the information gathered from lesson plans showed, by using digital tools, which language skill (vocabulary, reading, writing, speaking, and listening) they focused on each week more. The numbers of digital materials, the duration given to them, and the actual time spent in the classroom and the supervisor scores in observation scale (two observation scales for each pre-service), which is given by the Ministry of Education in Turkey to university supervisors and school mentors to grade pre-service teachers' performance on specific descriptors, were computed to describe their tendencies in lesson delivery. Finally, descriptive statistics

were run to see which language skill they focused on more. The qualitative data were elicited from pre-service teachers' reflective journals (each week), and open-ended structured questions on the technology integration in language classes. Theme-based thematic analysis was done, and emergent themes were tabulated and discussed in detail.

Participants

In a language teacher education program, prospective teachers take four years of various theoretical courses, including English language, literature, and language teaching methods. In their final year in the program, these teacher candidates are expected to take a school experience course (practicum). They visit schools regularly and observe English classes in state or private schools. In total, they are expected to be in these schools at least 168 hours of class in a year in which they teach at least 24 times 40-minute lessons at primary and secondary levels. They are expected to write their lesson plans in advance and send it to both the mentor teacher and university supervisor. They are also expected to write reflections on their teaching and their peers' teaching by noting each detail of what went well and wrong in their lessons. At the end of the school experience, these candidates must submit a portfolio that includes all of their peer observations, self-reflection, and lesson plans. Each participant is expected to complete a compulsory practicum that aims to integrate the program content of their departments within the authentic teaching and learning environment.

The participants of this study (N=16, 14 female, 2 male) were assigned to give 6th and 7th graders English courses in a public school. The first two weeks of practicum were allocated to classroom observation in which participants closely examined their mentor teachers and wrote reflective journals. For the remaining 12 weeks, they had to teach at least one classroom hour each week. In addition, the practicum group was formed with at least two pre-service teachers to facilitate peer feedback. To gain more insights into their use of digital tools, they were asked to write their perceptions of digital tools in language classes through structured, open-ended questions at the end of the practicum.

Procedure

The procedure for data collection has been tabulated in Figure 1. All participants wrote their lesson plans paying specific attention to details requested by the researchers. During their course delivery, university supervisors observed some of their lessons and graded their performance according to descriptors provided in the observation scale (See Table 6). After they delivered their courses, they were asked to write reflective journals, including the actual time they spent on the use of digital tools, their perceptions, and peer observation notes. They followed these steps for each course delivery over 12 weeks, and they were asked to write their perceptions on the use of digital tools by answering open-ended questions.

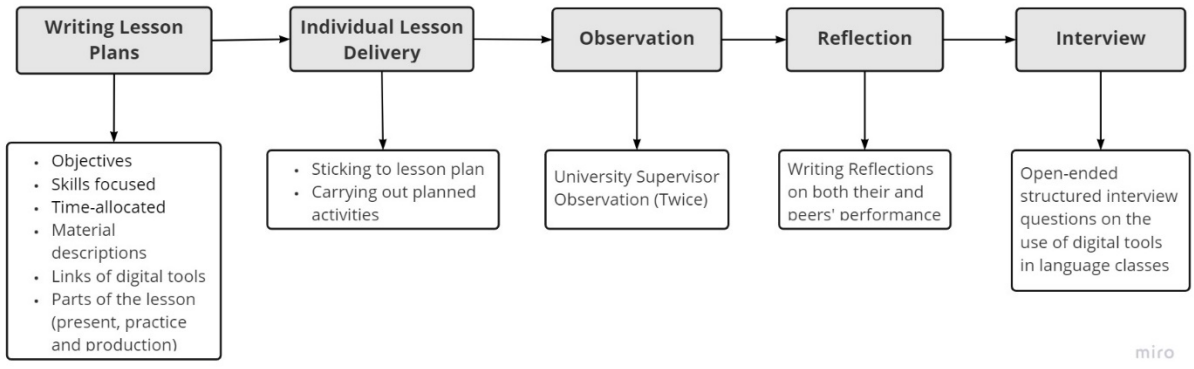

Figure 1. *Procedure for Data Collection*

FINDINGS

The purpose of the study was to shed more light on classroom implementations of pre-service teachers (in practicum days) who get the advantage of publicly available digital tools and materials. When lesson plans were analyzed in detail, the total number of digital tools used in classes of pre-service teachers was computed for statistical analysis. The findings showed that 50% of the digital tools were planned to be used in the "practice" part of the lesson, while only 9% were intended to be used in the "production" part. The "presentation" part consisted of 41% of the total digital tools. This finding shows that pre-service teachers in the current study mostly used digital tools to facilitate receptive knowledge of their students while not getting help from these tools to enhance productive knowledge of language items and structures. Table 1 demonstrates the descriptive statistics for each lesson part's number of digital tools.

Table 1. Parts of the Lesson in Which Digital Tools are Used

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Presentation	16	5	10	131	8,19	1,601
Practice	16	8	14	164	10,5	2,049
production	16	1	4	29	1,81	,981
Valid N (listwise)	16					

The second research question was about time management by using digital tools. When pre-service teachers' pre-conceived time management in their lesson plans and the actual classroom time spent on the planned materials were computed, it was found that digital tools take much more time than expected in classes. Table 2 demonstrates the number of digital tools used in classes, the time allocated for them (minutes), and the actual time spent in classes with these tools.

Table 2. Lesson Plan Analysis for Time Allocated for the Use of Digital Materials and Actual Time Spent in Class Course Delivery

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Number Digital Materials	16	14	26	333	20,81	3,600
Time Allocated for Them (Min)	16	120	260	2870	179,38	44,342
Actual Time Spent Class (Min)	16	170	300	3615	225,94	39,884
Class Hour (Min)	16	320	320	5120	320,00	,000
Valid N (listwise)	16					

The results show that the participants planned nearly 56% of their lessons with digital tools and spent 70% of the classroom hour on these tools. The gap between their planning time and actual classroom implementation can be attributed to their inexperience in teaching. They must have disregarded the classroom atmosphere while tending to use these tools. However, as teacher observation notes show, this delay led to less focus on productive skills, which were generally planned to be at the end of the lessons.

The study has also focused on analyzing language skills attempted to be taught in language classes. Details for each language skill are tabulated in Table 3.

Table 3. Skills Focused on with the Aid of Digital Tools

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Vocabulary	16	10	16	224	14,00	1,67
Listening	16	2	5	61	3,81	1,04
Speaking	16	0	0	0	,00	,00
Reading	16	0	2	8	,50	,73
Writing	16	0	0	0	,00	,00
Valid N (listwise)	16					

The analysis revealed that pre-service teachers mostly utilized digital tools (76.5 % of total digital tools) for decontextualized vocabulary exercises by asking learners to come and match list or play a game with target vocabulary items that are publicly available online. All these activities were reflected by the smartboard in classes. This tendency can be attributed to the easiness of finding these tools and implementing them in classes.

They can easily find many vocabulary practice sources online and ask students to complete them in a class hour, which helps them exert less effort to recycle target items in classes. Another common category that was primarily focused on was listening and reading. Just like vocabulary sources, there is a large number of reading and listening sources online. In addition, YouTube videos were computed under the listening category. In most cases, listening activities were used as icebreakers in language classes.

Supervisors' Observation Scale Results

The University supervisors observed each pre-service teachers' teaching English in practicum days twice and gave grades to them depending on descriptors written in the observation scale developed by the Ministry of National Education for Academic advisors and mentor teachers at schools. The observation scale included grades from 1 (the lowest) to 3 (the highest) for each descriptor. This observation scale consists of two sections, one of which is written for university supervisors and the other is written for mentor teachers. Therefore, only the first part demonstrated below was filled by the supervisor academicians twice, which means that the highest score obtained from each descriptor is 6. Table 4 illustrates the mean scores of each descriptor.

Table 4. Practice Student Evaluation Form

Subject Area and Field Education	Mean Scores of All participants	Std. Deviation
1.1 Content Knowledge		
1.1.1 Knows the basic principles and concepts related to the subject	5.88	,50
1.1.2 Uses the basic principles and concepts in the subject area logically.	4.88	1,02
1.1.3 Uses verbal and visual language required by the subject (shape, diagram, graphic, formula, etc.) appropriately	5.50	,89
1.1.4 Has the ability to associate the subject with other subjects in the field	2.63	,95
1.2 Pedagogical Knowledge		
1.2.1 Knows special education approaches, methods, and techniques	5,25	1,00
1.2.2 Benefits from instructional technologies	5,88	,50
1.2.3 Identifies wrongly developed concepts in students	3,25	1,00
1.2.4 Has the ability to generate appropriate and sufficient answers to student questions	4,88	1,02
1.2.5 Ensures the safety of the learning environment	5,88	,50

2.0 Teaching-Learning Process		
2.1 Planning		
2.1.1 Has the ability to write the lesson plan in a clear, understandable, and orderly manner	6,00	,00
2.1.2 Has the ability to express purpose and objectives clearly	5,88	,50
2.1.3 Identifies appropriate methods and techniques for target behaviors	3,00	1,03
2.1.4 Selects and prepares suitable tools and materials	3,88	1,54
2.1.5 Identifies appropriate assessment forms for target behaviors	2,63	,95
2.1.6 Associates the subject with previous and next lessons	2,50	,89

In the content knowledge part, it was observed that teacher candidates fail to associate the subject with other subjects in the field. For example, when they teach the subject "chores" with "have to / has to", they avoided giving additional examples with other grammar forms. Although they knew that their learners were familiar with, for example, "is/are expected to", they did not give any additional sentences to revise previously learned topics. This finding can be attributed to the novice nature that keeps them engaged only with teaching whatever they wrote into their lesson plans. The other descriptors of content knowledge part did not seem to be problematic at all. When it comes to the pedagogic knowledge, it was observed that they failed to give appropriate feedback to their learners when they made mistakes. Most of these mistakes were mispronunciation of target vocabulary items. The most problematic part was observed to be the teaching-learning process part. They failed to match appropriate materials to reach target learning behaviors. For example, in their lesson plans, they included a production section; however, due to improper time management with other tools and materials, they could not move on to facilitating their productive knowledge. One of the most problematic aspects of their teaching practice was that they failed to recycle language structures and get the learners ready for the upcoming lessons. As the participants were concerned with course delivery in most cases, they did not do any summative assessment. The only assessment type observed in these classes was achieved by online exercises with students. However, even with these exercises, they gave very limited feedback or recasts.

Pre-Service Teachers' Perceptions of Using Digital Tools in Their Classes

Educators generally carry various beliefs and attitudes about the best classroom implementations that have the potential to increase learning conditions in their classroom contexts. These beliefs influence their classroom practices and shape their teaching experiences (Kagan, 1990). Therefore, eliciting their views on using these tools in their classes gives detailed insights into their metacognition to use digital tools in their classrooms. When examined thoroughly and subjected to content analysis, the interview data revealed some common themes that emerged from the data. These are written in detail below.

Table 5. Pre-service Teachers' Views Regarding of Digital Teaching Materials

Theme	Subthemes	Freq.	Sample Views
Advantages of Using Digital Tools for Lesson Preparation	Ease of use	16	*P 11 Online teaching tools have made our jobs easier. We can find many videos and interactive and ready-made worksheets on the target grammar rules and lexical items. When I plan my lesson, I try to add more digital tools that can help me explain new topics or recycle the previous ones.*
	Time Saving	13	*P 6 When I plan my lesson, I can quickly access many Web.2.00 digital tools to complement my materials. I don't spend so much time on searching for worksheets or developing my own activity. Readymade ones are there for us.*
	Less labor intensive	8	*P 14 I don't exert much effort to find appropriate web. 2.00 tools to write my lesson plans. I easily find interactive worksheets and use them in my classes.*

Advantages of digital tools in class applications	Engage more students	16	*P 8 We can create opportunities for learners to practice what they learned in the previous lesson by engaging them in meaningful language practice. The Web.2.0.0 tools that we have used in classes were life-saving and complimentary for our classroom practices. Based on my experiences, I can state that even the quietest students in the class who do not attend the classes frequently participate in the activities prepared with digital tools.*
	Overcome Boredom	10	*P 6 Digital materials brings fun and excitement to the classes. Learners do not get bored and time flies when we use these tools in classes.*
	Appeal to more senses	8	*P 5 Digital tools include visual and auditory facilities. These facilities are generally well selected and attracts interests of the learners. There are also funny videos, songs and listening tracks. Therefore, these tools appeal to more than one sense.*
	Motivates teachers more	7	*P 10 Since digital tools contribute to students' learning while having fun, their motivation for the lesson is also high. Therefore, in addition to their effects on students' motivation, I can say that digital tools also contribute to my motivation as a teacher candidate. Because thanks to these tools, when I observe that the students participate in the lessons willingly, I can say that my motivation as a teacher candidate has increased and that I tend to teach most of my classes using digital tools.*

Perceived Pedagogical Advantages of Digital Tools

When the participants were interviewed about using these tools, they reported many advantages of their use in language classes. One of the common themes that emerged from the interview data is the easiness of accessing these sources. Online tools have become increasingly available for use in the educational context. The internet serves great and sophisticated sites where teachers can create their own worksheets or use publicly available ones without much effort. Being aware of this fact, especially after the covid-19 outbreak, both in-service teachers and pre-service teachers witnessed the implementation of many materials in language classes. As such, their familiarity with these tools has increased, which resulted in more tendency to use such tools in their lessons. All of the participants reported that they could find whatever they wanted quickly by making queries from search engines. They said that the availability of such sources offers them unprecedented opportunities in their classes as they face fascinating options for using technology in their classes.

The second theme emerged based on the interview responses that these sources are time-saving and less labor-intensive. The participants received a material design course at the university. This course required them to create their own handmade materials that have the potential to be used in language classes. This philosophy was broken by the online tools which are available for everyone. The participants mentioned that using online tools saves their time (N=13) and energy (N=8). Instead of preparing their own materials, they report that many materials sources are online, which can easily be used or adapted for their classroom use.

Another common theme was that using digital tools helps teachers engage more students in classes. All participants mentioned the motivating aspect of online tools in language classes. They said they could create engaging experiences for learners by choosing complementary tools from various options and creating active learning spaces.

Ten of the participants said that the use of digital tools helps teachers overcome boredom in classes, which facilitates learners' participation in classroom activities. The interview data has also revealed that participants do not want to adhere to traditional teaching methods, which they consider boring and useless. The data showed that when they use interactive smart boards and ask learners to do some activities one by one, they can easily recognize the flash of interest in their learners' eyes, especially when they have a competitive task. In addition, all of the participants reported that using online tools keeps learners stimulated and craving for more exercises.

Another theme is the effect of the utilization of digital tools on increasing teachers' motivation. Seven participants mentioned that they observed how their students felt when using digital tools. The reason behind pre-service teachers' heavy dependence on using such tools can mostly be attributed to this fact. The more students get involved into class activities the better teachers feel as long as the concern of the teacher is to occupy classroom time. Thanks to all affordances of such tools, pre-service teachers get all advantage of these tools and do their responsibilities by depending on them too much.

One of the most frequently mentioned themes was the facilitative role that digital tools play on language skills. Having visual and auditory features that can be adapted or used following the learners' needs is believed to have the potential to increase learners' ability to memorize more words, understand reading passages better, and use the language in a more meaningful context.

Pre-service Teachers' Views on Using Digital Tools in Language Classes

Pre-service teachers shared their perceptions of using digital tools in classes by referring to their in-class experiences. As Table 6 demonstrates, thirteen participants touched on the importance of using these tools timely and effective. Digital tools are seen to be effective complementary materials for pre-service teachers. Some participants reported that instead of depending heavily on these tools, pre-service teachers should use them timely and effectively to reach their course objectives. Admitting that spending all classroom hours for digital activities on some occasions, they failed to facilitate other skills such as speaking and writing.

Raising concerns about the choice of appropriate digital materials, half of the participants commented on their peers' teaching practices indicating that some of them didn't use appropriate exercises, or tools or didn't have enough technological skills to use in classes. These categories will be discussed in detail by complementing data from the quantitative findings.

Table 6. Pre-Service Teachers' Perceptions of the Use of Digital Tools

Theme	Subthemes	Freq.	Sample Views
Time Management	Effective planning	13	P 7 Sometimes, I failed to finish exercises with digital tools due to wrong time planning. Therefore, teachers should be more careful with lesson plans when integrating these sources into their lessons, as they take more time than expected.
Technological, Pedagogical Content Knowledge	Appropriate activities for levels of learners	9	P 3 I once chose a video for my students. It was so long and included so many unknown words that most of the students failed to answer the following questions.
	Appropriate materials	12	P4 Some of the ready-made materials included different lexical items so I had difficulty introducing the new words while helping them do the activities.
	Appropriate content	6	P16 teachers using digital tools should construct students' knowledge through active involvement into activities.
	Appropriate technological knowledge	14	P4 Some digital tools are easy to use, but when we tend to make our own online materials, we may feel inadequate as our knowledge on the process is limited.

DISCUSSION & CONCLUSION

The current study aimed to describe the existing practices of pre-service English teachers in the integration of digital tools aspect and sought to understand why these practices happened and what could be done better. Gaining deeper insights into pre-service teachers' educational practices is essential because their misconceptions or malpractices could be spotted to eliminate potential future problems in their teaching. The use of technology in instruction plays an important role; however, this use does not necessarily mean that the lesson can reach its objectives. Rather than what to use, how to use digital tools in classes should be questioned, and teacher education programs should provide more successful technology integration examples to their students. The literature has well documented that good performance in teaching requires teachers' knowledge about themselves, the knowledge of technology, pedagogy and content, and the knowledge of each context in which they do their job (Fulton et al., 2003; Koehler & Mishra, 2009; Johnson, 1999). Additionally, it is also acknowledged that teachers

must have a more critical eye on technological materials to ensure they complement their class activities and help reach the objectives of the courses (Waight & Abd-El-Khalick, 2007) and instead of occupying the whole classroom time with these digital tools, they need to use them as complementary tools that allow multimodal production.

The current study results showed that pre-service teachers' technology integration in their courses successfully motivated learners to participate in-class activities. However, when the big picture was analyzed in detail, it was found that the most effortless and straightforward approach was taken when integrating technology in their class deliveries. Commonly used vocabulary exercises with individual matching and multiple-choice word practices; they did not try to improve speaking and writing skills with digital tools. In recent years, the systematic and frequent use of computer-based tools may have left a misconception that teachers have to integrate technology in most parts of their classroom, with the notion that more technology equates to better education approach. Although their mentors and supervisors continuously informed them, they kept on depending on these tools to occupy lesson hours. Contrary to popular assumption, excessive utilization of technology does not always result in a better educational experience. Instead, it usually ends in a hasty adoption of digital materials without careful analysis of their educational practicality.

The logic behind teachers' lesson deliveries, choice of materials, and time allocation for specific tasks are reflected in their classroom practices (Ball, 2000). Therefore, the themes that emerged from the participants' interview data complement and explain the quantitative data findings. All perceived advantages of using these tools (ease of use, time and energy saver, student and teacher motivator, etc.) are the reason behind heavy dependence on these tools in their classes. It is a well-known fact that the development of technology-based materials has generated various choices for today's teachers. Using technology to deliver a part of a lesson or manage all parts of the lesson by depending on these tools is in the hands of the teachers. In that sense, the question of how teachers can find the best and the most effective tools; how and when to implement these tools should be known thoroughly to reach the objectives of the lessons. A good language lesson does not consist of a series of exercises or activities that the teacher brings to class to occupy classroom time; it requires a solid understanding of how a foreign language is taught by taking into account the needs of the learners in each aspect of language learning (Richards & Bohlke, 2011). In the case of the current study, the participants believed that these tools have varied benefits for learners; they overemphasized simple exercises and activities to facilitate learners' vocabulary knowledge. Instead of using these tools as mediators for overcoming boredom, they placed them at the center of their classes and felt responsible for opening and closing these tools till the end of the lesson. Paying less attention to other skills such as speaking and writing in classes can be attributed to the relative scarcity of easy and applicable digital tools for these skills. However, a sufficiently qualified teacher should implement their in-class activities to facilitate all language skills simultaneously _ be it a speaking skill, writing skill, reading skill, and listening skill.

The frequent use of vocabulary exercises by digital tools can best be explained by ease of finding and using them in classes. Asking only the meaning of the target item and moving to the next one must have been easier than helping students read, listen and comprehend a text or speak in the target language. That is, they occupy nearly most of the classroom time by recycling vocabulary items without taking a more active role in providing learners with the opportunities to take part in extended practice by producing the target language. This result can be seen from the finding that showed they, in most cases, use digital tools for practice leaving a very limited or nearly no place for the production part.

Hiding behind many advantages of using digital tools in classes, pre-service teachers in the current study failed to provide a coherent sequence of learning activities encompassing more than one language skill. This result can be attributed to their inexperience in language classes. In addition, they struggle to overcome barriers such as classroom management in crowded classes or choosing appropriate complementary materials.

The results have shown that pre-service teachers allocate most of the classroom time using online sources. They mainly focused on lexical items by finding repetition drills and matching exercises using some websites and digital tools. They sometimes integrated listening tools, but most of the time, they recycled vocabulary items. The study has also revealed a difference between their planned time for each activity and their actual classroom performances. However, this time difference seemed to decrease as they got more experienced using these tools.

The description of the overall picture of pre-service teachers revealed a problematic and worrisome scene. Teacher education faculties may have more goal-orientated instructional technology design courses in which pre-service teachers are educated to integrate all language skills and computer-based materials in their classroom settings. The results showed that additional attention should be given to speaking and writing, which were the least touched skills by pre-service teachers. Lastly, Hutchison and Woodward's (2014) technology integration planning

cycle (TIPC) can be adapted to the language teaching context to assist pre-service teachers when selecting appropriate digital tools to reach the instructional objectives of their lessons.

Researchers' Contribution Rate

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion	(Other)
Author 1	☒	☒	☒	☒	☒	☒	☐
Author 2	☐	☒	☒	☒	☐	☒	☐

Conflict of Interest

The authors hereby declare no potential conflicts of interest with respect to research, authorship and/or publication of this article.

Statements of Publication Ethics

Authors hereby declare obeying the principles of publication ethics.

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Student-Generated Videos: A Bibliometric Analysis and Systematic Review

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Abstract

This study aims to provide an overview and contribute to the related literature by examining the videos created by the students. In this context, a systematic literature review was conducted in addition to a bibliometric analysis that was performed using the bibliographic data from Web of Science directory to identify the common words. Afterwards, word clouds were formed based on the information gathered from titles, keywords, and abstracts of studies. The literature highlights the metacognition category, that is students' thinking about their own learning, with relation to the purpose of use for the student-generated videos. Further, it is observed that the sampling of studies was mostly carried out in the higher education level. In terms of theoretical background, unspecified studies outnumber; theories in which students actively engage such as collaborative learning, constructivist approach and experiential learning stand out.

Keywords: Student-generated videos, bibliometric analysis, systematic literature review.

Öğrenci Tarafından Oluşturulan Videolar: Bibliyometrik Bir Analiz ve Sistematik İnceleme

Öz

Bu araştırmanın amacı, öğrencilerin oluşturdukları video çalışmaları ile ilgili alanyazın incelenerek, alanyazına genel bir bakış sunmak ve bu alandaki uygulamaları aydınlatmaktır. Bu bağlamda sistematik literatür incelemesi yapılmıştır. Aynı zamanda sistematik literatür incelmesi için Web of Science dizininden elde edilen bibliyografik veriler kullanılarak ortak kelime analizi yapmaya yarayan bibliyometrik analiz yapılmıştır. Başlık, anahtar kelimeler ve özete göre kelime bulutları elde edilmiştir. Alanyazında öğrenciler tarafından üretilen videoların kullanım amaçlarında öğrencilerin kendi öğrenmesine yönelik düşünmesi anlamına gelen üst biliş kategorisi ön plana çıkmıştır. Yapılan çalışmaların örneklem kademesi olarak çoğunlukla yükseköğretimde yapıldığı görülmüştür. Kuramsal dayanak açısından, belirtilmemiş çalışmaların sayısı daha fazladır; işbirlikli öğrenme, yapılandırmacı yaklaşım ve deneyimsel öğrenme gibi öğrencilerin aktif olarak yer aldığı kuramlar öne çıkmaktadır.

Anahtar kelimeler: Öğrencinin oluşturduğu videolar, bibliyometrik analiz, sistematik alanyazın incelemesi, literatür incelemesi.

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INTRODUCTION

The creation of videos by students is considered as the videos created for learning purposes (Alqurashi, 2020, p. 220). Videos created by students is expressed in various ways, such as student-created video, student-authored, learner-authored, or learner-created video, student or learner-generated media, student or learner designed digital media, and student or learner generative video media. Analysis of all these studies reveal the active participation of the students in the process. Students involve in the processes dynamically; hence, their perception and the way they use information deserve attention (Campbell et al., 2019; Campbell et al., 2020).

By actively engaging in the process of creating a video, students experience a more independent learning route for their own learning needs compared to passively watching the videos prepared by the instructor (Annan et al., 2019; Snelson, 2018). Students not only synthesize numerous resources related to subject content, but also write a script, read it, rehearse it, and then take multiple shots and edit. These activities enable students to gain competences of cross-curricular and self-expression skills (Annan et al., 2019; Arruabarrena et al., 2021). Studies on these videos have reported improvement in students' higher-order thinking skills, levels of participation, satisfaction, and collaboration skills (Annan et al., 2019; Benedict & Pence, 2012; Gallardo-Williams et al., 2020).

A limited number of research have examined issues related to student-generated videos (Reyna & Meier, 2018; Snelson, 2018). For instance, Epps et al. (2021) analyzed the use and benefits of studies on student-generated videos through a systematic literature review using the databases of JSTOR, ScienceDirect, Google Scholar and EBSCO. A total of 39 studies were reviewed within the context of pre-defined inclusion and exclusion criteria. The findings indicate that the production of videos by students reduces cognitive load, promotes creativity, enhances student independence, increase cross-curricular competence, and enable students to gain the ability to apply knowledge in a meaningful way. It is recommended that learning objectives be clearly stated; the teacher guide the students to manage their time effectively during the video projects; the students be exposed to diverse video and media designs to discover their creativity. Furthermore, leading experimental research help to explore student achievement thoroughly.

From another perspective, Snelson's (2018) research surveyed student video production with reference to content area learning. Within the scope of the study, 61 selected studies from 2006 to 2017 were systematically investigated. According to the results, student-generated videos form an integral part of the instruction to meet the learning objectives of competence, performance, composition, literacy, or creativity. Moreover, educators from multiple disciplines considered video creation by students as a viable strategy for assessing student learning.

Reyna and Meier (2018) reviewed literature by limiting the criteria to subject area and target audience and digital media created by the learner. The research followed four stages: identification, screening, filtering, and selection of relevant studies. Video animation, screenshot, digital story, and podcast creation studies were considered as student-generated digital media. Lack of student-generated digital media studies negatively influences the decisions of the model to be applied, and theoretical structure. Hence, consistent methodology deficits to evaluate the learning experience of the students; the field needs to be further explored. Specifically, regardless of content type produced by students, science teaching seems advantageous. A framework of design, implementation, and evaluation of digital media assignments by students necessitate to guide the educators.

Gallardo-Williams et al. (2020) presented an analysis on the use of student-created videos in chemistry and chemistry education in the context of generative learning theory. It also covers information about videos created by chemistry education students and presents guidelines for future researchers planning to integrate videos into their studies. Reflections of student-generated videos in the curriculum focus on the use of videos in the chemistry laboratory and those demonstrating chemical concepts.

Literature on student-generated videos is limited and bounded by specific fields such as chemistry education or science education. Despite their use in different disciplines, these videos seem integral to the content area, and are used especially for evaluation purposes. This study demonstrates that student work can be used in multiple ways without being restricted to the field. This perspective is believed to guide scholars conducting disciplinary and interdisciplinary research and those willing to integrate and research the student-generated video works.

This study aims to provide an overview of the literature by examining student-generated videos and to illustrate its implications to this field. For this purpose, answers to the following questions were sought:

Research Questions

1. What are the results of common word analysis of student-generated videos?
2. How do student-generated videos show a distribution based on the following?
    a. Subject area
    b. Disciplines
    c. Research design
    d. Sample level
    e. Sample size
    f. Sample selection method
    g. Data collection tool
3. How are student-generated videos used in the literature?
    a. How are they distributed according to the theoretical background?

METHOD

The bibliometric analysis method was used to answer the first research question of this study by presenting an overview of student-generated videos. This method provides a quantitative summary of information about studies (Hung & Zhang, 2012). The analyses of citation, co-citation, bibliography match, co-author and common word can be performed with numerous software. Common word analysis as a type of bibliometric analysis examines the concepts used in the title, abstract and keywords of the selected studies and the relationship between these concepts (Bağış, 2021). Since the software for bibliometric analysis functions as complementary, the content analysis takes less time (Hung & Zhang, 2012). A word cloud visualized the common word analysis. Word cloud, also referred to as tag cloud, is a visual representation of text data collected from various keywords or any text material (Kulakli & Shubina, 2020). The second and third research questions were examined with the descriptive analysis method, a qualitative research method, aiming a systematic review. In descriptive analysis, after the data analysis and description in a systematic way, the cause-effect interrelationships are explored and conclusions are reached (Yıldırım & Şimşek, 2013).

Observation, interview, and document analysis are among the data collection tools in qualitative research (Yıldırım & Şimşek, 2013). Since related literature is examined in terms of certain variables, this study utilizes document analysis method. The following inclusion and exclusion criteria are applied to access the studies to be systematically reviewed by the document review.

- Inclusion criteria
    - Student-generated videos
    - Studies indexed in the Web of Science database and published in English
    - Keywords used in titles: “student-created video”, “student-generated video”, “student-produced video”, “learner-generated video”, “student-prepared video”, “peer-generated video”
- Exclusion criteria
    - Teacher/instructor generated videos and those outside the context of focus
    - Studies with limited access
    - Non-peer-reviewed studies

Data Collection

During data collection, the articles were accessed using the Web of Science database. The following search query was based on the article selection criteria given in the inclusion and exclusion criteria.

Student-created video (Title) or student-generated video (Title) or student-produced video (Title) or learner-generated video (Title) or student-prepared video (Title) or Peer-Generated Video (Title) and Articles or Review Articles or Early Access (Document Types) and Book Chapters (Exclude – Document Types)

Considering these criteria, 42 articles that fit the purpose of the study were included in the study. Research process is given in Figure 1 with the PRISMA flowchart. The PRISMA flowchart is followed in meta-analysis studies and systematic literature reviews to show the process of systematic application of specified inclusion and exclusion criteria (Stovold et al., 2014).

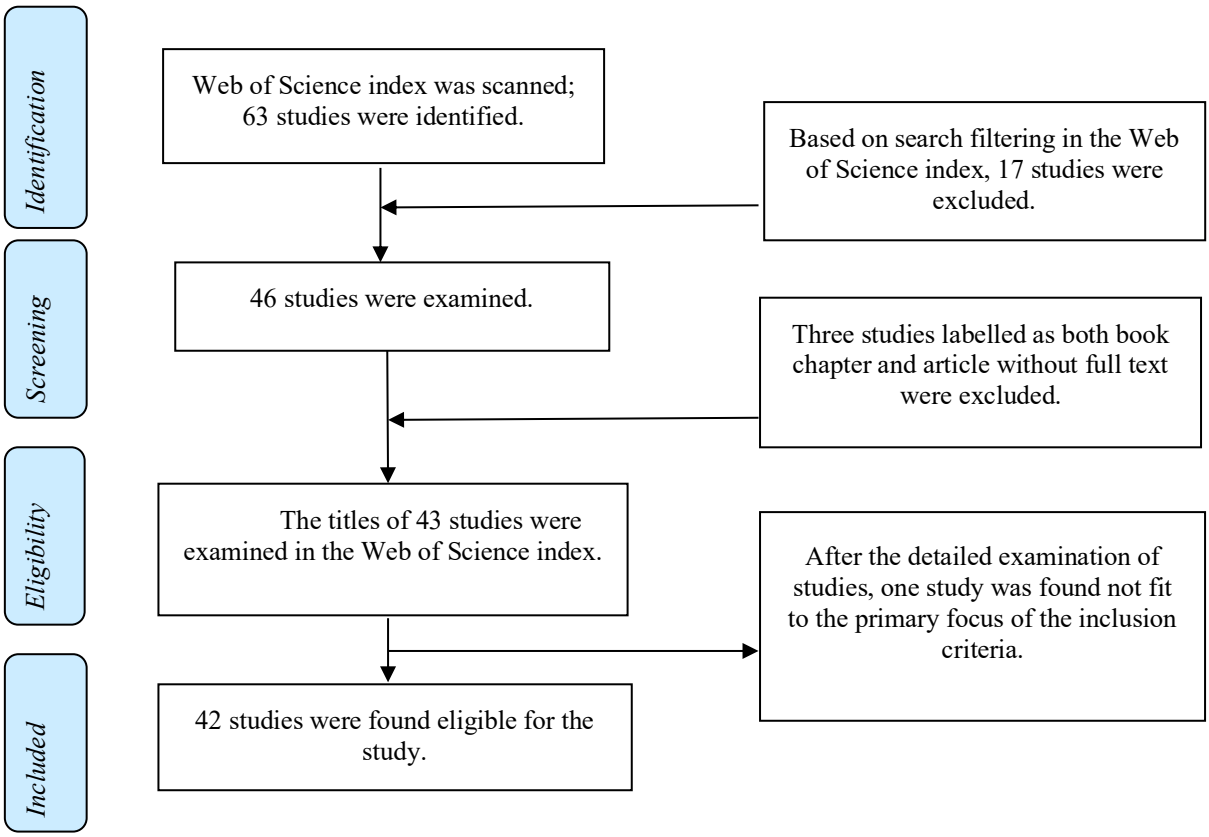

Figure 1. *PRISMA Literature Review Process Flowchart*

Source: Moher et al. (2009).

While coding the studies, the variable tables from the previous studies were referred. The studies were listed and saved to the MAXQDA software; coding was performed after the variable tables were transferred to this software. Kappa test was run to determine the level of agreement. Cohen Kappa measured the agreement between the two coders (Kılıç, 2015). In the first concordance study, the interrater reliability among the researchers was .62. Since this value was lower than the ideal value of .75 for Kappa, the researchers tried to come to an agreement. According to the fit test, the reliability coefficient was found as .85 and an ideal fit coefficient was reached.

Research Ethics

This study did not require ethical or legal consent since it was a bibliometric and systematic study.

FINDINGS

To address the first research question, the results of the common word analysis and the subject area, disciplines, research design, sample level, sample size, sample selection method, data collection tool, theoretical background, and the purpose of the video creation studies were examined in terms of the variables.

Common Word Analysis

In this type of bibliometric analysis, inquiry includes the title, summary, and keywords. A common word analysis was conducted using Web of Science's index title, author keywords, keywords plus and summary data. The bibliometrix online environment that uses the R infrastructure was chosen to study the common words. No coding knowledge is required to exploit this website (https://www.bibliometrix.org/); it can simultaneously combine the analysis and mapping of bibliographic data (Derviş, 2020).

Titles	Abstracts
	
Keywords Plus	**Author's Keywords**
	

Figure 2. Results of Common Word Analysis

Figure 2 presents the common word analysis results of titles, keywords, and abstracts in a word cloud. Depending on the frequency of the relevant words in the given categories, important words and texts are highlighted. Emphasis is usually signaled by font size or color. Accordingly, while the words "video" and "student-generated" prevail in the title, the concepts of "students", "learning" and "video" dominate in the abstract. As for the keywords, expressions like "education", "skills", "YouTube", "motivation", "organic chemistry" are seen extensively.

Classification of Studies by Topics

A systematic literature review was led using Yıldız et al.'s (2020) classification. As seen in Table 1, the topics of almost half of the studies (n=21) targeted Learner Outcomes covering performance outcomes, satisfaction, engagement, and motivation. It is followed by studies about Disposition code that includes students' perceptions, attitudes, preferences, and expectations. No comparative studies were identified.

Table 1. Distribution of Studies by Topics

Learner Outcomes	Performance outcomes, student satisfaction, engagement, effectiveness, motivation and effort, independence in learning and retention rates	21
Dispositions	Perceptions, attitudes, preferences, student expectations, and learning styles	9
Technology	Its use and role, effect, type, implementation, and familiarity	7
Instructional Design	Designs, strategies and best practices; design process; implementation; environment and course structure; and evaluation tools	3
Interaction	Student-to-instructor, general interaction, student-to-student, collaboration, community, and social presence	3
Professional development	Professional development	3
Comparison	Blended &face-to-face and blended & online	0
Demographics	Student and faculty	0
Other	Benefits and challenges, access and availability, support system, time efficiency, nature and role of blended learning, and international issues	4
Total		50

Source: Yıldız et al.'s (2020) adaptation from Drysdale et al. (2013)

Classification of Studies by Disciplines

A systematic literature review was conducted with reference to Yıldız et al.'s (2020) classification of learning domains. Studies that belong to other than the current classification were coded as 'other'. The distribution of the studies according to the disciplines are listed in Table 2.

Table 2. Distribution by Disciplines

Natural Sciences	Mathematics Computer and information science Physical sciences Chemical sciences Earth and environmental sciences Biological sciences Other disciplines in natural sciences	14
Social Sciences	Psychology Economics and business Educational Sciences Sociology Law Political Science Social and economic geography Media and communication Other disciplines in social sciences	8
Medicine & Health	Basic medicine Clinical medicine Health sciences Health biotechnology Other disciplines in medicine	6
Humanities	History and Archaeology Language and Literature Philosophy, ethics and religion Art (art, art history, performing arts, music) Other disciplines in humanities	5
Engineering & Technology	Engineering (Construction, electrical, electronics, information) Mechanics Chemical Materials Medical Environmental (Environmental Biotechnology) Industrial Biotechnology Nanotechnology Other disciplines in engineering and technologies	5
Agricultural Sciences	Agriculture, forestry and fishing Animal and dairy science Veterinary science Agricultural biotechnology	0
NA	The scope of the study does not fall into any disciplines.	1
Other	A learning area outside the classification	1
Unspecified	The discipline was not specified in the study.	2
Total		42

Source: Yıldız et al.'s (2020) adaptation from OECD (2007)

Table 2 demonstrates the status of Natural Sciences (n=14), followed by studies in Social Sciences (n=8). Further examination of these studies shows the popularity of chemistry within natural sciences. No study was detected from the field of agricultural sciences.

Research Design

The research design classification of Goktas et al. (2012) was referred and a systematic literature review was conducted. Studies that did not specify their research design were coded as "Not Specified".

Table 3. Distribution of Studies by Research Design

Qualitative	Case study Grounded theory Concept analysis Culture analysis Phenomenology	11
Quantitative	Comparative Descriptive Relational Quasi-experimental Survey Weak experimental Full experimental Ex post facto Single-subject (group)	8
Mixed	Triangulation Explanatory Exploratory	3
Literature Review	Literature review Meta analysis	3
Other	System development, design-based research	0
Unspecified	The research design was not specified in the study.	19
Total		44

Table 3 illustrates that almost half of the studies (n=19) were coded as "Unspecified" since the research design used was not stated in the studies. However, among the specified, most were conducted qualitatively (n=11).

Sample Level

This study referred to the sample level by Goktas et al. (2012) and completed a systematic literature review. If no sample level was mentioned in the studies, it was coded as "Unspecified". Studies unsuitable for the sample level were coded as "Not applicable". Table 4 presents the distribution of studies according to their sample level.

Table 4. Distribution of Studies by Sample Level

Higher education	31
K-12	9
Teacher/ Faculty	1
In-service/Employee	0
Preschool	0
Guardian	0
Unspecified	2
NA	1
Other	0
Total	44

As listed in Table 4, the majority of the studies (n=31) were carried out at the higher education level and the studies at the K-12 level remained at a lower level (n=9).

Sample Size

Goktas et al.'s (2012) sample size classification was referred, and a systematic literature review was conducted. Studies not suitable for sampling were coded as "Not suitable for sampling". However, the studies that did not provide any information about the sample size were coded as "Not Specified". The distribution of studies according to sample size is given in Table 5.

Table 5. Distribution of Studies by Sample Size

31-100	18
101-300	7
301-1000	4
11-30	4
1-10	3
1001 and above	0
Unspecified	5
NA	1
Total	42

Table 5 shows that the sample size (n=18) of the studies that showed a distribution size between 31-100. No study was found with a distribution size of 1001 and above.

Sample Selection Method

By referring to Goktas et al.'s (2012) sampling method classification, a systematic literature review was finalized. The studies without a specific sample selection method were coded as "Not Specified". The distribution of the studies according to the sample selection method is given in Table 6.

Table 6. Distribution of Studies by Sample Selection Method

Random	4
Purposive sampling	3
Convenience sampling	2
Total population sampling	0
Other	0
Unspecified	33
Total	42

As presented in Table 6, sample selection method was not indicated in many of the studies (n=33) and coded as Unspecified.

Classification of Data Collection Tools

Based on Yildiz et al.'s (2020) classification of data collection tools, a systematic literature review was performed. Studies without a data collection tool were coded as "Unspecified". Table 7 presents the distribution of the analyzed studies according to the data collection tool.

Table 7. Distribution of Studies by Data Collection Tool

Mixed	Combination of two or more data collection tools	23
Questionnaire	Question design, self-administered questionnaire, mail survey, questionnaire design, question types, question statement, questionnaire structure, preliminary survey, web-based questionnaire	8
Advanced technology	Computer-aided data collection, grid technology, audio and video, data mining, e-social science approaches to data collection	3
Interview	Question design, qualitative and quantitative, telephone, face-to-face, focus groups / group interview, computerized, standardized and non-standardized, interview practice, interviewer, interview procedure, interviewer training, respondents, response records	2
Measurement	Measurement of attitude, behavior, ability, etc.	2
Observation	Field observation, field experiment, participant observation, laboratory observation	0
Self-Administrative Questioning	Question design, mail survey, e-mail survey, web-based survey, opinion polls	0

Use of administrative resources		0
Sampling	Sampling and survey designs, sampling types (cluster sampling, multistage sampling, etc.)	0
Visual methods		0
NA	Data collection tool does not fit the classification or is not used for research method.	0
Unspecified	Data collection tools were not included in the studies.	4
	Total	42

Source: Yıldız et al.'s (2020) adaptation from Beissel-Durrant (2004).

Table 7 shows that more than half of the studies (n=23) used the mixed data collection tool that combine more than one data collection tool.

Uses of Student-Generated Videos in the Literature

Literature was systematically reviewed with reference to Schuck and Kearney's (2006) summary of the uses of student-created digital video. Studies of literature review were coded as "Other". Table 8 illustrates the distribution of the analyzed studies according to the uses of student-generated videos.

Table 8. Uses of Student-Generated Videos in the Literature

Communication tool	Activities for students to express and convey their thoughts, feelings, and knowledge	13
Observation and Analysis tool	Studies to develop students' observation, measurement, and analysis skills	10
Other	Works that do not fit into any of these categories. Literature review, meta-analysis etc.	3
Total		46

Source: Adapted from Schuck and Kearney (2006)

As listed in Table 8, almost half of the studies (n=20) aimed at facilitating students' own learning processes.

Theoretical Background

The codes in Table 9 reveal the results of examination for the theoretical background of the studies. Studies in which no theory was specified were coded as "Unspecified".

Table 9. Theoretical Background of the Studies

Collaborative learning	6
Constructivist approach	4
Experiential Learning	4
Constructionism (learning theory)	2
Theory of difference	1
Multimodal pedagogy	1
Sociocultural approach	1
Productive Learning Theory	1
Scaffolding	1
Project based inquiry	1
Learner video thumbnailing	1
Cognitive apprenticeship model	1
Role playing	1
Unspecified	20
Total	45

As seen in Table 9, the theoretical background of most studies (n=20) is unspecified; for those with theories stated, the most common theory (n=6) is based on collaborative learning.

DISCUSSION & CONCLUSION

This research aims to provide an overview of the research by examining the student-generated videos and to contribute to the practices in this field. Findings from the studies examined in the context of this purpose show that the majority of the studies in this field concentrate at the higher education level and that the studies in other fields are scarce. Similarly, Snelson (2018) points out the higher education students create more videos. This can

be practical and effective as university students access mobile devices easily and use them to capture videos (Epps et al., 2021; Gallardo-Williams et al., 2020).

In the study examining the disciplines in which student-generated videos are used, studies in the field of natural sciences are reported to be in the majority. Epps et al. (2021) state that in their systematic literature review approximately 70% of the studies are conducted in natural sciences such as biology, chemistry, and mathematics. As highlighted by Snelson (2018) study, educators from various disciplines see student-generated videos as a practical strategy forming a part of content area.

The distribution of the studies according to the subject area underscores the category of learner outcomes. Within this category, students' performance outputs, student satisfaction, participation, effectiveness, motivation, and effort are discussed. In the study by Reyna and Meier (2018), student-generated video activities are found to advance collaboration, project management, and experiential learning. Similarly, Snelson's (2018) literature review indicates that in the category of video production in the content area, projects generally focus on information and performance. Studies report learner outcomes for the development of students' knowledge and skills; however, theoretical frameworks for their measurement and studies in this field are methodologically do not suffice. Further, studies in this field are methodologically deficient (Reyna & Meier, 2018). In particular, the study design and sample selection processes were not expressed in many of the studies; hence they were coded as unspecified.

As for data collection tools used in the studies, the mixed data collection tool outnumbered due to the use of multiple data collection tools. In the studies, interview forms were used, as well as the video transcriptions. Despite the status of mixed data collection tool in the studies, Reyna and Meier (2018) state that a need for consistent methodologies to evaluate the learner outcomes rises due to emergence of studies in this field.

The metacognition category stands out in Schuck and Kearney's (2006) study analyzing the uses of student-generated videos. Most of these studies aim at facilitating students' thinking about their own learning. In this case, the most prevalent category in the coding for the subject area seems consistent. Correspondingly, Snelson (2018) highlights the position of studies on knowledge and performance.

In terms of theoretical background, unspecified studies outnumber; theories in which students actively engage such as collaborative learning, constructivist approach and experiential learning stand out. Similarly, Gallardo-Williams et al. (2020) echo the active processes during video creation processes in the field of chemistry within the productive learning theory. In this way, students have become media producers that create content for social media platforms such as YouTube, instead of being passive video consumers. As a result, approaches putting students in the center that lead to active participation guided by sound a theoretical basis contributes to student-generated video practices.

Suggestions

The following statements are recommended in the context of the studies reviewed to the researchers who will carry out studies based on student-generated video.

- Interdisciplinary studies can be carried out for studies in disciplines such as Agricultural Sciences where related studies lack; some best practices can be found in Natural Sciences, Social Sciences and Health.
- These studies can focus on different levels of education, such as K-12, preschool, or in-service education, instead of concentrating solely on higher education.
- Although the research designs are not clearly stated in many studies, most are qualitative studies. By increasing the number of experimental studies, the effects of student-generated videos can better be explored.
- Studies can be conducted on the use of student-generated videos for different purposes such as their advantages for peers, in addition to their use for metacognition, observation and analysis, and communication.
- Most of the studies are found to lack theoretical background. It is suggested that new studies be based on sound pedagogical theories.

Researchers' Contribution Rate

Researchers' Contribution Rate (You may modify this table according to your article)

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion	(Other)
Author 1	☒	☒	☒	☒	☒	☒	☐
Author2	☒	☒	☒	☐	☐	☒	☐

Conflict of Interest

There is no conflict of interest.

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Appendix-1 List of Studies Examined

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Pre-Service Turkish and English Teachers' Achievement Levels, Perceptions of Self-Efficacy and Attitudes in relation to Summarizing Skills

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Abstract

This study aims to compare pre-service Turkish and English teachers' achievement levels, perceptions of self-efficacy, and attitudes in relation to summarizing skills. This study adopted a sequential mixed-method research design and there were 265 pre-service teachers who were chosen via convenience sampling. The data were collected through the Summarizing Attitude Scale (SAS), the Summarizing Self-Efficacy Perception Scale (SSEPS), a semi-structured interview form, and the participants' written summaries of the given text. The SAS was analysed in terms of belief in the importance and enjoying summarizing aspects, while the SSEPS was analysed in terms of summary-based reading and summary writing aspects. The validity and reliability of the scales were confirmed via Confirmatory Factor Analysis and Cronbach alpha values, and the Independent Samples t-test was employed to compare the scores of the participants. On the other hand, the interview data were subjected to summative content analysis, while the participants' written summaries were evaluated via the Story Summary Evaluation Rubric (SSER). According to the findings, the participants' summarizing achievement level was at a good level. Also, it was found that the participants had a high level of belief in the importance of summarizing, they enjoyed summarizing at a moderate level, and their attitude scores towards summarizing were high. In addition, the participants' summary-based reading, summary writing, and self-efficacy perceptions of summarizing were at a high level. On the other hand, it was revealed that there were no significant differences between the scores of the pre-service English and Turkish teachers in terms of summarizing achievement levels, believing in the importance of summarizing, reading for summarizing, writing a summary and summarizing self-efficacy. Finally, there was a significant difference in favor of the pre-service Turkish teachers in the dimension of enjoying summarizing and the overall scores of the summarizing attitudes scale.

Keywords: Summarizing ability, attitudes towards summarizing, summarizing self-efficacy.

Türkçe ve İngilizce Öğretmeni Adaylarının Özetleme Başarısı, Özetlemeye Yönelik Öz Yeterlik Algıları ve Tutumları

Öz

Bu çalışmanın amacı Türkçe ve İngilizce öğretmeni adaylarının özetleme başarısını, özetlemeye yönelik özyeterlik algılarını ve tutumlarını karşılaştırmalı olarak incelemektir. Sıralı karma yöntem kullanılan çalışmanın katılımcılarını uygun örnekleme yoluyla seçilen toplam 265 Türkçe ve İngilizce öğretmeni adayı oluşturmuştur. Veriler, Özetleme Tutum Ölçeği, Özetleme Öz-Yeterlik Algısı Ölçeği, yarı yapılandırılmış görüşme formu ve katılımcıların verilen metni yazılı olarak özetlemeleri yoluyla toplanmıştır. Özetleme Tutum Ölçeği özetlemenin önemine inanma ve özetlemeden hoşlanma boyutları açısından, Özetleme Öz-Yeterlik Algısı Ölçeği ise özetele amaçlı okuma ve özet yazma boyutları açısından incelenmiştir. Ölçeklerin geçerliliği ve güvenilirliği Doğrulayıcı Faktör Analizi ve Cronbach alfa değerleri ile doğrulanmış ve katılımcıların puanlarının karşılaştırılmasında Bağımsız Örnekler t-testi kullanılmıştır. Öte yandan görüşme verileri özetleyici içerik analizine tabi tutulurken, katılımcıların yazılı özetleri Öykü Özeti Dereceli Puanlama Anahtarı aracılığıyla değerlendirilmiştir. Elde edilen bulgulara göre katılımcıların özetleme başarısı iyi düzeydedir. Ayrıca katılımcıların özetlemenin önemine inanma düzeylerinin yüksek olduğu, özetleme yapmaktan orta düzeyde hoşlandıkları ve özetlemeye yönelik tutum puanlarının yüksek olduğu saptanmıştır. Katılımcıların özetleme amaçlı okuma, özet yazma ve özetleme özyeterlik algılarının da yüksek seviyede olduğu bulunmuştur. Öte yandan İngilizce ve Türkçe öğretmeni adaylarının özetleme başarısı, özetlemenin önemine inanma, özetleme amaçlı okuma, özet yazma ve özetleme özyeterlik algısı puanları arasında anlamlı fark olmadığı görülmüştür. Son olarak, özetleme yapmaktan hoşlanma boyutunda ve özetlemeye yönelik tutum ölçeğinin genelinde Türkçe öğretmeni adaylarından yana anlamlı fark çıkmıştır.

Anahtar kelimeler: Özetleme becerisi, özetlemeye yönelik tutum, özetlemeye yönelik öz yeterlik.

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INTRODUCTION

Summarizing is an action which includes reading comprehension and written expression skills. Therefore, it requires multidimensional cognitive skills and loads. According to Çetinkaya, Şentürk, and Dikici (2020, p. 584), it is a text creation process in which various metacognitive methods such as summarizing, selecting, combining, interpreting, generalizing, and exploring are employed. In other words, summarizing includes selecting important parts from the source text and reconstructing the semantic integrity consistent with the macrostructure of the text.

Various models have been developed to explain summarizing (Brown & Day, 1983; Kintsch & van Dijk, 1978). Kintsch and van Dijk's (1978) Macrostructure Model is the most widely accepted model among these models. This model covers deletion, generalization, and reconstruction strategies. Brown and Day (1983, as cited in Larsen, 2018, p.3) propose six summarizing rules based on the model of Kintsch and van Dijk (1978). These are as follows: (1) Deleting unimportant information, (2) Deleting redundant information, (3) Using a single generalizing concept for similar concepts, (4) Using a generalizing action concept for similar sequential actions, (5) Using the topic sentence in each paragraph, (6) Creating a new topic sentence if the topic sentence is not clearly stated in the text.

The rules outlined above make it clear that summarizing is a skill with certain rules and criteria, and both receptive and productive operations are performed. Individuals need training in summary writing to develop the skills to write a qualified summary text in line with these rules and criteria. However, when the relevant studies are examined, it is seen that the required importance is not attached to summarizing ability in educational environments and materials (Dilidüzgün, 2013; Karadağ, 2019; Kaya, 2021; Kaya & Kurudayıoğlu, 2021; Ulaş & Yılmaz, 2021).

Teachers have different roles such as organizer, observer, feedback provider, prompter, motivator, and resource for reading and writing activities (Harmer, 2007). In this respect, it is a prerequisite for the teacher who will provide training on summary writing skills to have a high level of summary writing skills. On the other hand, the teacher's enjoyment of writing summaries and his/her belief in the importance of summarizing will also affect his/her teaching practices to include summarizing activities in teaching environments. In this vein, the results of the relevant studies demonstrate that pre-service teachers are not competent enough in summarizing the text they read (Çalışır Zenci, 2020; Deneme, 2009; Doğan & Özçakmak, 2014; Eyüp et al., 2012; Kurnaz & Akaydın, 2015; Özçakmak, 2014; Taşdemir & Çağlayan Dilber, 2021; Yüksel & Demir, 2022).

Results of the studies on the summarizing proficiency of pre-service Turkish and English teachers also indicate that the summarizing skills of pre-service teachers in both departments are weak. For example, Eyüp et al. (2012), who focused on pre-service Turkish teachers, stated that the participants were not sufficient in using summarizing methods and mainly preferred the methods of distinguishing important information, reading the entire source text and ensuring the integrity of ideas by using conjunctions. Similarly, Yüksel and Demir (2022) examined the summarizing skills of 51 pre-service Turkish teachers and found that the participants perceived summarizing as shortening of the given text, used titles in their summary texts, employed various summarizing methods together, and adopted an objective style in their expressions. In addition, the authors stated that the participants had many punctuation, spelling and coherence mistakes in their summary texts, and did not revise the texts after summarizing. Deneme (2009), on the other hand, investigated summarizing methods of pre-service English teachers and stated that none of the participants received training on summarizing. Also, it was seen that the participants preferred the summary writing methods randomly and their summary writing skills were quite weak.

In addition to the findings of the aforementioned studies, various factors such as self-efficacy and attitude can affect summarizing ability. Affective variables such as self-efficacy and attitude have an impact on learning and academic achievement. Self-efficacy can be defined as an individual's opinion of how well s/he can carry out the required actions to overcome possible situations (Bandura, 1982, p. 122). In this sense, summarizing self-efficacy can be defined as an individual's perception of his/her ability to successfully perform tasks such as summary-based reading and writing summary texts (Bahçıvan & Çetinkaya, 2021). On the other hand, attitudes are spiritual orientations formed as a result of an individual's experiences that affect situations, objects and how s/he will react to them positively or negatively (Mensah et al., 2013). In this vein, attitude towards summarizing is a spiritual orientation that consists of two dimensions: whether the individual likes to summarize and believes in the importance of summarizing (Bahçıvan & Çetinkaya, 2021, p. 139).

Summarizing is one of the tasks that teachers often assign to students in the classroom. However, it can be claimed that students at different educational levels may not be given the necessary training on how to summarize. When we look at the relevant studies in Turkey, it appears that they mostly focus on teaching techniques for summarizing (Duran & Özdil, 2018, 2019a, 2019b; Külte Çağlar, 2016), the necessity of teaching summarizing skills through education by following a more planned and systematic way Benzer et al., 2016; Eyüp et al., 2012; Özçakmak, 2014), material evaluation (Dilidüzgün, 2013; Karadağ, 2019; Kaya, 2021; Kaya & Kurudayıoğlu, 2021), examining summarizing skills of students (Dilidüzgün, 2013; Eyüp et al., 2012; Kuşdemir et al., 2018; Ulaş & Yılmaz, 2021) and scale development (Kuşdemir & Uzun, 2018; Tekin & Bolat, 2018). However, no body of research has investigated pre-service Turkish and English teachers' achievement levels, perceptions of self-efficacy and attitudes in relation to summarizing skills. Since the participants of the study are expected to become in-service Turkish and English teachers, they will deliver lessons which will include reading and writing activities, and summarizing is one of the sub-skills of reading and writing skills. Although the participants receive training to become language teachers, their departments are different from each other and a comparative study could shed light on their summarizing competencies, reveal some insights into their training and attract the attention to the departmental differences. In this way, they can gain consciousness about the importance of summarizing for their future career, notice the gap in their summarizing skills, capitalize on their strong aspects, and develop various strategies to overcome their weak aspects. Also, teacher educators in the relevant departments could pay more attention to enhancing summarizing skills of these pre-service teachers by modelling different types of summarizing activities in their classes for practical ends. Finally, this study results can pave the way for future researchers to conduct studies on summarizing in different teaching departments for pedagogical purposes.

Based on the niche in the relevant literature and the importance of summarizing skills for pre-service language teachers, it was aimed to provide a deeper analysis of the factors influencing their achievement levels, perceptions of self-efficacy and attitudes concerning summarizing skills. Therefore, the main purpose of this study is to compare pre-service Turkish and English teachers' achievement levels, perceptions of self-efficacy and attitudes in relation to summarizing skills. To this end, the current paper aims to answer the following research questions:

1- What are the psychometric properties of the Summarizing Attitude Scale (SAS) and Summarizing Self-Efficacy Perception Scale (SSEPS)?

2- What are the perceived levels of the participating pre-service English and Turkish teachers in terms of summarizing achievement, attitude and self-efficacy?

3- Is there a significant difference between the summarizing achievement, attitude and self-efficacy perception scores of the participating pre-service English and Turkish teachers?

4- What are the reflections of the participants about the main factors affecting their summarizing skills?

METHOD

Research Design

This study was informed by a sequential mixed-method research design since the data collection tools were administered at different time intervals. The mixed-method was employed to benefit from the complementary purposes of numerical and textual data (Creswell et al., 2003; Dörnyei, 2007; McKay, 2006). In the quantitative phase of the research, causal-comparative research, one of the survey models, was used. Causal comparative studies aim to reveal the causes of an existing/naturally occurring situation or event and the variables affecting these causes or the results of an effect (Büyüköztürk et al., 2008). First, the Summarizing Attitude Scale (SAS) and Summarizing Self-Efficacy Perception Scale (SSEPS) were administered, and then the participants were asked to answer four interview questions (open-ended questions) in order to gather more in-depth opinions (Adams, 2015; Cohen et al., 2007; Dörnyei, 2007; Nunan & Bailey, 2009). After that, a total of 50 participants were given a narrative text and asked to summarize the text in their own sentences. Therefore, the qualitative part of the study was carried out as a case study since the researchers investigated a specific case (summarizing) in a specific context (pre-service teacher education) within a limited number of participants, and the qualitative research method was used to interpret the phenomenon in question in its real-life context (Creswell et al., 2003; Dörnyei, 2007; Hamilton & Corbett-Whittier, 2013; McKay, 2006; Patton, 2002). To this end, a semi-structured interview form was employed in this study.

Participants

Pre-service Turkish and English teachers selected via convenience sampling participated in the research (Mackey & Gass, 2005). The scales and interview questions were administered to the sophomores, juniors, and seniors. For the summary writing activity, only the seniors participated. In order to reach a sufficient number of participants for the validity and reliability issues, the two scales were administered to the sophomores, juniors, and seniors. In light of the relevant literature, only pre-service Turkish and English teachers were chosen as the participants since it is seen that summarizing ability is mostly the subject of research in mother tongue (L1) and foreign language (L2) education. Since the research was carried out in the Fall semester of 2022-2023 academic year and the freshmen had not yet completed any course periods, they were not included in the research, and the seniors who took various field and educational sciences courses were selected for the summary writing activity to find their summarizing achievement levels. It should also be noted that the delivery of instruction was face-to-face when the study was conducted and the participants took some common courses online, namely Atatürk's Principles and History of Turkish Revolution. As to the demographic characteristics of the participants, a total of 265 pre-service teachers, namely 150 pre-service English teachers and 115 pre-service Turkish teachers, participated in the research. 93 (35.10%) were sophomores, 99 (37.35%) were juniors, and 73 (27.55%) were seniors. Also, 186 (70.19%) were females and 79 (29.81%) were males. Finally, their ages ranged between 18-38 and the average was 21.3. Further details about the demographic features are provided in Table 1.

Table 1. Demographic Features of the Participants

	Pre-service English teachers	Pre-service Turkish teachers
Grade		
Sophomores	52 (34.67%)	41 (35.66%)
Juniors	50 (33.33)	49 (42.61%)
Seniors	48 (32%)	25 (21.73%)
Total	150	115
Gender		
Female	113 (75.33%)	73 (63.48%)
Male	37 (24.67%)	42 (36.52%)
Total	150	115

As for the responses, there were 265 participants for both scales; however, the number of the participants who answered the interview questions varied since a number of participants did not answer some of the interview questions. To illustrate, 231 participants answered the second part of the first question, 244 participants answered the second part of the second question, 252 participants answered the third question, and finally 240 participants answered the fourth question.

Data Collection Tools

In the research, the data collection tools consisted of the Summarizing Attitude Scale (SAS) developed by Çetinkaya and Polat Demir (2017), the Summarizing Self-Efficacy Perception Scale (SSEPS) developed by Çetinkaya and Dikici (2023), a semi-structured interview form prepared in the light of the relevant literature and expert opinion, and narrative texts in English and Turkish were used. Since the related scales were intended for secondary school students, adaptation processes were carried out for pre-service teachers. The short story "The Hole in the Wall" (Prentis, 2023) was given to the pre-service English teachers, while the short story "The Wall" (Ali, 2000) was given to the pre-service Turkish teachers as the source texts to be summarized. In the selection of the texts, the length of the text and compliance with the language proficiency level of the participating groups were considered as the criteria in that while the English text included 1880 words, the Turkish text included 1840 words to make the text length similar for both groups. Also, to determine the English text, the short story at B2-C1 level was chosen (https://learnenglish.britishcouncil.org/general-english/story-zone/b2-c1-stories). This level was found suitable for pre-service English language teachers as they started their field courses at the Faculty of Education after reaching a certain level in English (upper intermediate) at preparatory school. As for the pre-service Turkish language teachers, a short story written by a Turkish native speaker was chosen since the participants were Turkish native speakers and attending Turkish Language Teaching Department.

Data Collection Procedures

The researchers first submitted the relevant documents to the Social and Humanities Sciences Scientific Research and Publication Ethics Committee of the university, where the research was conducted. Then, they carried out the research after obtaining the official permission. The Summarizing Attitude Scale (SAS), the

Summarizing Self-Efficacy Perception Scale (SSEPS), and the semi-structured interview form were all applied online. These scales and the interview items were implemented in Turkish as the participants of the study were native Turkish speakers, and it was aimed to facilitate their comprehension of the items and gather detailed responses about summarizing. Then, the answers given to the interview were translated into English and double-checked by the researchers.

In the implementation of the study, the researchers visited the face-to-face courses of the pre-service Turkish and English teachers after contacting the lecturer and obtaining his/her permission to conduct the study. First, the participants were informed about the study, and it was stressed that the participation was on voluntary basis. Then, the researchers sent the link of the scales and interview form to the participants. There was only one link which included the SAS, SSEPS and written interview questions, respectively. The researchers were present in the classes at the time of the implementation in case of any inquiries. After the participants filled in the scales and answered the interview questions, the researchers checked the number of the participants in the class and the total number of answers given in order not to miss any participants. After checking the total number of answers, the researchers thanked the participants for their voluntary participation, and left the class. The scales and the interview were implemented between October-December, 2022. Then, in January, 2023, all the senior pre-service teachers who volunteered to participate in the summary writing activity were selected via purposeful sampling (Dörnyei, 2007). The pre-service teachers in both groups were given a narrative text and asked to summarize it in their own words. It should be noted that the two groups were asked to summarize the given text on different days, and since there were two groups of participants, the researchers implemented the summarizing activity separately for both groups. The pre-service Turkish teachers wrote their summaries in Turkish, while the pre-service English teachers wrote their summaries in English due to their departments. Also, since the software used in the summary writing in the computer environment can make automatic corrections in various fields such as grammar, spelling, punctuation, and vocabulary, the summary writing activity was carried out face to face. In addition, a Turkish text was given to the pre-service Turkish teachers, while an English text was given to the pre-service English teachers. While summarizing, there were no word or time limits, and they were given time until they finished writing their summaries. The summarizing activity took 45-70 minutes for the participating pre-service Turkish and English teachers. A total of 50 pre-service teachers, namely 29 pre-service Turkish teachers and 21 pre-service English teachers, participated in this summary writing activity.

Data Analysis

SPSS 21 program was utilized to analyze the data obtained from the scales. Before the analysis, it was examined whether the scores obtained from the scales showed a normal distribution or not. In order to check whether data distribution was normal or not, the skewness and kurtosis values of the scores were examined. Skewness values ranged from -0.023 to -0.496, while kurtosis values ranged from -.002 to -1.056. Since the values were between -1 and +1, it showed that the score distributions did not deviate significantly from normality, and it was concluded that the score distribution was normal. Thus, the Independent Samples t-test, a parametric test, was used to analyze quantitative data. The summary texts of the participants were evaluated through the Story Summary Evaluation Rubric (SSER) developed by Bahçıvan (2020) in order to determine the participants' summarizing achievement levels. Also, to reveal summarizing achievement levels of both groups, firstly, independent evaluations were made by the researchers, and then the arithmetic average of these achievement scores was taken. To ensure the trustworthiness of the qualitative data analysis, there was a member checking and peer debriefing process in that two independent raters were also involved in the study, and the researchers informed these raters about the scope of the study as well as the SSER content and scoring details. Specifically, the researcher from the English Language Teaching (ELT) department evaluated the English summaries written by the pre-service English teachers individually. There was also another rater from the ELT department to evaluate the English summaries. This rater was an Assist.Prof.Dr. from the ELT Department at a state university in Turkey and had 15-year teaching experience. Similarly, the researcher from the Turkish Language Teaching (TLT) Department evaluated the Turkish summaries written by the pre-service Turkish teachers individually. There was also a separate rater to evaluate these Turkish summaries. This rater was a Turkish language teacher who was working a state secondary school in Turkey and had 12-year teaching experience. The raters in both groups, namely raters for Turkish and English summaries, first evaluated the summaries individually and then, they held a meeting to get the average score for their scoring for each participant according to the SSER developed by Bahçıvan (2020). This rubric is based on content, and layout and writing quality. The content consists of introduction, key events, and ending. Each category scores range from 0 to 4 (0=very poor, 1=poor, 2=moderate, 3=good, 4=very good). In this sense, the lowest score is 0, while the highest score is 16. Each summary was evaluated according to the rubric and each participant was given two scores by the two raters, and then average score of these two scores was

determined as the final summarizing score of the participant. Since there was no time or word limit for the summarizing activity, the length of the summaries was not considered as a criterion. Instead, the content including key characters, the events which take place at the beginning, in the middle and at the end of the story, climax of the study, the theme, and layout and writing quality including the number of grammar, vocabulary, punctuation mistakes were considered.

For the analysis of the interview findings, summative content analysis was employed to interpret the underlying context (Dörnyei, 2007; Fraenkel et al., 2012; Hsieh & Shannon, 2005; Kondracki et al., 2002; Schreier, 2012). Due to the subjective nature of the qualitative analysis, two raters took part in the analysis of the interview data, and the interrater reliability was calculated (Miles & Huberman, 1994). Firstly, the analysis of the answers given to the first question (25% of the data) was conducted independently by both researchers without using any predetermined categories or lists. The interrater reliability, that is, the level of agreement, was calculated as .82. Both raters held a meeting for the differing themes and categories. Then the remaining interview questions were examined. After examining all the interview questions, the raters held the second meeting, and the interrater reliability was calculated as .90. Both levels of agreement were higher than the required level of .70, and the trustworthiness of the qualitative data analysis was ensured. After the remaining categories with different interpretations were discussed and placed under the relevant themes, the qualitative data analysis was completed.

FINDINGS

The findings will be presented in line with the research questions.

RQ1:What are the psychometric properties of the Summarizing Attitude Scale (SAS) and Summarizing Self-Efficacy Perception Scale (SSEPS)?

First, validity and reliability analyses were carried out to administer the scales to pre-service teachers since The Summarizing Attitude Scale (SAS) and Summarizing Self-Efficacy Perception Scale (SSEPS) were originally developed for secondary school students. Confirmatory Factor Analysis (CFA) was used to test the construct validity of the scales. CFA was used to test whether the two-dimensional structures of the scales were confirmed in the data obtained from the pre-service teachers. To test their reliability, the Cronbach alpha internal consistency coefficient was calculated.

The Summarizing Attitude Scale (SAS) - Construct Validity

First, it was tested whether the data set met the assumptions. In order to determine univariate outliers (extreme values), standard z values for each item were calculated, and it was found that the z values obtained were in the range of (-3) to (+3). In order to determine multivariate outliers, Mahalanobis distances were calculated and the data of five participants were removed from the data set. In order to determine whether there is a multicollinearity problem or not, the values obtained by calculating the binary correlations between the responses to the items were found to be below 0.90. In line with these findings, it was concluded that the assumptions were met.

Table 2. Goodness of Fit Values for the SAS

χ^2	df	P	χ^2 /sd	RMSEA	GFI	AGFI	NFI	NNFI	CFI	IFI
595.26	316	p<.05	1.88	0.058	0.86	0.83	0.95	0.97	0.98	0.98

As a result of CFA, χ2/sd ratio was 1.88, RMSEA 0.058, GFI 0.86, AGFI 0.83, NFI 0.95, NNFI 0.97, CFI and IFI were 0.98. When the goodness of fit values given in Table 2 are considered, it is seen that the construct validity of the scale is ensured by the data obtained from the pre-service teachers.

Cronbach's Alpha Coefficient: The Cronbach's alpha reliability coefficient was found to be 0.819 for the Belief in the Importance of Summarizing dimension, 0.928 for the Enjoying Summarizing dimension, and 0.914 for the entire scale. These values demonstrate that the reliability of the scale is high.

The Summarizing Self-Efficacy Perception Scale (SSEPS) - Construct Validity

First, it was tested whether the data set met the assumptions. In order to determine univariate outliers, standard z values for each item were calculated, and extreme data that did not range from (-3) to (+3) were excluded. In order to determine multivariate outliers, Mahalanobis distances were calculated, and the data of four participants were removed from the data set. In order to determine whether there is a multicollinearity problem, the values obtained by calculating the binary correlations between the responses to the items were found to be below 0.90. In line with these findings, it was concluded that the assumptions were met.

Table 3. Goodness of Fit Values for the SSEPS

χ^2	df	P	χ^2 /sd	RMSEA	GFI	AGFI	NFI	NNFI	CFI	IFI
411.94	201	p<.05	2.05	0.063	0.88	0.84	0.96	0.98	0.98	0.98

As a result of CFA, χ2/sd ratio was 2.05, RMSEA 0.063, GFI 0.88, AGFI 0.84, NFI 0.96, NNFI, CFI and IFI were 0.98. When the goodness of fit values given in Table 3 are considered, it is seen that the construct validity of the scale is ensured by the data obtained from the pre-service teachers.

Cronbach's Alpha Coefficient: The Cronbach's alpha reliability coefficient was found to be 0.893 for Summary-based Reading dimension, 0.914 for Summary Writing dimension, and 0.942 for the entire scale. These values demonstrate that the reliability of the scale is high.

RQ2: What are the perceived levels of the participating pre-service English and Turkish teachers in terms of summarizing achievement, attitude and self-efficacy?

Table 4. Levels of Summarizing Achievement, Attitude and Self-Efficacy

Variables		N	$\bar{X}$	Level	sd	Minimum value	Maximum value
Achievement		50	9,54	Level	2,14	5	14
Attitude towards summarizing	Belief in the importance	265	4,15	I agree	,44	2,83	5,00
	Enjoying summarizing	265	3,09	I somewhat agree	,63	1,07	4,67
	Total	265	3,62	I agree	,45	2,36	4,80
Summarizing self-efficacy	Summary-based reading	265	4,13	Generally	,48	2,00	5,00
	Writing summary	265	4,10	Generally	,47	2,14	5,00
	Total	265	4,11	Generally	,44	2,07	5,00

According to Table 4, the average of the summarizing achievement scores of the pre-service teachers is 9.54, which indicates a "good" level. The average of the pre-service teachers' belief in the importance of summarizing scores is 4.15, the average of their enjoyment of summarizing score is 3.09, and the mean of their attitude towards summarizing is 3.62. When the average scores are examined, it is seen that the participants' scores for believing in the importance of summarizing are higher than that of enjoying summarizing. These findings reveal that although pre-service teachers believe in the importance of summarizing, they do not like summarizing as much as they believe in its importance. The pre-service teachers' belief in the importance of summarizing and their attitudes towards summarizing are at the level of "agree", and the scores of enjoying summarizing are at the level of "somewhat agree". The average of the summary-based reading scores of the pre-service teachers is 4.13, the average of the summary writing scores is 4.10, and the average of the summarizing self-efficacy scores is 4.11. Summary-based reading, summary writing and summarizing self-efficacy levels of teacher candidates are at "generally" level.

RQ3: Is there a significant difference between the summarizing achievement, attitude and self-efficacy perception scores of the participating pre-service English and Turkish teachers?

Comparison of Summarizing Achievement of Pre-Service English and Turkish Teachers

Table 5. Independent Samples t-test Results for Summarizing Achievement Scores

Test	Group	N	$\overline{X}$	Level	S_x	sd	t	p
Achievement	English	21	9,30	Good	1,94	48	.664	.594
	Turkish	29	9,71	Good	2,29			

*p<0.05

According to Table 5, the average of the summarizing achievement scores of the pre-service English teachers is 9.30, while that of the pre-service Turkish teachers is 9.71. When the average scores are examined, both groups' summarizing achievement is at a "good" level. According to the Independent Samples t-test results, it is seen that there is no significant difference between the summarizing achievement scores of the participants ($t_{(48)}$=.664, p>.05).

Comparison of Attitudes Towards Summarizing

Table 6. Independent Samples t-test Results for Attitudes towards Summarizing

Test	Group	N	$\overline{X}$	Level	S_x	Sd	t	p	η^2
Belief in the importance	English	150	4.10	I agree	0.45	263	-1.489	.113	
	Turkish	115	4.19	I agree	0.43				
Enjoying summarizing	English	150	2.95	I somewhat agree	0.65	263	-4.193	.000*	0.062
	Turkish	115	3.27	I somewhat agree	0.55				
Attitudes towards summarizing	English	150	3.53	I agree	0.47	263	-3.675	.000*	0.049
	Turkish	115	3.73	I agree	0.40				

*p<0.05

According to Table 6, the mean score of the pre-service English teachers for believing in the importance of summarizing is 4.10, the mean of enjoying summarizing is 2.95, and the mean of their attitude towards summarizing is 3.53. On the other hand, the mean score of the pre-service Turkish teachers for believing in the importance of summarizing is 4.19, the mean of enjoying summarizing is 3.27, and the mean of their attitude towards summarizing is 3.73. When the average scores are examined, it is seen that for both groups, the levels of belief in the importance of summarizing and the attitudes towards summarizing are at the level of "agree". In contrast, the scores of enjoying summarizing are at the level of "somewhat agree". The p value indicates whether the effect is significant, while eta-squared gives the strength of the effect. In this vein, η2 indicates the total variance of the independent variable in the dependent variable, and varies between 0.00 and 1.00. Also, η2 values of .01, .06, and .14 are interpreted as “small”, “medium” and “large” effect sizes, respectively (Büyüköztürk, 2009). According to the Independent Samples t-test results, it is seen that there is a significant difference in favor of the pre-service Turkish teachers in terms of the scores of enjoying summarizing and attitudes towards summarizing ($p<0.05$). The effect size value was found to be $\eta2 = 0.062$ for the enjoyment of summarizing dimension and $\eta2 = 0.049$ for the attitudes towards summarizing. These findings imply that there is a "moderate" effect on their enjoyment of summarizing, and a "low" effect on their attitudes towards summarizing. When the Independent Samples t-test results are considered, it appears that there is no significant difference between the two groups in terms of the scores of believing in the importance of summarizing ($p>.05$).

Comparison of Summarizing Self-Efficacy Levels

Table 7. Independent Samples t-test Results for Summarizing Self-Efficacy Levels

Test	Group	N	$\overline{X}$	Level	S_x	Sd	t	P
Summary-based reading	English	150	4.09	Generally	0.50	263	-1.106	.194
	Turkish	115	4.17	Generally	0.44			
Writing summary	English	150	4.06	Generally	0.48	263	-1.450	.075
	Turkish	115	4.16	Generally	0.44			
Summarizing self-efficacy	English	150	4.07	Generally	0.47	263	-1.362	.101
	Turkish	115	4.16	Generally	0.41			

According to Table 7, the average of the summary-based reading scores of the pre-service English teachers is 4.09, the average of summary writing scores is 4.06, and the average of summarizing self-efficacy scores is 4.07. On the other hand, the average of the summary-based reading scores of the pre-service Turkish teachers is 4.17, the average of the summary writing scores is 4.16, and the average of summarizing self-efficacy scores is 4.16. When the average scores are examined, it is seen that the levels of summary-based reading, summary writing and summarizing self-efficacy of both groups are at "generally" level. According to the independent samples t-test results, it is seen that there is no significant difference between the two groups in terms of their scores in summary-based reading, summary writing, and summarizing self-efficacy ($p>0.05$).

RQ4: What are the reflections of the participants about the main factors affecting their summarizing skills?

In the study, there were four interview questions, and each was evaluated separately. The interview questions, emerging themes, and sample participant responses are presented below. It should also be noted that the number of responses to the interview items varied since some participants did not answer some of the interview questions. The number of responding participants is presented for each item under the relevant question. Also, the

participants were coded as E (representing pre-service English teachers) and T (representing pre-service Turkish teachers) to ensure confidentiality and given a number according to their order of participation.

Question 1: Do you consider yourself successful in summarizing? Why?

In the first question, the participants were asked whether they found themselves successful in summarizing, and they were asked to explain why.

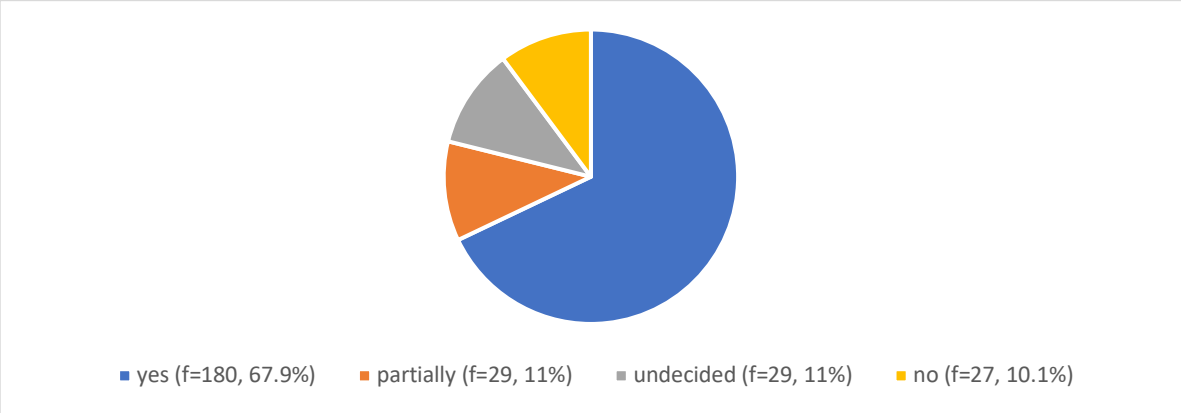

Figure 1. *Reflections of the Participants on Their Summarizing Success*

According to Graph 1, while 180 participants found themselves successful in summarizing, 27 participants stated that they did not find themselves successful. In addition, 29 participants found themselves partially successful in summarizing, and 29 participants stated that they were undecided. When the participants were asked to explain the reasons for their success, various themes emerged, and these are presented in Graph 2. In the part about summarizing success, 231 out of 265 participants answered the question, while 34 participants did not answer the question. According to the findings, the participants stated that reasons (f: 119) mostly affect their summarizing success. This is followed by educational reasons (f: 109) and textual reasons (f: 15).

It should be noted that since the same participant shared his/her reflections on more than one theme and some participants did not answer the questions, the total number of participants and the frequency of the emerging themes differ.

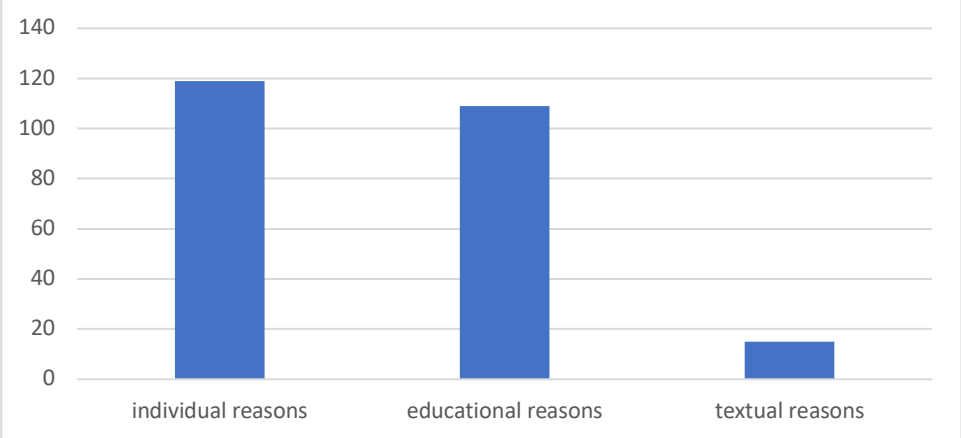

Figure 2. *Reflections on the Reasons for Summarizing Success*

There are also various categories accompanying these main themes. For example, the individual reasons include the categories of considering summarizing as an individual skill (f: 56), negative effect of lack of required skills (f: 14), the motivational state during summarizing (f: 12), personal interest (f: 9), lack of interest (f: 7), considering summarizing as an easy skill (f: 6), lack of practice (f: 5), vocabulary knowledge (f: 3), and personal inadequacy. (f: 2). In addition, some participants stated that personal abilities are important in summarizing (f: 1), summarizing is a personal preference (f: 1), being a good reader is important (f: 1), previous knowledge affects summarizing skills (f: 1) and lack of attention negatively affects summarizing (f: 1).

For educational reasons, it is indicated that summarizing contributes to understanding (f: 34), summarizing is used as a study technique (f: 27), summarizing is used continuously throughout education life (f: 19), previous experiences affect summarizing success (f: 12), book reading habit affects summarizing success (f: 10), feedback given upon summarizing is effective (f: 3), summarizing is practical in terms of saving time and distinguishing

important information (f: 2), summarizing is a learning method (f: 1) and it is used as an assessment method in exams (f: 1).

Finally, for textual reasons, the participants state that the source text's interestingness (f: 7), type (f: 3), theme (f: 2), level of difficulty (f: 2) and length (f: 1) affect their summarizing skills. Some participant quotations and the categories exemplified by these quotations are provided below. The abbreviation E stands for pre-service English teachers, while the abbreviation T stands for pre-service Turkish teachers. The number following these abbreviations represents the order of participation in the study.

For example, E1 stated that she used summarizing as a study technique by saying "I find myself successful because I use summarizing technique while studying." while E5 stated that her book reading habit contributed to her summarizing skills by stating that "I can be considered successful in summarizing because I have had book reading habit for years." In addition to these, E6 found herself successful in summarizing because she constantly used summarizing in her response "Yes, I think I am successful because I have done it many times." while E29 said "Partially. My summarizing skill changes in line with my interest in the text and my previous knowledge." and stated that he found herself partially successful in summarizing and his/her success of summarizing varied depending on the interestingness of the text and his/her previous knowledge.

As for pre-service Turkish teachers, T163, in a similar vein, stressed that he was undecided about the success of summarizing and his success changed depending on the interestingness of the text by saying "This is a situation that changes depending on whether the text I am reading/listening sounds interesting to me or not. Since my level of readiness will increase for the subjects that interest me, I can summarize such texts more easily." Finally, T231 said "Yes, because I think my book reading habit contributes to the success of summarizing." and drew attention to the effect of book reading habit on the success of summarizing.

Question 2: Do you think summarizing skill is important? Why?

The participants were asked whether summarizing skill was important and the findings are displayed in Graph 3. 251 participants thought that summarizing skill was important, 10 participants were undecided, two participants stated that summarizing was partially important, and two participants stated that summarizing was not an important skill.

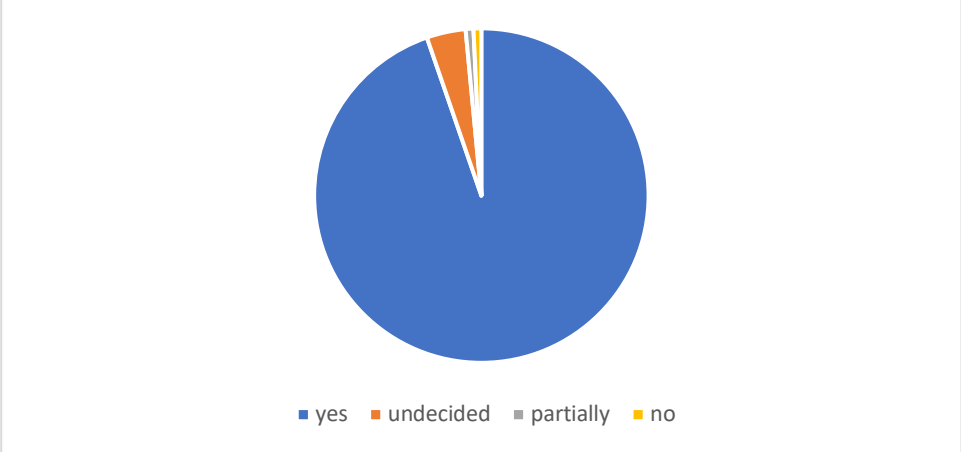

Figure 3. *Reflections on the Importance of Summarizing Skill*

The participants were also asked why summarizing skill was important. While 244 participants answered this question, 21 participants did not. According to the answers, educational factors (f: 232), linguistic factors (f: 41), mental factors (f: 18) and individual factors (f: 7) emerged as the main themes and these themes are presented in Graph 4.

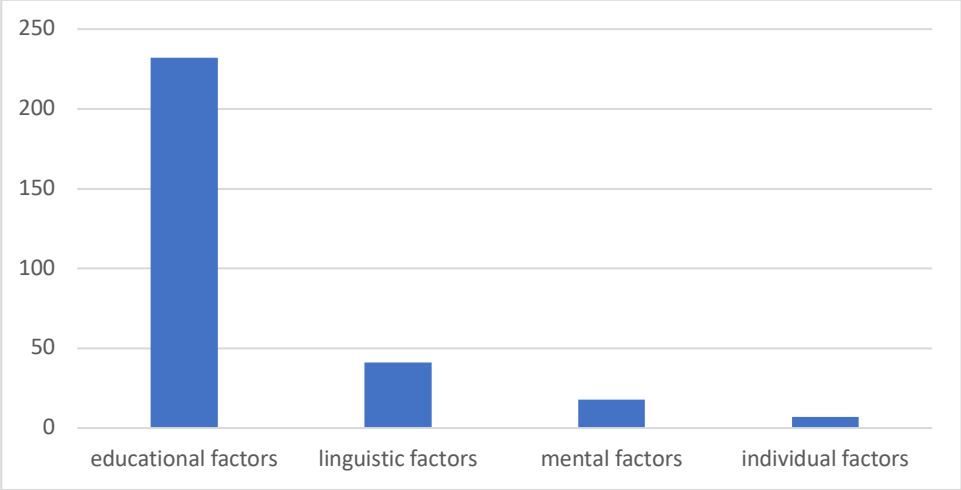

Figure 4. *Factors Affecting the Importance of Summarizing Skill*

The theme of educational factors includes the categories as in the following: contribution to understanding (f: 144), making knowledge permanent (f: 26), practicality in terms of time management (f: 24), using it as a study technique (f: 10), improving interpretation skills (f: 9), using it as a teaching technique (f: 5), contribution to learning (f: 5), academic requirement (f: 3), professional requirement (f: 2), helping to create a context (f: : 1), using it as an evaluation method (f: 1), increasing success (f: 1), and using it as a learning outcome (f: 1).

On the other hand, linguistic factors include the categories of improving various language skills (f: 38), improving writing skills (f: 1), improving expression skills (f: 1) and improving transfer skills (f: 1). As for cognitive factors, the categories cover contribution to thinking skills (f: 8), using it as an information processing method (f: 3), raising awareness (f: 3), improving cognitive skills (f: 2), supporting the use of mental processes (f: 1) and giving different perspectives (f: 1). Finally, in the theme of individual factors, the categories consist of the need for continuous use (f: 2), reader interest (f: 1), motivational state (f: 1), improving communication skills (f: 1), personal differences (f: 1) and interestingness of the text (f: 1). Some participant responses and the categories exemplified by these responses are provided below.

To exemplify, E4 said "Yes, it is important. I think it makes knowledge more permanent in our mind." and stated that summarizing makes knowledge more permanent, while E13 stated that "It is important because it helps to understand the text better.", implying that summarizing contributes to understanding. Also, E30 stated "Yes, because summarizing can be useful for us when there is a time limit." and emphasized summarizing was useful for saving time whereas E53 reported "It is an important skill for checking students' comprehension of a text." to indicate how summarizing can be used as an evaluation method. Finally, the E143 remarked "Absolutely. As many different skills are used while summarizing, it helps us to work effectively in many areas." to demonstrate how summarizing improves various language skills.

As to the pre-service Turkish teachers, T163 said "It is important because it improves our interpretation skills." to show the contribution of summarizing to interpretation skills, while T172 reported "Yes, it is important. Summarizing technique increases success." to highlight the potential of summarizing to increase achievement. Additionally, T188 proposed that summarizing is a professional requirement in her statement "It is important for the education (faculty) students because they will need to use it in their professional life and need it to guide students." whereas T216 reported "It is important. For example, we can study better by summarizing the important points." to exemplify how summarizing can be an important study technique.

Question 3: What are the main factors affecting your attitudes towards summarizing?

The participants were asked about the main factors affecting their attitudes towards summarizing. For this question, 252 participants responded, while 13 did not. The themes that emerged according to the answers given by the participants are presented in Graph 5. According to the data, the main factors affecting the attitudes towards summarizing were found to be textual factors (f: 179), educational factors (f: 120), individual factors (f: 65), and linguistic factors (f: 6).

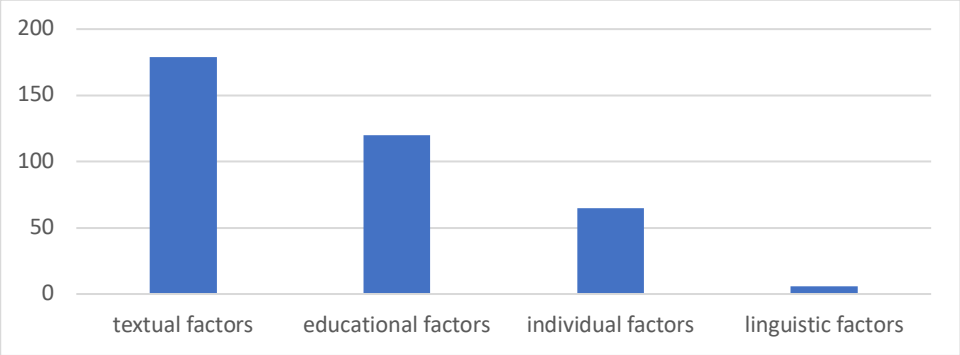

Figure 5. *Main Factors Affecting Attitudes Towards Summarizing*

To start with, within the scope of textual factors, the text's interestingness (f: 36), length (f: 36), theme (f: 35), engagement (f: 12), style (f: 11), difficulty level (f: 9), content (f: 7), structure (f: 6), language (f: 5), genre (f: 5), main idea (f: 3), clarity (f: 3), author (f: 2) and textual features (f: 1), intertextuality (f: 1), plot (f: 1), title (f: 1), protagonists (f: 1), importance (f: 1), use of conjunctions (f: 1) : 1), objectivity (f: 1) and coherence and consistency (f: 1) were the categories.

On the other hand, educational factors include the categories of contribution to understanding/learning (f: 35), practicality (f: 24), permanent knowledge (f: 9), previous experiences (f: 9), using as a study technique (f: 9), assigned homework (f: 6), education type (f: 5), academic requirement (f: 4), contribution to success (f: 3), improving language skills (f: 3), using it as a learning style (f: 3) (f: 2), exams (f: 2), providing feedback (f: 2), time limit (f: 2), teacher approach (f: 1), using it as a teaching technique (f: 1), scoring (f: 1) and theme restriction (f: 1). As for individual factors, the categories consist of personal interest (f: 19), reading habit (f: 10), motivational state (f: 6), personal skill (f: 5), vocabulary knowledge (f: 4), summary writing purpose (f: 4), the need for elaboration (f: 2), devoting time (f: 2), continuous use (f: 2), lack of experience (f: 2), use in daily life (f: 2), considering summarizing as an important skill (f: 1), shortening necessity (f: 1), background information (f: 1), anxiety (f: 1), subject knowledge (f: 1), academic achievement (f: 1) and mood (f: 1). Finally, in the linguistic factors theme, there are the categories of writing skill (f: 2), comprehension ability (f: 1), description skill (f: 1), expression skill (f: 1) and reading skill (f: 1). Some participant responses and the categories exemplified by these responses are demonstrated below.

For example, E34 stated "Interestingness and length of the text as well as the number of unfamiliar words influence my attitude towards summarizing." to emphasize that the role of interestingness and length of the text, and vocabulary knowledge in shaping her attitude whereas E46 reported "My habit that I have created thanks to the book summaries in the secondary school influences my attitude." to display how previous experiences can affect summarizing related attitudes. In addition, E135 said "It is a positive factor that my teachers attached importance to this issue and corrected my mistakes during my primary and secondary school years. Also, analyzing some articles in the reading classes at university is a factor that affects my attitudes." and stressed the effect of feedback on summaries and analyzing different types of genres as well as previous experiences in her attitudes. Finally, E148 drew attention to the practicality and contribution to understanding dimensions of summarizing in her response "It saves time and makes the plot more understandable."

As for the pre-service Turkish teachers, T185 expressed the importance of interestingness of the text and summarizing purpose by saying "Whether the text I will summarize attracts my attention and whether summarizing is given as homework (it motivates me more to do it as a learning method rather than homework)." whereas T205 foregrounded the effect of the theme of the text and its clarity by saying "The theme and clarity of the text affect my attitude towards summarizing." In addition, while T206 drew attention to the importance of motivation and subject knowledge in her statement "Emotional mood and my knowledge about the subject affect my attitudes.", T235 mentioned the role of reading habit and personal interest in her attitudes by stating "I consider myself as the main factor as I have the book reading habit and like thinking about what is implied at the end of the book and writing a summary." Finally, T248 foregrounded the importance of presenting the text's plot, title and protagonists as the factors affecting the attitude in his statement "…the plot and the order of events are my two most important factors. Then, the titles and protagonists of the text affect me.", while T264 said "There is renewal and attaching meaning to what is summarized while creating a summary. In this context, a kind of intertextuality is created." and attracted the attention to the intertextuality category.

Question 4: What are the main factors affecting your self-efficacy towards summarizing?

When the participants were asked about the main factors affecting their self-efficacy towards summarizing, 240 participants responded, while 25 did not. The emerging themes based on the answers of the participants are presented in Graph 6.

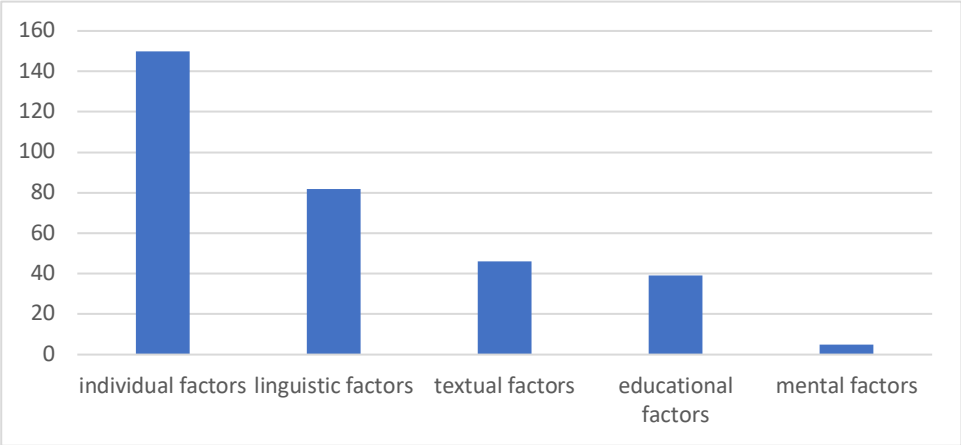

Figure 6. *Main Factors Affecting Self-Efficacy Towards Summarizing*

In light of the findings, it is seen that the main factors affecting the self-efficacy of the participants towards summarizing are individual (f: 150), linguistic (f: 82), textual (f: 46), educational (f: 39) and cognitive (f: 5) factors. Under the individual factors, the following categories are included: reading habit (f: 36), motivational state (f: 24), continuous use (f: 17), personal interest (f: 12), vocabulary knowledge (f: 11), schema (f: 10), personal skill (f: 9), focusing (f: 9), achievement status (f: 6), environment (f: 4), time allocation (f: 4), the purpose of summarizing (f: 2), personal achievement (f: 2), self-confidence (f: 2), personal attitude (f: 1) and literacy (f: 1) categories.

On the other hand, linguistic factors include the categories of language skills proficiency (f: 43), comprehension skills (f: 29), interpretation skills (f: 5), knowledge of structure (f: 2), description skill (f: 2) and note-taking (f: 1). In the textual factors theme, there are the categories of interestingness (f: 17), length (f: 7), theme (f: 7), content (f: 5), engagement (f: 4), clarity (f: 3), difficulty (f: 2) and type (f: 1). In addition, the theme of educational factors consists of the categories of previous experiences (f: 12), type of education (f: 6), contribution to understanding (f: 5), assigned homework (f: 4), feedback (f: 3), practicality (f: 3), exams (f: 2), solving questions (f: 2), teacher attitude (f: 1) and study technique (f: 1). Finally, cognitive factor categories include thinking skills (f: 2), way of thinking (f: 1), prediction skills (f: 1), and giving perspectives (f: 1). Some participant responses and the categories exemplified by these responses are provided below.

First of all, E36 stated that "Having previous knowledge about that subject may affect my self-efficacy." to demonstrate the role of the schema of the person, while E39 mentioned the theme and length of the text as the main factors by saying "The theme and length of the text I will summarize affect my attitudes." In addition, E54 drew attention to the importance of reading and writing skills in his response "Advanced reading and writing skills directly affect my summarizing self-efficacy." while E100 emphasized the role of reading habits by saying "I think my reading habits greatly affect my self-efficacy." Finally, E113 considered vocabulary knowledge and motivational state as the main factors by reporting "My level of prior knowledge about text terminology and having enough motivation to summarize.", whereas E128 said "I have loved writing since my childhood and participated in many competitions. My achievements in these competitions and my exams have been effective for me to improve myself in this direction." to highlight the effect of personal interest and achievement.

As for the pre-service Turkish teachers, T163 proposed that interestingness of the text was the main factor by saying "Whether the text I read/listen to attracts my attention or not affects my approach towards that text.", whereas T164 drew attention to the importance of motivation in her response "Whether I want to summarize the text at that moment affects me a lot." In addition, T166 stressed the environment by saying "The environment in which summarizing takes place affects my self-efficacy.", while T167 stated the effect of vocabulary knowledge by saying "The frequency of unknown words." Finally, T177 presented solving paragraph questions and reading habit as the main factors in her statement "Solving paragraph questions and reading books regularly affect my self-efficacy positively.", whereas T242 said "The frequent use of this technique by our teachers in primary school motivated me to appreciate summarizing and contributed to my success in this technique." to express the effect of her previous experiences on his/her summarizing self-efficacy.

DISCUSSION & CONCLUSION

This study aimed to reveal the psychometric properties of the Summarizing Attitude Scale (SAS) and Summarizing Self-Efficacy Perception Scale (SSEPS), both of which were implemented in Turkish. According to the findings of the Confirmatory Factor Analysis and Cronbach alpha values, the validity and reliability of the scales were confirmed. Also, it was aimed to reveal and compare the perceived levels of the participating pre-service English and Turkish teachers in terms of summarizing achievement, attitude and self-efficacy.

According to the findings, the summarizing achievement of the participating pre-service teachers was at a good level. However, it was revealed that there was no significant difference between the pre-service English and Turkish teachers in terms of their summarizing achievement scores. Similar studies also demonstrated that summarizing achievement of pre-service Turkish teachers was above average (Doğan & Özçakmak, 2014; Kurnaz & Akaydın, 2015). In addition, in the study of Çalışır Zenci (2020), it was found that summarizing achievement of pre-service English teachers was above the medium level.

Another dimension of the study is about attitudes. Attitudes towards summarizing is an important affective state that shapes an individual's frequency of summarizing activities. The findings showed that the participants had a high level of belief in the importance of summarizing, enjoyed summarizing at a moderate level, and their attitudes towards summarizing were high. On the other hand, there was a significant difference in favor of the pre-service Turkish teachers in the dimension of enjoying summarizing and overall attitude scale scores. However, it was revealed that there was no significant difference between the pre-service English and Turkish teachers in terms of their scores in believing in the importance of summarizing. Similarly, Bahçıvan (2020) stated that secondary school students believed in the importance of summarizing, enjoyed summarizing, and their attitudes towards summarizing were positive and at a high level. It was also indicated that their summarizing achievement was at a medium level.

The last dimension of the study is related to self-efficacy which is the individual's opinion of how competently s/he can carry out the necessary actions to successfully fulfill the task. In this sense, it was revealed that the participants' levels of summary-based reading, summarizing and summarizing self-efficacy perceptions were at a high level. In addition, it was found that there was no significant difference between the participants in terms of their summary-based reading, summarizing and overall summarizing self-efficacy scores.

In the light of these findings, it is possible to refer to similar and different studies in the related literature. For instance, according to the findings of Bahçıvan (2020), summarizing self-efficacy perceptions of the secondary school students were at a high level. Similarly, according to the results of the study of Hamzadayı and Demir (2022), the summarizing self-efficacy perceptions of the secondary school students were at a moderate level. However, the self-efficacy perceptions of the pre-service Turkish and English teachers in this study were higher than those of the secondary school students in these studies.

It should also be noted that the aforementioned studies display similarities and differences compared to the current study in terms of participant profile, research design and data collection tools. For example, Hamzadayı and Demir (2022) included secondary school students and adopted a correlational survey model - qualitative research design in their study. Also, the data collection tools were the Summarizing Self-Efficacy Scale, Student Information Form, and Summarizing Source Text, while the Story Summarizing Evaluation Rubric was used in data analysis. It is seen that the Summarizing Self-Efficacy Scale and the Story Summarizing Evaluation Rubric were employed in both studies; however, the participants and the research design were different. Doğan and Özçakmak (2014), on the other hand, focused solely on pre-service Turkish teachers and employed the Summarizing Strategies Scoring Scale that they developed. The authors also adopted a correlational survey model. In addition, Kurnaz and Akaydın (2015) focused on the summarizing skills of pre-service Turkish teachers and employed a quantitative research design. Furthermore, Çalışır Zenci (2020) examined the summarizing strategies of pre-service German, English and special education teachers. Finally, Bahçıvan (2020) investigated the relationship between secondary school students' summarizing achievement and attitudes towards summarizing, and self-efficacy perceptions via the SAS, SSEPS and SSER. However, in this study, pre-service Turkish and English teachers' achievement levels, perceptions of self-efficacy, and attitudes in relation to summarizing skills were compared via two scales (SAS and SSEPS) in a mixed-method research design, and their summaries were evaluated according to SSER. This study also gathered the reflections of the participants on the importance of summarizing, and their perspectives about the main factors which influence their attitudes and self-efficacy with regard to summarizing via semi-structured interview items.

In addition to the quantitative findings, the qualitative aspect of this study aimed to reveal the reflections of the participants about the main factors affecting their summarizing skills. There were four interview questions. Fisrtly, when asked how successful they found themselves in summarizing, most participants reported that they found themselves successful. However, almost one-third of the participants stated that they found themselves unsuccessful in summarizing or were not sure of their summarizing success. According to the participants, individual and educational reasons came to the fore among the factors affecting their summarizing achievement. Additionally, structure of the source text was also a variable which could their summarizing achievement. Secondly, qualitative findings demonstrated that the participants believed in the importance of summarizing. According to the participants, summarizing ability is important as it fosters educational, linguistic, mental and individual development. The participants reported that summarizing was important for educational success as it contributed to their understanding, made knowledge permanent and helped to save time. They also indicated that summarizing was important in terms of linguistic improvement as it improved their comprehension and expression skills. Additionally, summarizing was considered important in mental aspects as it enabled them to process information and evaluate facts from different perspectives. Finally, summarizing was reported to be important in individual sense since it increased their motivation and improved their communication skills. Thirdly, factors such as lack of skill, motivation, and individual interest came to the fore in the individual reasons that affect their summarizing achievement. Among the educational factors, contribution to making meaning and using summarizing as a study technique were reported. Therefore, it can be claimed that these factors could increase the individual's frequency of summarizing because the more frequently the individual summarizes, the better s/he will become at it. Another factor that the participants listed under the educational reasons for their summarizing achievement was their book reading habit. The act of reading is an important cognitive activity that nourishes and improves an individual's reading comprehension skills, text structure knowledge, and vocabulary knowledge. These skills also directly affect summarizing achievement. As to the textual reasons, factors such as the source text's interestingness, type, theme, difficulty level and length were mentioned. Fourthly, according to the participants, the main factors affecting their summarizing self-efficacy are, in descending order; individual, linguistic, textual, educational and mental factors. To exemplify, factors such as the frequency of reading books, the frequency of summarizing and vocabulary knowledge were among the individual factors. On the other hand, language proficiency, comprehension, interpretation, and description skills were listed under the linguistic factors. Also, interestingness, length, theme, content, engagement, and clarity of the text were reported under the textual factors. Furthermore, previous summarizing experiences, assigned tasks, and feedback frequency were indicated for the educational factors. Finally, prediction and thinking skills were important categories of the mental factors.

Conclusion and Pedagogical Implications

There are a number of conclusions which can be drawn in light of the gathered data. Firstly, summarizing appears to be an important cognitive skill that includes reading comprehension and writing skills. In this vein, it seems natural to expect pre-service Turkish and English teachers, who will provide training on summarizing skills to their future students in educational environments, to possess positive attitudes towards summarizing and high level of summarizing achievement and self-efficacy perceptions. Secondly, in the interviews, some participants argued that their summarizing skills might have improved because they took notes in the lessons or preferred summarizing as a method of preparation for the exam. On the other hand, while some participants drew attention to the importance of summarizing activities previously given as homework, others stated that their prior knowledge and readiness levels were the determining factors. These responses demonstrate that summarizing is a skill which develops over time in line with personal variables and is partially or implicitly taught rather than appearing as a sub-skill that is explicitly taught.

Based on these conclusions, there are a number of pedagogical implications to enhance summarizing skills of pre-service Turkish and English teachers. As it has been indicated that summarizing is considered partially or taught implicitly, its educational value seems to be ignored. For this reason, it is of great importance for pre-service teachers to possess summarizing skills through explicit instruction instead of implicit instruction. In more concrete terms, summarizing activities can be conducted after employing various activities such as asking questions, using visuals and teaching vocabulary to trigger students' background knowledge, and prepare them for the upcoming activities. In addition, teachers can elaborate on coherence, cohesion and intertextuality terms to raise consciousness about text-internal and text-external aspects. Another issue is related to the curriculum of the teaching departments. There are skills-based courses in the first year in the English Language Teaching Department; however, this is not the case for the Turkish Language Teaching Department. For example, pre-service English language teachers take four basic skills courses in English (reading skills, writing skills, listening and pronunciation, oral communication skills) when they are freshmen. However, it was found that this situation

did not result in any significant difference between the participants in terms of their summarizing achievement scores. In a nutshell, it can be claimed that it is necessary to refer to summarizing for both teaching and evaluation to promote summarizing skills in pre-service Turkish and English teacher training. In addition, pre-service teachers should be presented with some summarizing examples, summarizing techniques should be taught explicitly and summarizing methods should be included in microteaching practices. Finally, similar to pre-service English teachers, it is recommended that pre-service Turkish teachers should take courses which aim to improve language proficiency in terms of four language skills (listening, reading, writing, speaking) in their first year.

Limitations and Suggestions for Further Research

This study has some limitations. First of all, the study included 265 pre-service teachers from Turkish and English Language Teaching Departments at a state university in Turkey. In this sense, future studies can be conducted with a larger sample size and include pre-service teachers from different departments for comparative purposes. Also, this study included two scales and a semi-structured interview form. Thus, future researchers can benefit from different data collection tools such as observations, student diaries or teacher journals to triangulate data. Additionally, this study included pre-service teachers who were chosen via convenience sampling and adopted a mixed-method research design. Therefore, future studies could focus on summarizing skills and strategies of language learners with different demographic features such as age, grade, and language level through an experimental or quasi-experimental research design to reveal the role of different teaching practices in the participants' summarizing skills and strategies. In this way, future research studies could consider potential biases by employing different sampling methods, data collection tools or research designs, and add a different perspective to the importance and implementation of summarizing activities in educational settings.

Statements of Publication Ethics

The authors declare that they obey the principles of publication ethics. The researchers first submitted the relevant documents to the Social and Humanities Sciences Scientific Research and Publication Ethics Committee of the university where the research was conducted, and then carried out the research after obtaining the permission document numbered 68282350/2022/G19 and dated 18.11.2022.

Researchers' Contribution Rate

All the authors equally contributed to this study in terms of review of literature, data collection, data analysis and reporting.

Conflict of Interest

The authors specify that they have no conflict of interest.

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The Inventory of Resources of Power Used by Pre-school Children: A Validity and Reliability Study

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Abstract

This study aims to create an inventory to determine the power sources used by preschool children and to bring this inventory to the literature by conducting the necessary validity and reliability study. Participants were selected through maximum variation sampling method. The teachers of 346 children attending pre-school education in different regions of Turkey in the 2021-2022 academic years were included in the study. The validity of the inventory was tested with EFA and CFA. As a result of the EFA analysis, a four-factor structure was obtained. The total number of items for these four factors is 21. The factors obtained were named as charismatic power, coercive power, helplessness power and reward power. The inventory we developed explains 68.26% of the total variance. The fit indices obtained in the CFA are acceptable. The result of the Cronbach's alpha analysis performed to determine the internal consistency of the inventory showed that the reliability coefficients of the inventory were acceptable as well. As a result, it has been shown that "The Inventory of Resources of Power Used by Pre-School Children" is a valid and reliable assessment tool.

Keywords: Pre-school, power resources, inventory

Okul Öncesi Dönemdeki Çocukların Kullandıkları Güç Kaynakları Envanteri: Geçerlik ve Güvenirlik Çalışması

Öz

Bu araştırmada okul öncesi dönemdeki çocukların kullandıkları güç kaynaklarını belirlemeye yönelik bir envanterin geliştirilmesi, geçerlik ve güvenirlik çalışmasının yapılarak literatüre kazandırılması amaçlanmıştır. Katılımcılar maksimum çeşitlilik örnekleme yöntemi ile seçilmiştir. Çalışmaya Türkiye'nin farklı bölgelerinde 2021-2022 eğitim öğretim yılında okul öncesi eğitime devam eden 346 çocuğun öğretmeni dâhil edilmiştir. Envanterin geçerliliğini test etmek için AFA ve DFA kullanılmıştır. AFA sonucu dört faktörden ve 21 maddeden oluşan bir yapı elde edilmiştir. Elde edilen faktörler karizma gücü, zorlayıcı güç, aciziyet gücü ve ödül gücü olarak adlandırılmıştır. Geliştirilen envanter toplam varyansın %68.26'sını açıklamaktadır. DFA sonucu elde edilen uyum indeksleri kabul edilebilir düzeydedir. Envanterin iç tutarlılığını belirlemek amacıyla gerçekleştirilen cronbach's alpha analizi sonucuna göre envanterin güvenilirlik katsayıları yeterlidir. Sonuç olarak "Okul Öncesi Dönemdeki Çocukların Kullandıkları Güç Kaynakları Envanterin geçerli ve güvenir bir ölçme aracı olduğu ortaya konmuştur.

Anahtar kelimeler: Okul öncesi, güç kaynakları, envanter

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INTRODUCTION

The pre-school period covers the years that are very important in terms of supporting the social development of children and laying the foundations of their socialization. Interpersonal relations are extremely important in the socialization process of children (Atis-Akyol & Güney-Karaman, 2021). Children experience their first social relationship within their families and begin to socialize by getting together with their peers during the preschool education process. This contributes to the development and growth of children's social interaction network (Dinçer et al., 2019). Children experience the richest peer relationships in the school environment because they spend a significant part of their day with their peers at school (Atış-Akyol & Güney-Karaman, 2021).

Peer relationships are of great importance as they have functions that can affect each and every developmental stage in children (Hay et al., 2008). Peer relationships established in the pre-school period not only shape social relationships and experiences, but also affect children's social and emotional adaptation in the following years (Gülay, 2009). Positive peer relations in the preschool period have significant positive effects on the development of problem solving skills (Reitz et al., 2014), the development of behaviors regarding sharing and cooperation (Beyazkürk et al., 2007), social adaptation, acquiring social skills (Çetin et al., 2003) and increasing social competence (Luczynski & Hanley, 2013). On the other hand, negative peer relations in the preschool period lead to an increase in aggression (Schwartz et al., 2000), impulsivity, hyperactivity (Flouri & Sarmadi, 2016) and adaptation problems (Huber et al., 2019).

Peer relationships refer to a multifaceted relationship between children that encompass positive and negative behaviors and include different types of relationships within the peer group of children (Healy et al., 2015). Children's individual characteristics and interactions with each other shape the structure of their peer relationships (Song, 2006). In addition, power balance/imbalance is a factor that significantly affects the peer relations (Gülay, 2009).

Power, which is one of many different aspects of group relations, is a relational phenomenon that exists in all relationships (Cederborg, 2021; Eidsvåg & Rosell, 2021; Whitington, 2001). While Dahl (2001) defines power as getting someone else to do what one wants, while Weber (1996) defines power as the capacity to manage the behavior of others for one's own purposes in social relations. Resources of power are used in this process. Resources of power refer to the things that give power to the person who uses it. Individuals can differ in various aspects such as physical characteristics, mental capacity, financial status, education level, profession and social status. These differences can be advantageous for some people to exert power over others (Şişman, 2011). Due to the fact that there are many resources of power, many classifications have been made until today. Of these, the most widely used is the one classified by French and Raven (1959) as legitimate power, reward power, coercive power, charismatic power, and expert power. Whitington (2000) determined that coercive power is perceived negatively and reward, charisma, and expert power are considered positive. In addition to these, helplessness power has emerged as a type of power that is often used by people who feel that they lack other types of resources of power. People use this type of power when they are incapable of handling a task (Bilgin, 1988).

Legal power refers to the authority granted to the person by the authority (Hitt et al., 2005). Reward power refers to influencing people's behavior with rewards in order to exhibit desired behaviors (Hoy & Miskel, 2012). Coercive force refers to directing people to desired behaviors by resorting to material and moral coercion such as threatening, using violence and exerting pressure (Yılmaz & Altınkurt, 2012). Coercive power occurs when a person has the ability to punish others or inflict physical or psychological harm. The power of charisma is the source of power through which people influence others thanks to their exemplary and admired personal characteristics (Hoy & Miskel, 2012). Expert power refers to the ability of a person to influence the behavior of other people with his knowledge and skills (Bayrak, 2001).

Power relations that emerge as a result of interaction with peers are observed in preschool classrooms (Lee & Recchia, 2008; Vuorisalo et al., 2015). Children use power in various ways when establishing relationships with their peers. This use of power can be positive or negative (Hawley, 1999; Eidsvåg & Rosell, 2021). Positive use of power maintains fairness, and access within the group. In contrast, the use of negative power is related to manipulation and rejection of other children's attempts to participate in play (Hawley et al., 2007). Moreover, power can have negative consequences in children's dominance control over play in some cases (Eidsvåg & Rosell, 2021). Children's language skills, social skills (Skånfors, 2010), social status (Nærland & Martinsen, 2011; Whitington, 2001), ability to inspire others, efficiency in playing games (Walker, 2009), strategies and personal abilities (Whitington, 2001) affect the power they will use over their peers.

Previous studies have shown that children often use their power when deciding which game to play (Eidsvåg & Rosell, 2021; Skånfors, 2010), who will participate into the play (Evaldsson, 2004; Lee & Recchia, 2008), who will play with the toys (Cederborg, 2021; Eidsvåg & Rosell, 2021), when deciding the rules of the play (Evaldsson, 2004), deciding the playground, deciding the playtime, setting the agenda (Lee & Recchia, 2008), deciding the roles in the play, and when they try to secure their influence and position (Eidsvåg & Rosell, 2021). Studies have also shown that when children use power, they use the strategies of commanding, excluding, disapproving, giving permission (Cederborg, 2021; Kyratzis & Marx, 2001), using the body, using objects, condemning, appreciating, rewarding (Cederborg, 2021), intimidation, exhibiting aggressive behavior (Hawley, 1999; Whitington, 2001), exhibiting prosocial behavior (Hawley, 1999), and using information (Whitington, 2000).

Power is a relational phenomenon inherent in preschool children's social relationships (Eidsvåg & Rosell, 2021; Whitington, 2001). Ignoring this phenomenon leads to a poor understanding of social relations (Lee & Recchia, 2008; Whitington, 2001). Because the variables related to power among children closely affect peer relations (Gülay, 2009). In addition, children can use power positively or negatively (Eidsvåg & Rosell, 2021; Hawley, 1999; Whitington, 2000), and children can experience it in a natural or normal manner (Eidsvåg & Rosell, 2021). The relationships that children establish in the preschool period have an important effect on how children will use power in later years (Hawley, 1999; Mostow, 2004). This will affect the relationships that children will form later on in all areas of their life. Since power structures are an important part of our identities (Yuval-Davis, 2011), children exposed to negative power use are at risk of interpreting this experience as an integral part of their identities (Eidsvåg & Rosell, 2021). For this reason, it is important to determine the resources of power used by preschool children and to take immediate measures for children who use negative power sources. There is a lack of an assessment tool in the field to investigate the resources of power that preschool children use against their peers. In the literature, children's power relations have been investigated with qualitative approaches using interview and observation techniques (Cederborg, 2021; Eidsvåg & Rosell, 2021; Gündoğdu & Yaşar, 2021). These studies were carried out with fewer participants. In order to reveal the power relations of more children, measurement tools are needed. For this reason, there is a need to develop assessment tools to determine the resources of power that children use against their peers.

METHOD

This study aims to develop "The Inventory of Resources of Power Used by Pre-School Children" (IRoPUPC) to determine the resources of power used by preschool children, as well as to conduct validity and reliability studies of the inventory. This section includes participant information, the development process of the inventory, the data collection process and the data analysis process.

Participants

The participants consisted of teachers of 346 children attending pre-school education in different regions of Turkey in the 2021-2022 academic years. Participants were selected through maximum variation sampling method. With the maximum sampling, children from different regions, different genders and different age groups were included in the study. It was tried to represent Türkiye in general with participants from different regions. The fact that the genders of the children were close to each other prevented the differentiation by gender. The ratio of children's age groups to each other is similar to the age groups of children receiving pre-school education in Turkey. According to the Ministry of National Education (2022), there is a schooling rate of 15% at age 3, 36% at age 4, and 98% at age 5. The children's teachers filled out the form during the data collection process. It is stated in the literature that, in order to perform factor analysis in inventory development studies, the sample size should be between 5 and 10 times the number of items in the inventory (Kline, 2005; Tavşancıl, 2014) or at least 300 (Çokluk et al., 2018). The participants in our study meet these criteria. Demographic information of the participants are presented in Table 1.

Table 1. Demographic Information of the Participants

Variable	Category	f	%
Sex	Female	186	53.8
	Male	160	46.2
Age	3	17	4.9
	4	75	21.7
	5	254	73.4

Geographical Region	Central Anatolia	116	33.5
	Mediterranean	99	28.6
	Southeastern Anatolia	69	19.9
	Aegean	28	8.1
	Eastern Anatolia	23	6.6
	Marmara	6	1.7
	Black Sea	5	1.4
	Total	346	100

As seen in Table 1, 53.8% (n=186) of the children were girl and 46.2% (n=160) were boy. 73.4% (n=254) of the children were 5 years old, 21.7% were 4 (n=75) and 4.9% (n=17) were 3 years old. In terms of geographical regions, it is seen that of the participants 33.5% (n=116) are in the Central Anatolia Region, 28.6% (n=99) are in the Mediterranean Region, 19.9% (n=69) are in the Southeastern Anatolia Region, 8.1% (n=28) are in the Aegean Region, 6.6% (n=23) are in the Eastern Anatolia Region, 1.7% (n=6) are in the Marmara Region and 1.4% (n=5) are in the Black Sea Region.

The Development Process of the Inventory

A valid and reliable inventory was developed through a systematic process to be used to assess the resources of power used by preschool children. As a first step, a literature review was conducted. In addition, opinions were received from 116 preschool teachers working in different provinces of Turkey on the subject. Participants were asked the following question: What strategies do the children in your class use against their peers to achieve the things they want? (What do they do to achieve the things they want?). In this context, a pool of 60 items was created. The content validity of IRoPUPC was ensured by consulting expert opinions. For this, the draft version of IRoPUPC was submitted to the opinion of three experts in the field of pre-school education and an expert in the field of measurement and evaluation. In terms of face validity, the draft version of IRoPUPC was examined by an expert in the field of Turkish Education. Upon receiving feedback from the experts, items that mean the same thing, that do not assess the desired features and that are considered problematic were removed from the form (14 items in total). In line with the suggested corrections, the draft form of the 46-item IRoPUPC was created. Five-point Likert-type ratings such as “Always”, “Often”, “Sometimes”, “Rarely” and “Never” were used in the draft version of IRoPUPC. There is no reverse coded negative item in the inventory.

Data Collection Process

The data collection started in December 2021 and lasted approximately four weeks. The data were collected approximately three months after the start of the education in order for the teachers to get to know the children and have information about them. IRoPUPC was created as an online form. A link was sent to preschool teachers to fill out the form online. The form contained information about the study. In addition, it was stated that participation in the study required voluntariness and consent forms were obtained from each teacher. The time to fill out the form per participant was approximately 10 minutes. The researcher reached preschool teachers in different regions through school contact information. First of all, school administrators were called by phone and informed about the research. After the approval of the school administrators, pre-school teachers were contacted by phone and informed about the research. Teachers were asked to fill out the form (as many times as they wanted) for each of the children in their class. A total of 112 teachers filled out forms for 367 children. This corresponds to approximately 3.28 children for each teacher.

Data Analysis Process

Before analyzing the collected data, missing and incorrectly filled data were examined and outliers were determined. As a result of the examination, it was revealed that there were no missing or erroneous data, but the data of 21 participants were outliers (Z-score greater than 3 and less than -3). In this context, the data of these 21 participants were excluded from the analysis due to being outliers. Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett Sphericity test were used to decide whether the data were suitable for EFA (Çokluk et al., 2018). EFA was performed using SPSS 22 package software. For CFA, LISREL 8.7 software was used.

FINDINGS

Findings Regarding Validity

The construct validity of the items that compose the IRoPUPC was test by EFA. According to Kaiser (1974), a KMO value higher than .90 indicates an excellent construct. The KMO value of 0.909 obtained as a

result of the analysis shows that the sample meets the conditions for conducting a factor analysis. The result of the Bartlett test was found significant ($x^2 = 4621.267$; $p = .000$). The obtained results show that the data has a multi-variate normal distribution and are suitable for factor analysis.

Factor structure was analyzed using principal component analysis and varimax rotation method. Principal component analysis is used to reduce the number of variables, simplify complex data (Landau & Everitt, 2004) and to determine the size under which items will be grouped (Çokluk et al., 2018). Varimax rotation method is the most common axis rotation method in social sciences (Izquierdo et al., 2014) and it is used for determining the number of factors. This method was used assuming that the factors are not related to each other (Seçer, 2017). Because power resources have different characteristics and differ from each other. Factors with an eigenvalue above one were evaluated as significant in the EFA analysis. (Büyüköztürk, 2014). Factor loadings should be above .32 and the items should not overlap at the level of .10 (Tabachnick & Fidell, 2001). According to these criteria, a four-factor structure consisting of 21 items was obtained. This structure is also seen in the scree plot graph (Figure 1).

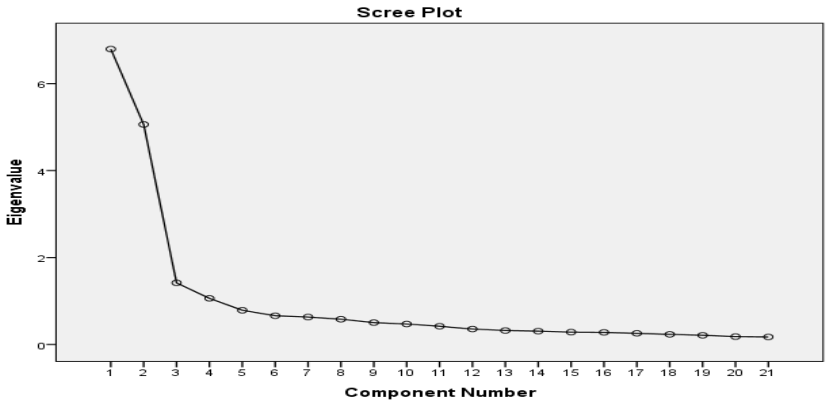

Figure 1. Scree Plot

The inventory explained 68.26% of the total variance. Tavşancıl (2014) state that a total variance rate between 40% and 60% is sufficient for studies in the field of social sciences. Therefore the total explained variance ratio obtained in the study is sufficient. Eigenvalues, percentages of variance explained, and percentages of total variances of the factors revealed in principal components analysis and varimax rotation method are shown in Table 2.

Table 2. Principal Components Analysis Results

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Factor	Total	Variance Explained (%)	Cumulative Variance Percentage	Total	Variance Explained (%)	Cumulative Variance Percentage
1	6.794	32.353	32.353	4.485	21.359	21.359
2	5.060	24.097	56.450	4.390	20.905	42.264
3	1.418	6.751	63.202	2.845	13.547	55.811
4	1.062	5.056	68.257	2.614	12.447	68.257

As it can be seen in Table 2, there are four factors with eigenvalues above 1. The inventory had four factors and explained 68.26% of the total variance. The total variance explanation rates of the factors are 21.36%, 20.91%, 13.55% and 12.45% respectively. The factor loadings that emerged in the principal component analysis of the items in the inventory are presented in Table 3.

Table 3. IRoPUPC Item Factor Loadings

Items	Factors			
	1	2	3	4
17 By using his speaking ability, he makes his wishes come true.	.857			
18 Makes wishes come true by using inspiring behaviors.	.796			
19 Thanks to his personal abilities, he makes his wishes come true.	.786			
14 By using the leadership feature, he makes his wishes come true.	.782			
16 His wishes come true because he is loved by most children.	.777			
26 By using his persuasion ability, he makes his wishes come true.	.724			
34 Makes his wishes come true by oppression.		.836	.320	
29 Makes his wishes come true by threatening.		.830		
32 Makes your wishes come true by disrupting the play.		.805		
8 Makes his wishes come true by giving a stern warning.		.796		
31 He/She makes her wishes come true by using violence.		.795		
27 It ensures the realization of their wishes by excluding them from the group of friends.		.748		
43 Makes his wishes come true by making emotional pressure.			.817	
42 He makes his wishes come true by showing his wishes small.			.758	
40 Makes their wishes come true by complaining to the teacher.			.703	
39 Crying makes his wishes come true.			.616	
36 By being distant and cold, he makes his wishes come true.		.360	.595	
2 By using the rewards, he makes his wishes come true.	.352			.832
3 By using the expressions of appreciation, he makes his wishes come true.	.484			.738
1 By sharing his toy, he makes his wishes come true.				.710
5 He makes his wishes come true by saying that he will be friends with her.	.387			.662

As it can be seen in Table 3, a four-factor structure consisting of 21 items was obtained as a result of EFA. The first and second factors consist of six items, the third factor consists of five items and the fourth factor consists of four items. The loadings of the first factor vary between .72 and .86, the loadings of the second factor vary between .75 and .84, the loadings of the third factor vary between .60 and .82 and the loadings of the fourth factor vary between .66 and .83. The results show that the items in the inventory strongly represent the dimension to which they belong (Tabachnick & Fidell, 2001).

CFA was performed using Lisrel 8.7 software to test whether the four-factor structure of IRoPUPC resulting from EFA was confirmed. χ2/sd, RMSEA, GFI, AGFI, NFI, SRMR, CFI, IFI, NNFI, RFI, PNFI and PGFI values were calculated to test whether the model was a fit for CFA. The obtained fit indices are presented in Table 4.

Table 4. Fit Indices in the Confirmatory Factor Analysis

Model Fit Indices	Good	Acceptable	Obtained	Conclusion	References
χ2/sd	χ2/sd ≤ 3	χ2/sd ≤ 5	2.296	Good Fit	Kline, 2005; Sümer, 2000; Çokluk et al., 2018
RMSEA	RMSEA ≤ .05	RMSEA ≤ .08	0.061	Acceptable Fit	Schumacher & Lomax, 2004
GFI	.90 ≤ GFI	.85 ≤ GFI	0.90	Good Fit	Hooper, Caughlan & Mullen, 2008; Schumacher & Lomax, 2004
AGFI	.90 ≤ AGFI	.85 ≤ AGFI	0.87	Acceptable Fit	Schumacher & Lomax, 2004
NFI	.95 ≤ NFI	.90 ≤ NFI	0.96	Good Fit	Schumacher & Lomax, 2004
SRMR	SRMR ≤ .05	SRMR ≤ .08	0.072	Acceptable Fit	Hu & Bentler, 1999
CFI	.95 ≤ CFI	.90 ≤ CFI	0.98	Good Fit	Hu & Bentler, 1999; Sümer, 2000; Thompson, 2004
IFI	.95 ≤ IFI	.90 ≤ IFI	0.98	Good Fit	Schumacher & Lomax, 2004
NNFI	.95 ≤ NNFI	.90 ≤ NNFI	0.97	Good Fit	Schumacher & Lomax, 2004; Sümer, 2000; Tabachnick & Fidell, 2001; Thompson, 2004
RFI	.95 ≤ RFI	.90 ≤ RFI	0.95	Good Fit	Schumacher & Lomax, 2004

χ2=413.20, sd=180, 90 Percent Confidence Interval for RMSEA = (0.054; 0.069)

As it can be seen in Table 4, values of χ2/sd = 2.296, GFI = .90, NFI = .96, CFI = .98, IFI = .98, NNFI = .97 and RFI = .95 are considered as a good fit and the values of RMSEA = .061, AGFI = .87 and SRMR = .072

are considered as an acceptable fit. Therefore, it can be said that the four-factor model obtained from CFA has a sufficient level of fit. As a result, the four-factor structure of the IRoPUPC consisting of 21 items was confirmed. The path diagram of the confirmatory factor analysis and the standardized factor loads are presented in Figure 2.

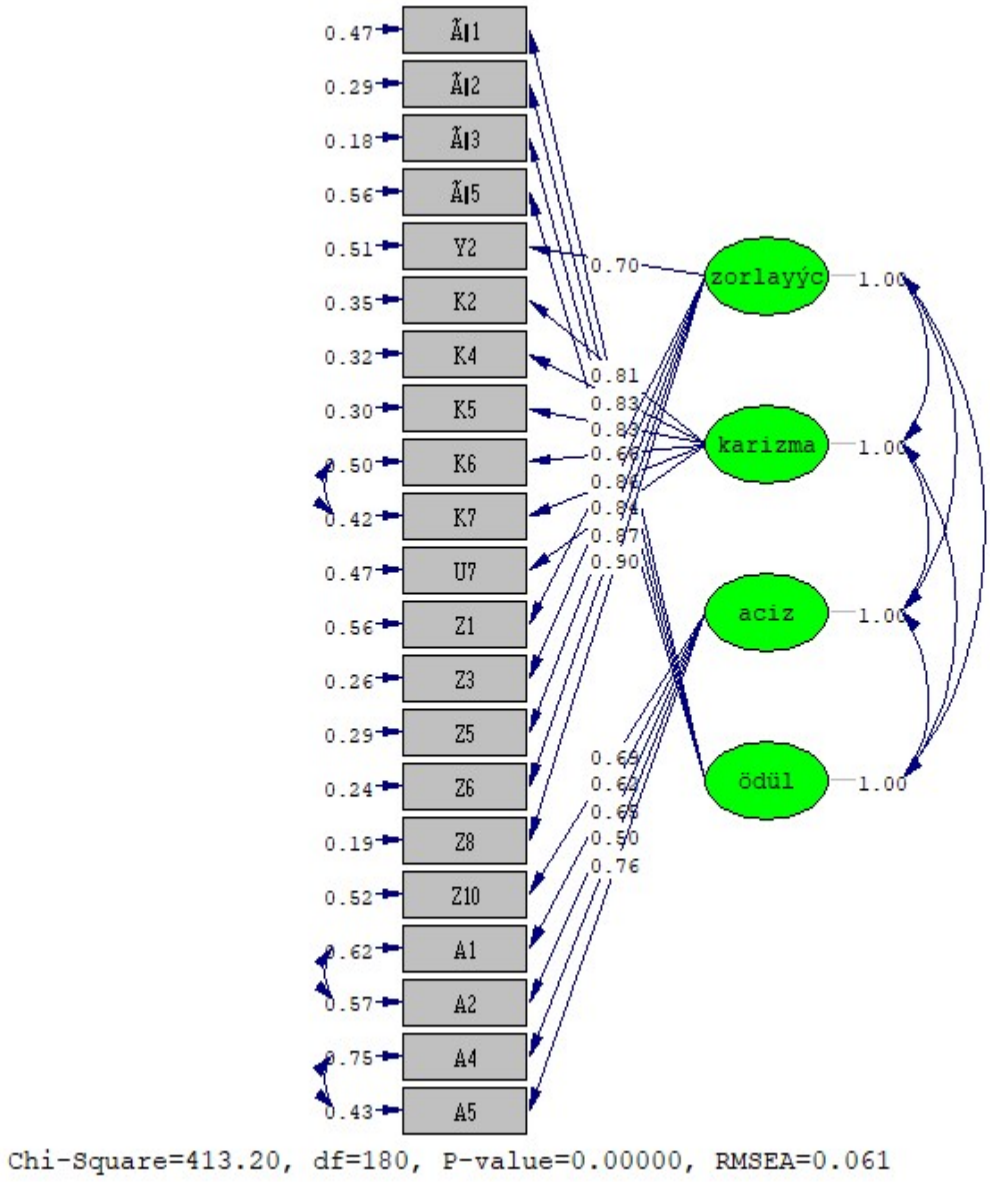

Figure 2. Path Diagram

Findings Regarding Reliability

Cronbach Alpha (α) coefficient, Spearman-Brown coefficient and Guttmann Split-Half coefficient were calculated to test the reliability of IRoPUPC. The obtained values are given in Table 5.

Table 5. Reliability Analysis Results of IRoPUPC

Factors	Item Number	Cronbach's Alpha	Spearman-Brown	Guttmann Split-Half
Charisma power	6	.904	.882	.878
Coercive power	6	.915	.911	.911
Helplessness power	5	.804	.813	.786
Reward power	4	.861	.862	.862

As it can be seen in Table 5, the Cronbach Alpha coefficients of the factors are .90, .92, .80 and .86 respectively. The split-half reliability of the measurements for each factor was calculated using the Spearman-Brown coefficient and the Guttmann Split-Half coefficient formula. The split-half reliability coefficients were

found to be above .70. A reliability coefficient above .70 indicates that the measurements are reliable (Büyüköztürk, 2014). Therefore, it can be said that the reliability coefficients of the inventory are sufficient.

Item Analysis

The item-total correlation was calculated to determine the discrimination levels of the items in the IRoPUPC. The values obtained in the item analysis are given in Table 6.

Table 6. Reliability Analysis Results of IRoPUPC

Factors	X	SD	Item Total Correlation	Cronbach's Alpha If Item Deleted	27% Lower Average n=94	27% Upper Average n=94	p
Factor 1							
17	2.99	1.22	.744	.887	1.54	4.51	.000
18	2.97	1.13	.762	.884	1.42	4.12	.000
19	3.23	1.23	.796	.878	1.73	4.23	.000
14	2.71	1.10	.706	.892	1.39	4.31	.000
16	3.03	1.04	.742	.887	1.52	4.20	.000
26	3.24	1.15	.680	.896	1.65	4.39	.000
Factor 2							
34	2.00	1.10	.651	.916	1.00	3.37	.000
29	1.62	.97	.823	.892	1.00	2.97	.000
32	1.58	.95	.785	.897	1.00	3.29	.000
8	1.79	1.06	.802	.894	1.00	3.73	.000
31	1.87	1.05	.852	.887	1.00	2.88	.000
27	2.23	1.18	.687	.912	1.00	3.54	.000
Factor 3							
43	2.02	1.19	.543	.783	1.00	3.67	.000
42	2.70	1.04	.613	.759	1.00	3.50	.000
40	2.10	1.05	.525	.785	1.49	3.98	.000
39	2.28	1.09	.724	.722	1.00	3.66	.000
36	2.10	1.04	.547	.778	1.00	3.48	.000
Factor 4							
2	3.47	1.01	.656	.844	1.71	4.31	.000
3	3.17	1.08	.793	.788	1.67	4.42	.000
1	3.23	1.15	.792	.787	2.22	4.48	.000
5	3.18	1.11	.603	.866	1.69	4.36	.000

As it can be seen in Table 7, the results regarding the item-total correlation ranged from .68 to .80 for factor 1, .65 to .85 for factor 2, .53 to .72 for factor 3, and .60 to .79 for factor 4. Items with a value of .30 and above are considered sufficient in terms of distinguishing the feature to be measured (Büyüköztürk, 2014). On the other hand, the scores of the participants in the lower 27% group and the upper 27% group are statistically significant at the level of .001 according to the independent groups t-test results. These results showed that all of the items in the inventory have adequate levels of discrimination.

DISCUSSION & CONCLUSION

The present study aimed to develop an inventory to determine the resources of power used by preschool children. For this purpose, a literature search was made, and 116 preschool teachers' opinions on the subject were taken. In this context, a pool consisting of 60 items was prepared. The prepared item pool was sent to academicians in the field of pre-school education, measurement and evaluation, and Turkish, and expert opinion was obtained. In this way, a form with 46 items was created and applied to the teachers of 346 children. According to Tabachnick and Fidell (2001), the Bartlett value must be significant and the KMO value must be greater than .60 in order for the data to be suitable for factor analysis. These results show that the data are suitable for EFA.

In the EFA, it was found that the inventory consisting of 21 items had four factors. The items collected in the factors were named considering their contents and considering the literature. The first factor is charismatic power (six items), the second factor is coercive power (six items), the third factor is helplessness power (five items), and the fourth factor is reward power (four items). It was seen that these factors explained 21.36%, 20.91%,

13.55% and 12.45% of the total variance, respectively. The total variance explained was 68.26%, which is considered sufficient in the literature (Tavşancıl, 2014). Since the factor loads of 21 items in the inventory are .60 and above, the construct validity of the inventory is quite high (Tabachnick & Fidell, 2001).

CFA was applied to the 21-item structure of the inventory, which was collected under four factors as a result of EFA. As a result of DFA, the RMSEA value was found to be 0.061 and $\chi 2/sd = 2.296$. This value indicates an acceptable fit (Schumacher & Lomax, 2004). Goodness of fit values obtained as a result of CFA show that the data obtained in the study have a good fit and CFA is statistically significant and valid. Cronbach's alpha internal consistency coefficients of the factors were found to be 0.90, 0.92, 0.80 and 0.86 respectively. Büyüköztürk (2014) state that a Cronbach's alpha value of .70 and above indicates that the measurements are reliable. Item analysis was performed to determine the predictive power of the items in the inventory and to determine their discrimination levels. Within the scope of item analysis, item-total correlation and 27% lower-upper group comparisons were examined. It was concluded that the t values of the upper and lower 27% groups of each item in the inventory were significant. This result is evidence of item discrimination (Büyüköztürk, 2014). High item coefficient values and high reliability coefficient values obtained as a result of the analyzes show that the internal consistency of the inventory is high. The results obtained in all analyzes show that "The Inventory of Resources of Power Used by Pre-School Children" is a valid and reliable assessment tool. A full score cannot be obtained from the inventory. According to the factors, it is revealed which power sources children use more.

An inventory developed to measure the resources of power used by preschool children has not been found in the literature. In the literature review, only a study on power relations of preschool children in Turkey (Gündoğdu & Yaşar, 2021) was found. It is thought that this inventory developed within this framework will fill the gap in the literature. This inventory, which will determine the power sources of children, will lead the studies to be done on this subject. Children can use positive and negative power sources. With the inventory, the power sources used by children can be determined and children who use positive power resources can be supported, while initiatives can be taken to prevent the use of negative power resources. The inventory can be used to determine the resources of power used by preschool children after the validity and reliability study that is conducted by the researchers.

Statements of Publication Ethics

Ethical approval, numbered 2021.09.310 and dated 25.10.2021, was obtained from Nevşehir Hacı Bektaş Veli University Ethics Committee for the study.

Conflict of Interest

Author declares no competing interests.

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A Revised Bloom's Taxonomy-Based Analysis of Lower Secondary Education English Teaching Curriculum

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Abstract

This study evaluated the learning outcomes in lower secondary education English Curriculum regarding knowledge and cognitive processes in the Revised Bloom Taxonomy. Document analysis, a qualitative research method, was employed in data analysis. Two hundred forty-five learning outcomes were analyzed: 52 in Grade 5, 60 in Grade 6, 63 in Grade 7, and 70 in Grade 8. The findings revealed that most of the outcomes in lower secondary education English curriculum were at the "conceptual knowledge" dimension according to the Revised Bloom Taxonomy. In addition, most outcomes were at the "applying" level in the conceptual knowledge dimension. The study's results suggested that knowledge and cognitive processes were not equally distributed in English courses. It was found that the learning outcomes were mainly concentrated on the applying level in the 5th, 6th, and 7th grades. In contrast, in the 8th-grade outcomes, there was an increase in the higher-order thinking stages, and the results for the analysis and creating levels were included for the first time. However, it was observed that there was no increase in the cognitive process dimensions of the outcomes from the 5th Grade to the 7th Grade. Therefore, attention should be paid to the distribution of the outcomes in the curriculum, considering the students' developmental levels.

Keywords: Lower secondary education English teaching curriculum, Revised Bloom's Taxonomy, Document analysis

Ortaokul İngilizce Dersi Öğretim Programının Yenilenmiş Bloom Taksonomisi 'ne Göre Analizi

Öz

Bu çalışmada, ortaokul İngilizce dersi öğretim programında bulunan kazanımları Yenilenmiş Bloom taksonomisinin bilgi ve bilişsel süreç boyutu açısından değerlendirilmesi amaçlanmıştır. Verilerin analizinde nitel araştırma yöntemlerinden biri olan doküman analizi kullanılmıştır. Çalışmada 5. sınıfta 52 kazanım, 6. sınıfta 60 kazanım, 7. sınıfta 63 kazanım ve 8. sınıfta 70 kazanım olmak üzere toplam 245 kazanım analiz edilmiştir. Araştırmanın sonucunda İngilizce dersi 5. 6. 7. ve 8. sınıflara ait kazanımlara bakıldığında, Yenilenmiş Bloom Taksonomisinin "bilgi birikimi" boyutuna göre kazanımların çoğunluğunun "kavramsal bilgi" boyutunda yer aldığı görülmektedir. Kazanımlar "bilişsel süreç" boyutu açısından incelendiğinde ise en yoğun basamağın "uygulama" olduğu belirlenmiştir. Sonuçlar değerlendirildiğinde İngilizce öğretim programında bilgi ve bilişsel süreç boyutunda yapılan sınıflandırmaların dengeli yer almamaktadır. 5. 6. ve 7. sınıf düzeylerinde kazanımların ağırlıklı olarak uygulama basamağında yoğunlaştığı; 8. sınıf kazanımlarında ise üst düzey düşünme basamaklarında artma olduğu, analiz ve yaratma basamağına yönelik kazanımların yer almaya başladığı görülmektedir. Ancak İngilizce öğretim programında 5. sınıftan başlayarak 7. sınıfa kadar kazanımların bilişsel süreç boyutlarında basamaklar arasında artma olmadığı görülmektedir. Bu nedenle öğrencilerin gelişim düzeyleri dikkate alınarak öğretim programındaki kazanımların dağılımına dikkat edilmesi gerektiği söylenebilir.

Anahtar kelimeler: Ortaokul İngilizce dersi öğretim programı, Yenilenmiş Bloom Taksonomisi, doküman analizi

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INTRODUCTION

With the development of communication systems introduced by the global technological revolution, the English language has become universal. As a result, it has become necessary to include the English language in the education system from the early years of education to the final years of university (Kırkıç & Boray, 2017). Turkey has been ongoing efforts for years to create an efficient English education to keep up with the pace of modern ages (Hamurcu & Ekinci, 2020).

Due to the necessity of learning English, there have recently been frequent revisions in English teaching curriculums in Turkey (Seçkin, 2011). The primary school English curriculum published in 2006 was found insufficient regarding flexibility and recommended time (Yücel et al., 2017). Consequently, a new teaching program was designed for the 2013-2014 school year, and as of this date, English was integrated into the program starting from Grade 2 (MEB, 2013). In 2018, some revisions were made to the lower secondary education English teaching curriculum by decreasing the workload and underlining education values (Aslan et al., 2019).

The common purpose of the constantly updated and prepared English teaching programs is to ensure the fluency and permanence of the language and to be applied in daily life (MEB, 2013; MEB, 2018). Curriculums published in 2006, 2013, and 2018 also included world events in English teaching, thus serving as teacher guides (Akyol, 2021; Yücel et al., 2017). The English teaching curriculum, designed in 2018 for secondary school students, aims to create motivation for English learning through effective communication over the English language (Acar, 2019).

Learning outcomes ensure that curricula are delivered to the students within a particular objective and organization (Gezer et al., 2014). When learning outcomes comply with the learning objective, it is possible to have an efficient practice for the teaching-learning process and measurement and evaluation activities (Coşkun Diker, 2017). Thus, learning outcomes for the English teaching curriculum include advanced thinking skills and a focus on acquiring four basic language skills for more efficient use of the language (MEB, 2018).

Tekin (2009) and Gezer et al. (2014) stated that some educators suggested a restriction on educational targets due to the need for a clear reflection of the change in students' attitudes and that outcomes are being interpreted the same by the language operators. In line with this objective, the studies were carried out by Bloom, Englehart, Furst, Hill, and Krathwohl. (1956) have been widely accepted (Gezer et al., 2014). Bloom's classification aims to make cognitive learning easy for students and thus boost learning levels (Anderson & Krathwohl, 2001).

An overall analysis of the original Bloom's Taxonomy suggests a structure of three stages: cognitive, affective, and psychomotor. The cognitive field focuses on students' intellectual development, affective emotions, and psychomotor physical skills (Chandio et al., 2021). Bloom concentrates his studies mainly on the cognitive field. He defines the cognitive dimension in six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation (Lasley, 2014). Bloom's Taxonomy suggests that teaching and evaluation processes should switch from lower to higher levels of learning. In this taxonomy, 'knowledge,' 'comprehension,' and 'application' account for lower learning levels, whereas analysis, synthesis, and evaluation account for higher levels (Chandio et al., 2021). In other words, learning takes place from the lowest level to the highest one, which suggests progress from simple to complex, concrete to abstract, easy to hard (Tuğrul, 2002). Moreover, a student has to fully comprehend previous levels or levels before moving onto a higher level (Hamurcu & Ekinci, 2020).

In the 1990s, Lorin Anderson, a student of Bloom, decided to revise the taxonomy for 21st-century students and teachers by considering modern needs (Forehand, 2010). Some revision requirements included changes in learning and teaching outcomes, doubts about the order of evaluation steps, and insufficiency in explaining the learning process (Birgin, 2016).

In Bloom's original taxonomy, the six steps of cognitive dimension were changed from nouns to verbs: knowledge was changed to remembering, comprehension to understanding, and synthesis to creating (Forehand, 2005). Besides, the Revised Bloom's Taxonomy (RBT) also suggests a change in the order of synthesis and evaluation (Arı, 2011). Another change in Bloom's Taxonomy considers cognitive areas from two perspectives: knowledge and cognitive process (Yurdabakan, 2012).

This section should define the background to research, significance and research problem(s). While writing your manuscript, please regard APA 7, format-free article template, and keep your name anonymous throughout the manuscript. You may change the titles in the manuscript. Please use this style when you are writing text in the body of your manuscript. Arrange your tables as shown below:

Table 1. Sample Table Title

Knowledge Dimension	Cognitive process Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Factual	A1	A2	A3	A4	A5	A6
Conceptual	B1	B2	B3	B4	B5	B6
Procedural	C1	C2	C3	C4	C5	C6
Metacognitive	D1	D2	D3	D4	D5	D6

*A1: Remembering-Factual	*B1: Remembering-Conceptual	*C1: Remembering- Procedural	*D1: Remembering – Metacognitive
*A2: Understanding-Factual	*B2: Understanding-Conceptual	*C2: Understanding- Procedural	*D2: Understanding - Metacognitive
*A3: Applying-Factual	*B3: Applying-Conceptual	*C3: Applying- Procedural	*D3: Applying- Metacognitive
*A4: Analyzing – Factual	*B4: Analyzing –Conceptual	*C4: Analyzing – Procedural	*D4: Analyzing - Metacognitive
*A5: Evaluating – Factual	*B5: Evaluating –Conceptual	*C5: Evaluating – Procedural	*D5: Evaluating - Metacognitive
*A6: Creating – Factual	*B6: Creating –Conceptual	*C6: Creating – Procedural	*D6: Creating – Metacognitive

Table 1 illustrates that the knowledge dimension includes factual, conceptual, procedural, and metacognitive levels, whereas cognitive processes include remembering, understanding, applying, analyzing, evaluating, and creating. A pre-revised version of the taxonomy includes factual, conceptual, and procedural knowledge, and a metacognitive level was added later on (Wilson, 2016; Yurdabakan, 2012).

The factual dimension contains basic information that students should know. Conceptual knowledge is the classification, generalization, and principles involving more complex and organized information. Procedural knowledge includes knowing how to do something, such as algorithms, methods, and techniques. Metacognitive knowledge was added to the knowledge dimension as the revised taxonomy brings new perspectives to students' cognitive processes. This dimension refers to a knowledge in which the person is aware of the thinking processes. It enables students to know what they are doing and how to use the acquired skills in various situations (Krathwohl, 2002; Wilson, 2016; Tayyeh et al., 2021; Tutkun, 2012).

Remembering, the first step of the cognitive process, indicates identifying or remembering information in memory. The second step, understanding, refers to explaining, interpreting, sampling, summarizing, and classifying messages in written or visual texts. Applying denotes applying and using information in similar situations. Analyzing means breaking down information in order to research, understand, and relate to each other. Evaluating refers to being able to criticize information, make suggestions and judgments. Creating is the original arrangement, assembly, and re-creation of elements. It is the most difficult and complex level in which a new form is created by synthesizing the parts (Krathwohl, 2002; Wilson, 2016).

Bloom's Taxonomy classifies outcomes as cognitive, affective and psycho-motor. (Doğanay & Sarı, 2007). Cognitive domain refers to cognitive processes such as knowing, remembering, understanding and evaluating in program development and implementation. Cognitive outcomes are related to the learning process of the information in the mind and its use in daily life (Özdemir, 2014). Since the lower secondary school English curriculum is mainly verbal and language based, most of the outcomes are related to the cognitive domain. Cognitive learning has mainly mental outcomes and covers a series of hierarchical stages, starting with remembering and ending with creativity (Akpınar, 2017). Besides cognitive outcomes, there are also affective and psychomotor learning outcomes. The affective domain emphasizes feelings such as willingness, motivation, attitude, interest, willingness, like, or dislike. (Demirel, 2013). The psychomotor domain is related to mind-muscle coordination. (Senemoğlu, 2009). The statements above revealed that the lower secondary school English Curriculum outcomes were related to the cognitive domain.

A literature analysis shows that there needs to be more research on the learning outcomes for the English Curriculums. However, there is a sufficient amount of analysis on the compliance of English exam questions (Dalak, 2015; Gökdeniz & Demirci, 2020, Gökler, Aypay & Arı, 2012) to the national assessment and English curriculum objectives (Kozikoğlu, 2018), based on Revised Bloom's Taxonomy (Hamurcu & Ekinci, 2020). This study aimed to analyze the learning outcomes for the English curriculum designed for Grades 5, 6, 7, and 8 in terms of cognitive process and knowledge dimension in the Revised Bloom's Taxonomy. For this purpose, answers to the following questions were sought:

The Aim of the Study

This study evaluated the learning outcomes in lower secondary education English Curriculum regarding knowledge and cognitive processes in the Revised Bloom Taxonomy.

Research Questions

1. What is the distribution of the 5th-grade English curriculum outcomes according to RBT's cognitive process and knowledge dimension?

2. What is the 6th grade English curriculum outcomes distribution according to RBT's cognitive process and knowledge dimension?

3. What is the distribution of the 7th grade English curriculum outcomes according to the cognitive process and knowledge dimension of RBT

4. What is the distribution of the 8th grade English curriculum outcomes according to RBT's cognitive process and knowledge dimension?

5. What is the general distribution of the learning outcomes for lower secondary English curriculum regarding RBT?

METHOD

In this study, document analysis, one of the qualitative research methods, was adopted to examine lower secondary school English curriculum based on cognitive process and knowledge dimension in Revised Bloom Taxonomy. Document analysis includes a thorough examination of the written texts on the events and phenomena relevant to the research topic (Yıldırım & Şimşek, 2018). Document analysis also investigates the characteristics of a particular text or document with numerical expression and content analysis (Karasar, 2008) so that results can be reported once the data is categorized (Merriam, 2013). As the data source, cognitive outcomes in the English Teaching Curriculum for Grades 5,6,7,8 designed by the Board of Education in the Ministry of Education in 2018, which public schools still use.

This study included a three-stage analysis of the lower secondary education English teaching curriculum based on Revised Bloom's Taxonomy. The first stage consisted of a classification of all the learning outcomes based on RBT. (A total of 245 outcomes, 52 in 5th Grade, 60 in 6th Grade, 63 in 7th Grade, and 70 in 8th Grade, were analyzed). In stage two, three experts on curriculum development and two from English language teaching were asked for expert opinions. These experts analyzed the data independently. In the final stage, all experts were brought together to check the cognitive process and analysis of the knowledge dimension. As a result, a consensus was reached on the majority of outcomes. The experts could not reach a consensus on three of the 52 learning outcomes of the 5th Grade (*E5.5.L1. Students will be able to identify common illnesses and understand some of the suggestions made, E5.7.S3. Students will be able to use utterances to express obligation, E5.8.S2. Students will be able to accept or refuse suggestions simply*), two of the 60 outcomes of the 6th Grade (*E6.2.S2. Students can express their opinions about the food they like and do not like, E6.10.R1. Students will be able to recognize familiar words and simple phrases related to the concept of democracy*), two of the 63 outcomes of the 7th Grade (*E7.6.S2. Students will be able to express needs and quantity, E7.8.S2. Students will be able to report on explanations with reasons*), and four of the 70 outcomes of the 8th grades (*E8.1.W1. Students can write a short and simple letter apologizing and giving reasons for not attending a party in response to an invitation. E8.3.L1. Students will be able to get the gist of short, clear, simple descriptions of a process, E8.8.W1. Students can write short and simple poems/stories about their feelings and responsibilities, E8.10.SI4. Students will be able to give reasons and results to support their predictions about natural forces and disasters*). It was decided by a majority of votes in which domain these outcomes should be.

Later on, the experts expressed their opinions on the dimensions that should be included in Table 1 so that the outcomes for the cognitive process and knowledge dimensions could be determined, and the dimensions with the consensus were selected. Without consensus, the expert with a different opinion was asked to explain his/her reasons. The experts continued to work on the outcomes until they had a consensus. If no consensus was possible, the dimensions at least three of the five experts agreed on were accepted as the cognitive process and knowledge dimensions. In addition, some outcomes were discussed holistically. Thus, the analysis results based on the taxonomy classification were evaluated using a holistic approach. The meanings expressed in the outcomes were taken into consideration. For instance, the outcome stating that "E5.1.L1. Students will be able to understand

simple personal information" was included in A2, whereas "E5.2.S1. Students will be able to talk about the location of things and people in simple conversations" was included in B3.

In order to ensure the validity and reliability of the data, the codes used by the researchers and three experts were compared so that the data could be finalized.

Research Ethics

The approval of the Firat University Social and Human Sciences Research Ethics Committee was obtained for ethical compliance with the research procedures.

FINDINGS

This section includes an RBT-based evaluation of cognitive outcomes in the English Curriculum for Grades 5, 6, 7, and 8. Table 2 illustrates the frequency distribution of the learning outcomes in the English Curriculum for Grade 5 based on knowledge and cognitive process dimensions.

Table 2. Distribution of the Outcomes in English Curriculum for Grade 5 based on Revised Bloom Taxonomy

	Knowledge dimension					
Cognitive process dimension	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Factual knowledge	E5.1.R1 E5.4.R1	E5.1.L1 E5.2.L1 E5.3.L1				
Conceptual knowledge	E5.1.R2 E5.2.L2	E5.2.R1 E5.3.R1 E5.4.L1 E5.4.L2 E5.5.L1 E5.5.L2 E5.5.S1 E5.5.R1 E5.6.L1 E5.6.R1 E5.7.L1 E5.7.R1 E5.8.L1 E5.8.L2 E5.8.S4 E5.8.R1 E5.9.L1 E5.9.R1 E5.10.L1 E5.10.R1	E5.1.S1 E5.1.S2 E5.2.S1 E5.2.S2 E5.3.S1 E5.3.S2 E5.5.S2 E5.6.S1 E5.6.S3 E5.7.S1 E5.7.S2 E5.7.S3 E5.7.S4 E5.7.S5 E5.8.S2 E5.8.S3 E5.9.S1 E5.9.S2 E5.9.S3 E5.10.S1			
Procedural knowledge			E5.4.S1 E5.4.S2 E5.4.S3 E5.6.S2 E5.8.S1			
Metacognitive knowledge						

The 5th-grade English curriculum comprises a total of 52 outcomes. The analysis of these outcomes within the knowledge dimension of the taxonomy indicated that five of them were under the category of "factual knowledge," 42 pertained to "conceptual knowledge," and five aligned with "procedural knowledge." However, no outcomes were categorized under the metacognitive dimension in the 5th-grade English curriculum outcomes. Notably, the conceptual knowledge category found the highest number of outcomes.

The analysis of the outcomes based on the cognitive process dimension of the taxonomy showed that four outcomes corresponded to "remembering," 23 outcomes aligned with "understanding," and 25 outcomes fell under

"applying." However, no outcomes were categorized under the analysis, evaluation, and creation steps. Notably, the highest number of acquisitions was found in the applying step.

Table 3. Distribution of the Outcomes in English Curriculum for Grade 6 based on Revised Bloom Taxonom

	Knowledge dimension					
Cognitive process dimension	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Factual knowledge	E6.2.L1 E6.5.L1 E6.10.L1	E6.6.L2				
Conceptual knowledge	E6.1.L1 E6.3.L1 E6.5.R2 E6.7.L1 E6.8.L1 E6.9.L1 E6.10.R1	E6.1.R1 E6.2.R1 E6.2.R2 E6.3.L2 E6.3.R1 E6.4.L1 E6.5.R1 E6.6.L1 E6.6.R1 E6.7.R1 E6.8.L2 E6.8.R1 E6.9.L2 E6.9.R1 E6.9.R2	E6.1.SI1 E6.1.SP1 E6.1.SP2 E6.2.SI1 E6.3.SI1 E6.3.SI2 E6.3.SP1 E6.4.SI1 E6.4.R1 E6.6.SP2 E6.8.SI1 E6.8.SP1 E6.8.SP2 E6.8.W1 E6.8.W2 E6.9.SI1 E6.10.SI1 E6.10.SP1			
Procedural knowledge			E6.2.SP1 E6.3.SP2 E6.4.SP1 E6.5.SI1 E6.5.SP1 E6.6.SI1 E6.6.SP1 E6.6.W1 E6.7.SI1 E6.7.SP1 E6.7.W1 E6.8.SI2 E6.8.SP1 E6.9.SP1 E6.9.W1 E6.10.SP2 E6.10.W1			
Metacognitive knowledge						

The 6th grade English curriculum consisted of a total of 60 outcomes. The analysis of these outcomes based on the knowledge dimension showed that 4 fell under "factual knowledge," 40 aligned with "conceptual knowledge," and 17 pertained to "procedural knowledge." There were no outcomes classified under the metacognitive knowledge level, and the majority of the outcomes were in the conceptual knowledge dimension.

The examination the outcomes in the 6th grade English curriculum from the cognitive process dimension of the taxonomy revealed that 10 of them corresponded to "remembering," 16 to "understanding," and 34 to "applying." There were no outcomes categorized under the analyzing, evaluating, and creating steps. It was found that the most significant number of outcomes was concentrated in the applying step.

Table 4. Distribution of the Outcomes in English Curriculum for Grade 7 based on Revised Bloom Taxonomy

Knowledge dimension

Cognitive process dimension	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Factual knowledge	E7.2.L1 E7.4.L2 E7.6.L1 E7.8.L1					
Conceptual knowledge	E7.3.L1 E7.8.R1 E7.9.R1 E7.10.R2	E7.1.L1 E7.1.R1 E7.2.R1 E7.3.R1 E7.4.L1 E7.4.R1 E7.4.R2 E7.5.L1 E7.5.R1 E7.5.R2 E7.6.R1 E7.7.L1 E7.7.R1 E7.8.L2 E7.9.L1 E7.9.L2 E7.10.L1 E7.10.R1	E7.1.SI1 E7.1.W1 E7.2.SI1 E7.2.SP1 E7.4.SI1 E7.5.SI1. E7.5.SI2 E7.5.SP1 E7.5.SP2 E7.6.SI1 E7.6.SP2 E7.7.SI1 E7.8.SI1 E7.9.SI1 E7.9.SI2 E7.9.W1 E7.10.SI1 E7.10.SI2 E7.10.W1			
Procedural knowledge			E7.1.SP1 E7.2.W1 E7.3.SI1 E7.3.SP1 E7.3.W1 E7.4.SP1 E7.4.SP2 E7.4.W1 E7.5.W1 E7.6.SP1 E7.6.W1 E7.7.SP1 E7.7.W1 E7.8.SP1 E7.8.W1 E7.9.SP1 E7.9.W2 E7.10.SP1			
Metacognitive knowledge						

There were 63 outcomes in 7th grade English curriculum. According to the knowledge dimension, it was determined that 4 of the outcomes were in the "factual knowledge", 41 in the "conceptual knowledge" and 18 in the "procedural knowledge" stage. In addition, there was no outcome in the metacognitive knowledge level. It was found that most of the outcomes were in the conceptual knowledge dimension.

According to the cognitive process dimension of the taxonomy, it was seen that 8 of the outcomes were in the "remembering", 18 in the "understanding" and 37 in the "applying" steps. While the most outcomes were in the applying step, there was no outcome in the analyzing, evaluating and creating steps.

Table 5. Distribution of the Outcomes in English Curriculum for Grade 8 based on Revised Bloom Taxonomy

	Knowledge dimension					
Cognitive process dimension	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Factual		E8.4.L1				

knowledge		E8.4.R1		
Conceptual knowledge	E8.9.L1	E8.1.L1 E8.1.R1 E8.1.R2 E8.2.L1. E8.2.R1 E8.3.L1 E8.3.R1 E8.4.L2 E8.5.L2 E8.6.L1 E8.7.L1 E8.8.L3 E8.8.R1 E8.9.R1	E8.2.SI1 E8.2.W1	
Procedural knowledge		E8.3.R2 E8.5.L1 E8.5.SI1 E8.5.SI2 E8.5.SP1 E8.5.R1 E8.5.R2 E8.6.L2 E8.6.R1 E8.7.R1 E8.8.L1 E8.8.L2 E8.9.R2 E8.10.L1 E8.10.R1	E8.1.SI1 E8.1.SP1 E8.1.W1 E8.2.SP1 E8.2.SP2 E8.3.SI1 E8.3.SP1 E8.3.W1 E8.4.SI1 E8.4.SP1 E8.4.W1 E8.5.W1 E8.6.SI1 E8.6.SI2 E8.6.SP1 E8.6.W1 E8.7.SI1 E8.7.SI2 E8.7.SP1 E8.7.SP2 E8.7.SP3 E8.7.W1 E8.8.SI1 E8.8.SI2 E8.8.SP1 E8.9.SI1 E8.9.SI2 E8.9.SP1 E8.9.SP2 E8.9.W1 E8.10.SI1	E8.10.SI2 E8.10.SP1 E8.10.SP2 E8.10.W1
Metacognitive knowledge			E8.8.W1	

Table 5 revealed that there were a total of 70 outcomes in the 8th-grade English curriculum. In terms of the knowledge dimension of the taxonomy, there were two outcomes classified as "factual knowledge," 17 outcomes as "conceptual knowledge," 50 outcomes as "procedural knowledge," and one outcome as "metacognitive knowledge." Notably, the least number of outcomes were found in the factual and metacognitive knowledge levels, while most acquisitions were in the procedural knowledge stage.

The analysis of the cognitive process dimension of the taxonomy showed that, out of the 70 outcomes, one fell under "remembering," 31 under "understanding," 34 under "applying," and four under "analyzing." It was found that the fewest outcomes were in the remembering and creating steps, while the most outcomes were in the applying step.

DISCUSSION AND CONCLUSION

This study aimed to analyze the outcomes in the lower secondary education English teaching curriculum designed by the Ministry of National Education in 2018, based on the Revised Bloom Taxonomy's knowledge and cognitive process dimensions. This is because Revised Bloom's Taxonomy conforms to the core logic of the 2018 revision since "competence" as the updated pedagogical paradigm of "knowing" was revised to "doing." As Akpınar (2017) states, bloom, and his team pioneered the classification of the outcomes in the curriculum. Kratwhol later revised their classification so that each output expresses a verb. This revision underpins current contemporary teaching programs. An analysis of outcomes in the English Teaching Curriculum in Grades 5, 6, 7, and 8 put forward that the majority of the achievements (56.3%) are in the dimension of "conceptual knowledge," according to the "knowledge" dimension of the Revised Bloom Taxonomy. The ratios are, respectively, "procedural knowledge" 36.8%), "factual knowledge" (6.1%), and metacognitive knowledge (0.8%). On the contrary, it was concluded that the lowest number of outcomes is in the "metacognitive knowledge" step (0.8%). An analysis of outcomes for the "cognitive process" dimension points out that outcomes intensify in "applying" (53.9%) followed by "understanding" (34.7%), "remembering" (9.4%), "analyzing" (1.6%) and "creating" (0.4%), respectively. Therefore, the English teaching curriculum does not have evenly distributed knowledge and cognitive-process classifications. Students' mental development levels were used for the evaluation process as the most crucial element of the curriculum. Hamurcu and Ekinci (2020) state that the English teaching curriculum for Grade 5 includes outcomes for 'remembering,' 'understanding,' and ' applying' in the cognitive process dimension of RBT, while none is available for any of the four basic skills boost students' metacognitive thinking skills such as "analyzing," "evaluating" and "creating." Studies (Abdelrahman, 2014; Baş & Beyhan, 2012; Evcim & Özenici, 2019; Gökler et al., 2012; Igbaria, 2013; Utami et al., 2019) suggest that not just the exam questions but also the coursebooks for English curriculums focus on a similar level of knowledge and aim at low-level thinking skills. Analyzing the English teaching program and coursebook activities for Grade 9, Öztürk (2019) pointed to serious conceptual and metacognitive knowledge gaps.

Accordingly, it is seen that there are few outcomes in the upper-level steps of the knowledge and cognitive process dimensions of the English teaching curriculum. According to Aydın and Yılmaz (2010), it is necessary to include high-level cognitive outcomes for students to have advanced cognitive skills. Education programs can raise students who research, question, create logical solutions, and produce knowledge (Güldüren & Cangüven, 2020). For an effective English curriculum, it is necessary to focus on high-level cognitive steps to ensure the permanence of the outcomes. Concentrating on "analyzing," "evaluating," and "creating" in the cognitive process outcomes is highly essential to increasing high-level thinking skills and providing effective teaching (Çerçi, 2018; Mayer, 2002). Highlighting them shall also be essential to ensure that students can make analyses and evaluations expected by the 21st century (Çerçi, 2018).

It should also be noted that the cognitive process dimensions should be enhanced as the students' grade levels increase. It was found that outcomes enhanced, and the "analyzing" and "creating" stages appeared in Grade 8. The English teaching curriculum for Grades 5, 6, and 7 does not intensify cognitive process dimensions. Anderson and Krathwohl (2010) highlighted the importance of increasing cognitive levels for quality education as the grade levels rise. The fact that abstract thinking skills are not developed in young children may be the reason for the lack of outcomes that require high-level thinking skills in the early stages. Limited course hours and an intense curriculum are also why the outcomes in the cognitive dimension are not aimed at high-level skills. Some studies reported that the inverse proportion of course hours and curriculum density negatively affected language learning and retention. (Günday, 2007; Kuloğlu & Tutuş, 2022; Songbatumis, 2017; Teevno, 2011). The present study showed that the 5th, sixth, and 7th Grade outcomes are practice-based. In order to be successful, students must be exposed to language not only in the classroom but also outside the classroom. Thus, environments where children can only speak English outside of school can be established, and children can meet with native English speakers in these places (Tutuş, 2020). The lack of outcomes for high-level cognitive skills in the 5th, 6th, and 7th grades may lead to rote learning and memorization. Koç (2007) states that learning at the knowledge level occurs only by memorizing. In addition, Hamurcu and Ekinci (2020) thought that imposing a memorization method with the least permanence would not benefit young children, considering the outcomes. As a result of this study, it was found that the 5th, 6th, and 7th grade English curriculum could progress to the application and procedural knowledge levels. In the 8th grade, however, achievements belonged to creating and metacognitive knowledge domains, albeit a little. Accordingly, 5th, 6th, and 7th grade curricula can be revised based on the development of the students in order to measure advanced mental skills. In the 8th grade, more outcomes regarding the metacognitive dimension and the creating step can be included. In this way, students' ability to exercise their minds

and use the language can also improve. In addition, in preparing the outcomes, the number and levels of outcomes can be reduced based on the students' levels, practical activities and materials can be used, and content to use the language can be prepared. Schools should organize activities for applying as foreseen by the Ministry. The conformity of the outcomes and content to the curriculum can reflect on the behavior of the individuals applying the knowledge.

Statements of Publication Ethics

The Firat University Social and Human Sciences Research Ethics Committee approved the ethical permission for the research. The date of approval is 03.05.2021. The document number of approval is E-97132852-302.14.01-4258.

Researchers' Contribution Rate

All authors contributed equally to this work.

Conflict of Interest

This study has no conflict of interest.

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2D Animations: Teaching in Kitchen Skills to Individuals with Intellectual Disability

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Abstract

The present study investigated the effectiveness of an animation-based teaching package designed and developed to teach four different in-kitchen skills to individuals with intellectual disabilities (ID). A comprehensive teaching package was intended to teach lighting a stove, cooking eggs in the pan, setting a dining table, and clearing the dining table within the scope of the present work. Multiple baselines across behavior design were applied as single-subject research. The participants included three secondary public-school children with moderate ID in Aksaray, Turkey. The results reveal that the animation-based teaching package, in conjunction with the direct instruction model, has a positive effect in teaching daily living (DL) skills to individuals with ID, which is significant for greater independence across various settings.

Keywords: intellectual disability, animation, daily living skills, computer-aided instruction

2B Animasyonlar: Zihinsel Yetersizliği Olan Bireylere Mutfak İçi Beceri Öğretimi

Öz

Bu çalışmada, zihinsel yetersizliği (ZY) olan bireylere dört farklı mutfak içi beceriyi öğretmek için tasarlanan ve geliştirilen animasyon temelli bir öğretim paketinin etkililiği araştırılmıştır. Mevcut çalışma kapsamında çakmakla ocak yakma, tavada yumurta pişirme, yemek masası kurma ve yemek masası toplama konularına yönelik kapsamlı bir öğretim paketi tasarlanmıştır. Bu doğrultuda araştırmada davranışlar arası yoklama evreli çoklu yoklama modeli kullanılmıştır. Çalışmaya Aksaray İli'nde Milli Eğitim Bakanlığı'na bağlı bir özel eğitim ve uygulama okulunda II. kademeye devam eden orta düzeyde zihinsel yetersizliği olan üç öğrenci katılmıştır. Sonuçlar, doğrudan öğretim modeliyle birlikte animasyon temelli öğretim paketinin, zihinsel yetersizliği olan bireylere günlük yaşam becerilerini öğretmede olumlu bir etkiye sahip olduğunu göstermektedir.

Anahtar kelimeler: zihinsel yetersizlik, animasyon, günlük yaşam becerisi, bilgisayar destekli öğretim

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INTRODUCTION

Intellectual disability (ID) has been recognized as a developmental disorder that causes several enormous deficits that affect a variety of domains, such as conceptual, adaptive, and social (American Association on Intellectual and Developmental Disabilities, 2013). Individuals with ID lack motivation and have difficulties communicating, interacting, and concentrating (Rose et al., 2005), which impedes their learning processes and employment rates (Newman et al., 2011). Hence, individuals with ID have unique, complex learning needs (Sulaimani & Bagadood, 2022).

For a long time, efforts have been spent preparing individuals with ID to live independently and gain self-determination skills. Daily living (DL) skills are one of the critical learning areas for individuals with ID since they are necessary to obtain desirable life and employment opportunities (Heller et al., 2005). In-kitchen skills are among the essential multistep skills for developing autonomous living skills, including food preparation, cooking, preparing/gathering tables, etc. Such tasks lead to greater independence within various settings (Graves et al., 2005).

Considering that individuals with ID have difficulties in learning and recalling (Rezaiyan et al., 2007; Segatto et al., 2017; Wehmeyer et al., 2004), there is a need for practices that they can repeat over and over in the learning process. To acquire new skills and obtain independence and quality of life (Gooden-Ledbetter et al., 2007), they rely on effective teaching materials, strategies, and techniques (Sulaimani & Bagadood, 2022). Integrating assistive technology (AT) into learning processes is a promising way of addressing the issues encountered by individuals with ID. A wealth of research has investigated the effectiveness of AT and ensured empirical evidence on its contributions to teaching several skills to individuals with ID (Goo et al., 2016; Johnson et al., 2013; Kang et al., 2021; Taber-Doughty et al., 2011; Yalçın et al., 2023; Yeni et al., 2020). Computer-assisted instruction (CAI) as a current form of AT has great importance in developing necessary skills (Kamalı-Arslantaş et al., 2022; Ramdoss et al., 2012), and there is a tendency for more CAI studies (Burns et al., 2019) due to the technological improvements, ease access options and the educational affordances they ensure (Kamalı-Arslantaş et al., 2022). These educational affordances include the opportunity of repeated practice of the same task (Mechling, 2007), controlling of own learning processes (Kagohara et al., 2013; Kamali Arslantas et al., 2021), effective learning of skills (Chiu et al. 2019; Hopcan & Tokel, 2021; Polat et al., 2019), and decreasing the time spent for intervention (Yeni et al., 2020). Naturally, these affordances lead to educational gains such as skill acquisition, maintenance and generalization of skills, and motivation for more technology-based studies. Therefore, these individuals become less dependent and more talented (Mechling, 2007) as they develop autonomy (Van Laarhoven et al., 2009). Existing research reveals that several instructional strategies can be integrated into those processes, and integrating audio and video materials, including modeling or role-playing, has been identified as effective. Among those strategies, video-based instruction has attracted many researchers due to the evidence-based practices the studies provided (Ayres & Cihak, 2010; Hansen & Morgan, 2008; Mechling & Cronin, 2006; Mechling et al., 2015; Norman et al., 2001). Despite the positive outcomes of video-based instruction, students with special needs may need more interest in engaging in the desired behavior and still need more enjoyable content representation (Ohtake et al., 2015). Adding animation elements to video-based instruction is one of the ways suggested in the literature.

An alternative strategy to improve the skills of individuals with ID is animation-based video training (Cakmak & Cakmak, 2015; Drysdale et al., 2014; Eldeniz et al., 2017; Fujisawa et al., 2011; Shepherd, 2012; Yalçın et al., 2023), which was found to be enjoyable and increases curiosity and the ability to focus on the education of ID (Yeni et al., 2020).

Animations have several advantages when it comes to representing information effectively. Firstly, they can simplify complex concepts and make them easier to understand by breaking them down into smaller, more manageable parts. Secondly, animations can help learners visualize abstract or difficult-to-grasp concepts by providing visual cues that aid in retention and recall. Thirdly, animations can be more engaging than static text or images, as they can create an immersive and interactive learning experience. Research has shown that animations promote higher-order thinking skills such as analysis, synthesis, and evaluation (Barak & Dori, 2005). By presenting information in an interactive and engaging format, learners are more likely to think critically about the information presented and draw connections between different concepts. This can lead to a deeper understanding of the material being taught.

Moreover, animations can provide positive learning experiences for learners. Ohtake et al. (2015) found that animation-based instruction can be particularly effective for teaching skills to learners with special needs, such as those with autism spectrum disorder. Using animation-based video modeling to teach bathroom skills to a

student with autism spectrum disorder resulted in positive outcomes for the learner. Similarly, Bellini and Akullian (2020) noted that students with special needs engage more with videos when they are supported with animations or avatars. In summary, animations can be a powerful tool for representing information effectively and engagingly, particularly for learners with special needs. By providing visual cues, simplifying complex concepts, and promoting higher-order thinking skills, animations can lead to positive learning experiences and better retention of information.

However, existing research does not provide sufficient information related to the use of animation-based interventions in the education of people with disability. It is important to have evidence-based practices to understand the effectiveness of animation-based video instruction in teaching various skills. While existing research supports using animations in education, more studies are needed to determine this approach's benefits and limitations. Studies should be conducted with appropriate research designs and methodologies to establish the efficacy of animation-based video instruction across different subject areas and for learners with different backgrounds and abilities.

The present study investigated the effectiveness of an animation-based teaching package designed and developed to teach four different in-kitchen skills to individuals with ID. A comprehensive teaching package was designed to teach lighting a stove, cooking eggs in the pan, setting a dining table, and clearing the dining table. These skills are critical to improving participants' independent living skills and might help them become more autonomous. The current study investigated the performance of students during and after the intervention. The findings presented in the study extend the existing literature on the usage of animations in special education by examining the effectiveness of using animation-based videos in learning DL skills by individuals with ID. The animation used in this research is essential in ensuring effective time use, standardizing teaching, and minimizing practitioner-based limitations.

Research Questions

1. To what extent does the implementation of the animation-based daily life skills teaching package program impact the lighting stove skills acquisition of students with ID in the life skills classroom as measured by the percentage of correct lighting stove steps performed?
2. To what extent does the implementation of the animation-based daily life skills teaching package program impact cooking eggs in a pan skills acquisition of students with ID in a life skills classroom as measured by the percentage of correct cooking eggs in pan steps performed?
3. To what extent does the implementation of the animation-based daily life skills teaching package program impact the preparation of dining table skills acquisition of students with ID in the life skills classroom as measured by the percentage of correct preparation of the dining table skill steps performed?
4. To what extent does implementing the animation-based daily life skills teaching package program impact clearing the dining table skills acquisition of students with ID in the life skills classroom as measured by the percentage of correct clearing the dining table skills steps performed?

METHOD

Participants

The participants in this study included three secondary public-school children (Ahmet, Ayşe, Cansu) with moderate ID in Aksaray. Participants were enrolled in special education schools. These individuals met the following criteria: (1) diagnosed with moderate ID without comorbid additional disability, (2) attended school regularly, and (3) were not able to use the DL skills included in the current study. The researchers determined three students with these prerequisites and a substitute student, and the study started after the necessary approval and permissions were obtained.

The first participant, Ahmet, was a 16-year-old male student with moderate ID. Ahmet exhibits aggressive problem behavior. Ayşe and Cansu are 17-year-old female students with moderate ID who do not have any problem behaviors.

All participants are high school students in a particular education school, and at the same time, they attend an exceptional education and rehabilitation center two days a week. Based on the teacher and family interviews, it was determined that Ahmet performed many self-care skills independently, could count rhythmically from one to ten, recognized numbers, recognized some letters and sounds, and performed many of his communication skills independently. Ayşe was able to perform her self-care skills independently. She can also count rhythmically from

one to ten and recognize some letters. She can perform many of her communication skills independently. Cansu can perform self-care and communication skills independently. She can count rhythmically from one to nine. She does not have any academic skills related to reading. All participants need to be taught DL skills.

Research Design

A multiple baseline across behavior design was implemented as a single-case study to investigate the effectiveness of an animation-based teaching package in teaching four DL skills to individuals with ID. This model does not require continuous baseline data and controls factors that threaten internal validity, such as maturation and measurement. In addition, factors such as many repetitions and participant characteristics in this model effectively control the external validity of the model (Tekin-İftar, 2012).

Setting and Materials

Baseline, intervention, follow-up, and generalization sessions were conducted in a particular classroom. In this context, while the baseline, intervention, and follow-up sessions were held in the life skills classroom, the generalization session was held in the cafeteria within the school. The life skills classroom includes a dining table, chairs, kitchen cabinets, a counter, and a refrigerator. The researchers provided a countertop stove similar to the one used in the animation and placed it on the kitchen counter. In addition, the researchers provided other materials (lighter, pan, egg, oil, tablecloth, plate, glass, spoon, fork, knife, napkin holder, and saltshaker) to be used and placed in the kitchen cabinets. A laptop was used for the animation-based teaching package delivery. Accurate materials related to the four DL skills were used to examine whether these skills can be generalized to natural settings. For “burning the stove” skill; cooker and lighter; for “cooking eggs in a pan” skill; cooker, pan, oil, eggs, salt, and wooden spoon; for “preparing the dining table” and “clearing the dining table” skills; tablecloth, large and small plates, glasses, spoons, forks, knives, napkins, and saltshakers were used.

The study's dependent variables were the skills of burning the stove, cooking eggs in a pan, preparing the dining table, and clearing the dining table. The independent variable was the instruction provided by the animation-based teaching package.

Animation-Based Teaching Package

A web-based animation-based teaching package was designed, developed, implemented, and evaluated with the collaboration of special education and instructional technology experts to improve the DL skills of students with ID. The research team conducted task analysis for these skills after observing individuals performing the tasks. After analysis, the team performed the steps and recorded videos to determine whether the skills were correctly defined (see Table 1, Table 2, Table 3, and Table 4).

Table 1. Task Analysis Steps: Burning the Stove

Step No	Task analysis
1	Take the lighter from the drawer.
2	Go to the stove.
3	Light the stove by pressing the button of the lighter.
4	Turn on the stove with your other hand and remove your hand.
5	Bring the lighter closer to the stove.
6	Light the stove.
7	Extinguish the lighter by pulling your hand off the lighter button.
8	Put the lighter in the drawer

Table 2. Task Analysis Steps: Cooking Eggs in a Pan

Step No	Task analysis
1	Take the pan from the cabinet.
2	Put the pan on the stove.
3	Take the oil.
4	Pour some oil into the pan.
5	Leave the oil where you took it.
6	Turn on the stove.
7	Take the egg out of the refrigerator.
8	Crack the egg into the pan.
9	Throw away the eggshells.
10	Add some salt to the egg.

11	Put the salt where you took it.
12	Take the wooden spoon from the drawer.
13	Stir the eggs with a spoon until they are cooked.
14	When the eggs are cooked, put the spoon on the counter.
15	Turn off the stove.

Table 3. Task Analysis Steps: Preparing the Dining Table

Step No	Task Analysis
1	Take the tablecloth from the cupboard.
2	Layout the tablecloth.
3	Take the big plate from the cabinet.
4	Put the large plate on the table in front of the chair.
5	Take the small plate from the cabinet.
6	Place the small plate on top of the large plate.
7	Take the fork from the drawer.
8	Put the fork on the left side of the large plate next to it.
9	Take the knife from the drawer.
10	Put the knife on the right side of the large plate.
11	Take the spoon from the drawer.
12	Put the spoon next to the knife.
13	Take the napkin from the drawer.
14	Put the napkin next to the fork.
15	Take the glass from the cupboard.
16	Put the glass next to the knife and spoon.
17	Take the saltshaker from the cabinet.
18	Put the saltshaker on the table.

Table 4: Task Analysis Steps: Clearing the Dining Table

Step No	Task analysis
1	Take the saltshaker off the table.
2	Put the saltshaker on the counter.
3	Take the glass from the table.
4	Put the glass on the counter.
5	Put the napkins inside the small plate.
6	Take the small plate from the table.
7	Put the small plate on the counter.
8	Put the spoon on the large plate.
9	Put the knife on the large plate.
10	Put the fork on the large plate.
11	Take the big plate from the table.
12	Put the large plate on the counter.
13	Remove the tablecloth.
14	Put the tablecloth on the counter.

The web-based animation-based teaching package is based on the direct instruction approach, consisting of modules for each animation, such as “modeling,” “guided practice,” and “independent practice,” by this approach. There is also an “assessment” module for each animation. One of the two avatars named "Ege” and “Ece" performs the skills in all animations (see Figure 1). In the modeling module, by the instructions given by a voice-over, the character models all sub-steps of the skill. In contrast, the student is expected to apply the related skills with natural materials in the guided practice and independent practice modules. When the student cannot perform the skill correctly, the process restarts with the previous module. The implementation process was conducted under the guidance of the research team.

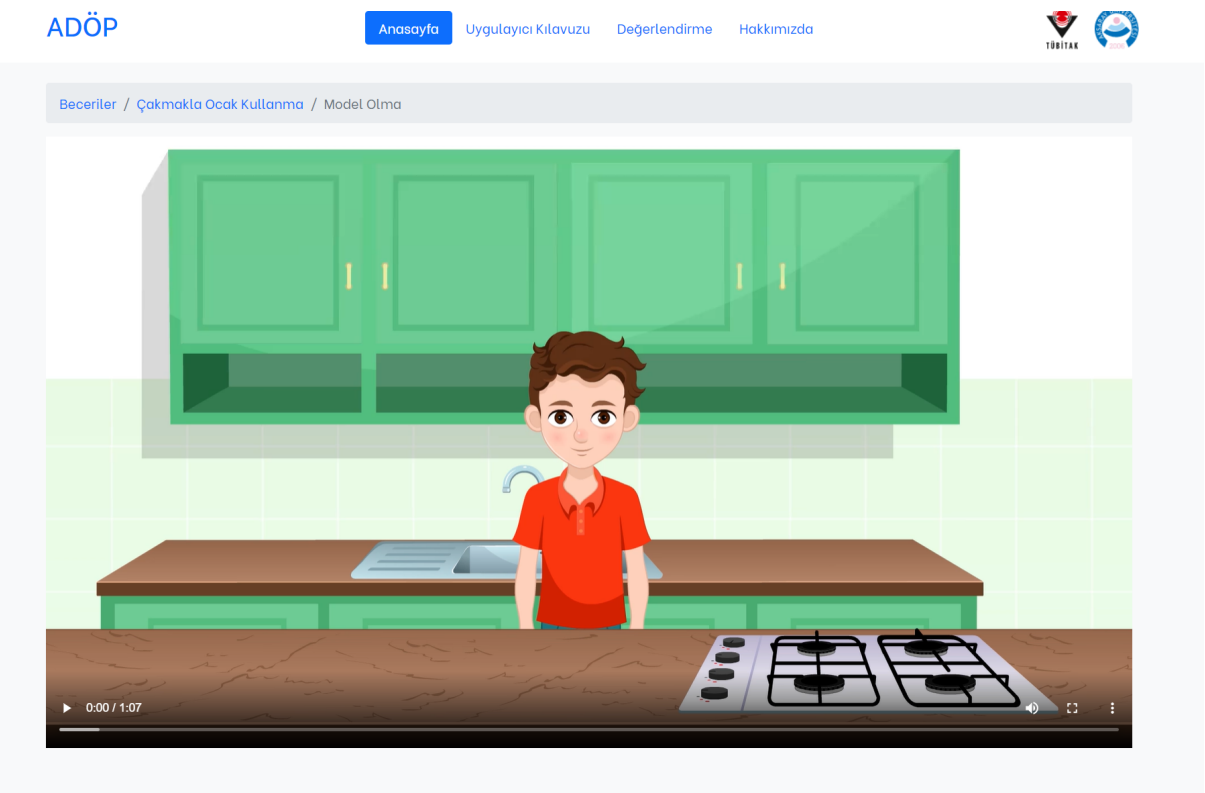

Figure 1. A Screenshot of the Animation Based Teaching Package

The Procedure of the Study

Baseline, intervention, probe, follow-up, and generalization sessions were conducted throughout the process. Before baseline, participants were determined, and informed consent was collected from the legally authorized representative of the participants. All the participants were rewarded based on their preferences.

During the *baseline* session, three repetitive baseline data were gathered from students. The researchers told the participants to do the relative daily task, and they were given a single opportunity to reflect on the effectiveness of the intervention. After the first intervention, *multiple probe sessions were conducted before each intervention,* and at least three sessions of data were collected until stable data were obtained. The process was conducted similarly to the baseline session. *Daily probe* sessions were organized one day after the intervention session before starting the subsequent intervention. The primary instruction was given in the probe sessions, and the students were expected to perform the skill. Reinforcements were not provided to the students at this stage. The criterion for all skills was set at 100%.

Intervention sessions were implemented four days a week, an intervention session per day. Researchers first explained the goal of the related skill to the participant. Then, the rules of the study were explained, and a specific reinforcement was determined. Then, the materials were introduced. After completing these preparations, the intervention sessions were conducted based on the modules. In the *modeling* module, the researcher and the student sat before the screen. The researcher selected the relevant skill from the screen, and the student watched the modeling steps of the skill. The researcher checked that the student was watching the animation. After the student watched the modeling module of the animation at least three times, the guided practice step was started. In guided practice, the researcher explained the procedure and said participation would be reinforced with preferred rewards. The avatar guided participants for each DL task step during the guided practice step. After the avatar in the animation told the participant what to do, the video was stopped, and the student waited 5 seconds to apply the activity step with natural materials. When the participant did the step correctly, it was reinforced, and the next step was taken by pressing the "forward arrow." When the participant reacted incorrectly or was unresponsive, the video was replayed. All the activity steps were completed in the same process. The guided practice session was terminated after the student performed the skill without assistance, and an independent practice session was started. In the independent practice session, the avatar told the participant to do the task alone with all the steps in the natural environment. In this session, if needed, the modeling stage was started again, and if the student performed the skill correctly at 80%, the intervention was terminated. The same procedures were followed for all DL skills until completed.

Follow-up data were collected to investigate the persistence of the new skill 7 and 14 days later. Participants were expected to perform the DL skills with relative steps. At this stage, the participants needed to be provided with hints or reinforcements. Furthermore, generalization sessions were conducted one week after the participants reached the 80% and 100% criteria for two follow-up sessions.

Data Collection

Data were gathered with forms developed to record the task chain. To calculate the percentage of correct steps completed independently, the number of completed steps was divided by the total number of steps of the task analysis and then multiplied by 100.

Inter-observer reliability data were collected to ensure reliability. For a randomly selected 30% of each participant, different types of sessions and inter-observer reliability data were coded. Interobserver reliability was calculated using Agreements / Agreements + Disagreements x 100 (Kazdin, 1982). In this context, the interobserver reliability of the study was calculated as 93%, 100%, and 100%, respectively, for Ahmet, Ayşe, and Cansu.

In order to measure the social impact of the study (Kennedy, 1992), social validity was investigated. For that purpose, five open-ended questions were prepared. Interviews were conducted with one teacher and three families of the participant students.

Data Analysis

An experimental criterion was conducted, and data were analyzed with visual graphs. The range of interpretation of the graphs, the rapid effect (comparison of the last three sessions of the baseline with the first three sessions of the intervention phase), and the percentage of overlapping and non-overlapping data (the proportion of the intervention session above the highest baseline point) were calculated. Social validity data obtained from families and teachers were analyzed by the descriptive analysis method.

Research Ethics

The researchers applied ethical principles throughout the study, ensuring respect for persons, beneficence, and justice. All participants were assured of their well-being, safety, and privacy. Informed consent was gathered from each student's legally authorized representative to protect the privacy and ensure the confidentiality of the data. The researchers obtained IRB approval from the Aksaray University Ethics Committee for Human Research.

FINDINGS

Participants were required to reach 100% success for lighting the stoves and 80% success criterion for the 3 DL tasks. Ahmet met the success criterion and maintained success for all four behaviors. Ahmet reached the success criterion for *lighting a stove* at a rate of 100% (Ranj= 100%-33%) at the end of seven intervention sessions, *cooking eggs in a pan* at a rate of 86% (Ranj= 86%-40%) at the end of six intervention sessions; *prepare the dinner table* at a rate of 94% (Ranj= 94%-66%) at the end of five intervention sessions, and *clearing the dinner table* at the rate of 92% (Ranj= 92%-57%) at the end of five intervention sessions. These rates showed 100% stability in all probe sessions after the intervention phase. In addition, the absolute level change analysis was performed for all skills, and the immediate effect was calculated. The difference between the last data of the first phase and the first data of the second phase was (33%-12%) for *lighting a stove;* (40%-0%) for *cooking eggs in a pan*; (66%-0%) for *preparing a dining table*, and (57%-0%) for *clearing the dining table*. The effect size of Ahmet's PND score was calculated between baseline and intervention as 100, which is highly effective (Scruggs et al., 1987).

Ayşe also met the success criterion and maintained 100% success for all four behaviors. Ayşe reached the success criterion *for lighting a stove* at a rate of 100% (Ranj= 100%-37%) at the end of eight intervention sessions; *cook eggs in a pan* at a rate of 86% (Ranj= 86%-26%) at the end of six intervention sessions; *prepare the dinner table* at a rate of 100% (Ranj= 100%-61%) at the end of five intervention sessions and *clearing the dinner table* at the rate of 100% (Ranj= 100%-64%) at the end of four practice sessions. These rates showed 100% stability in all probe sessions after the intervention phase. The difference between the last data of the first phase and the first data of the second phase was (37%-0%) for *lighting a stove;* (26%-13%) for *cooking eggs in a pan*; (61%-11%) for *preparing a dining table*, and (64%-14%) for *clearing the dining table*. The effect size of the PND score of Ayşe was calculated between baseline and intervention as 100, which is highly effective.

Likewise, Ahmet and Ayşe, Cansu met the success criterion and maintained 100% success for all four behaviors. Cansu reached the success criterion for *lighting a stove* at a rate of 100% (Ranj= 100%-25%) at the end

of five intervention sessions, *cooking eggs in a pan* at a rate of 100% (Ranj= 100%-60%) at the end of three intervention sessions; *prepare the dinner table* at a rate of 100% (Ranj= 100%-55%) at the end of five intervention sessions and *clearing the dinner table* at the rate of 100% (Ranj= 100%-57%) at the end of four practice sessions. These rates showed 100% stability in all probe sessions after the intervention phase. The difference between the last data of the first phase and the first data of the second phase was (50%-25%) for *lighting a stove;* (60%-6%) for *cooking eggs in a pan*; (55%-11%) for *preparing a dining table*, and (57%-14%) for *clearing the dining table*. The effect size of the PND score of Cansu was calculated between baseline and intervention as 100, which is highly effective.

The differences in absolute level change showed that the animation-based teaching package increasingly immediately affected all participants in the desired direction for all skills. Besides, the percentage of overlapping data is 0, and the percentage of non-overlapping data is 100% for all skills, implying that the animation-based teaching package effectively teaches these skills. In the follow-up sessions held on the 7th and 14th days after the intervention, participants achieved 80%-100% of all the skills. These data show that the skills learned with an animation-based teaching package continue to persist even after time has passed.

The following three graphs (Figure 2, Figure 3, and Figure 4) show results for all behaviors of each participant. The horizontal axes of the graphs show the implementation sessions, while the vertical axes show scores for each DL skill.

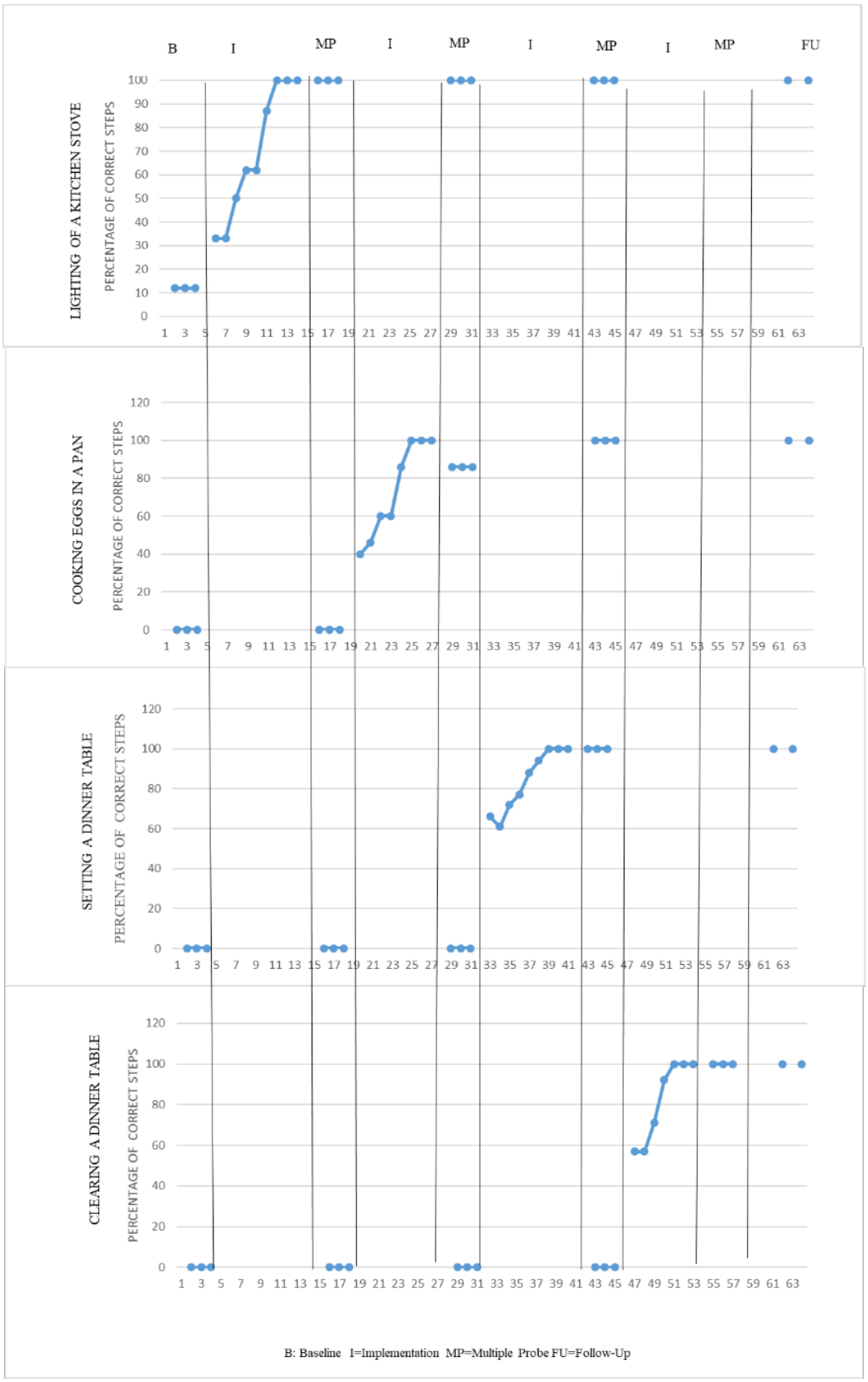

Figure 2. Results for Ahmet

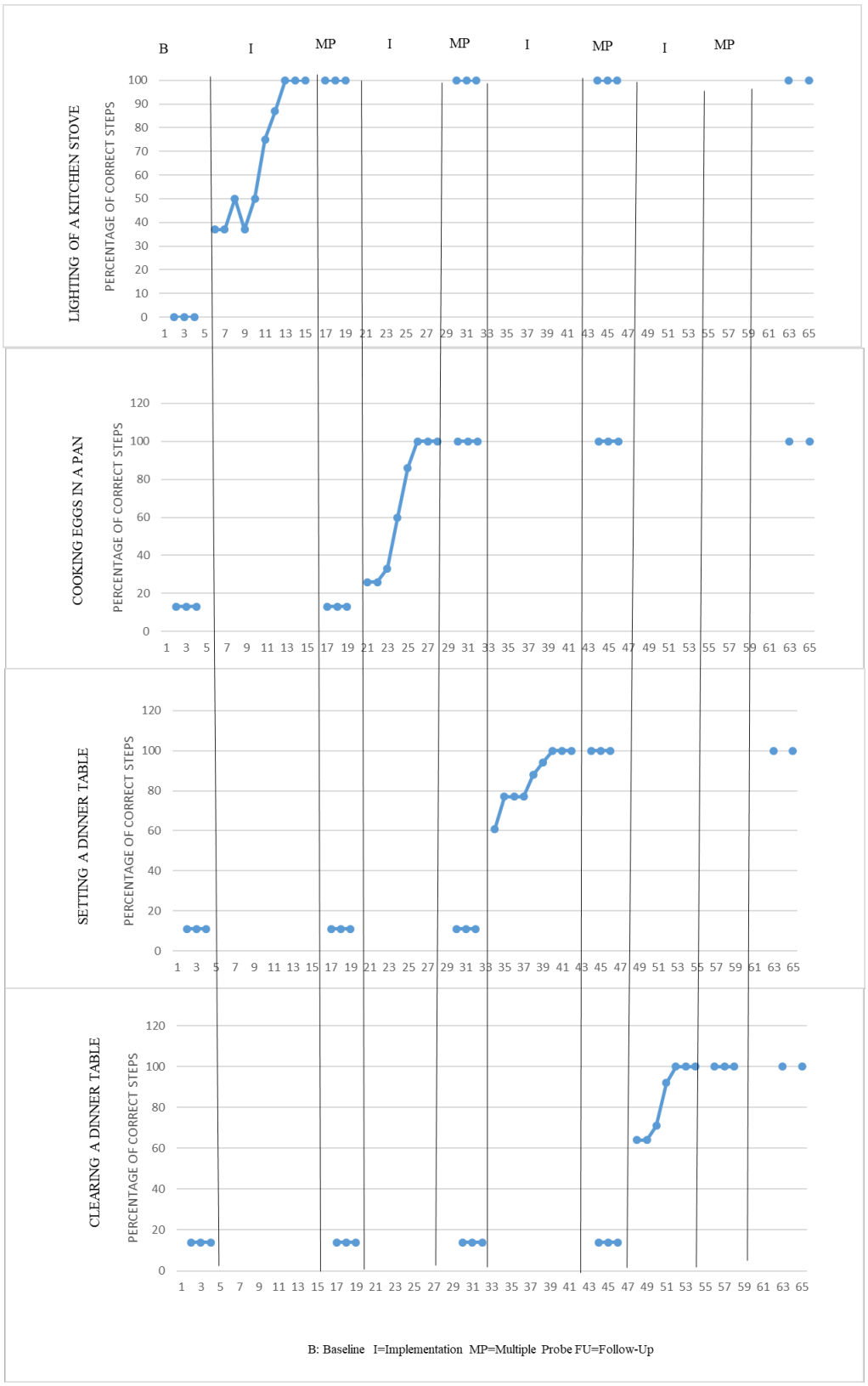

Figure 3. Results for Ayşe

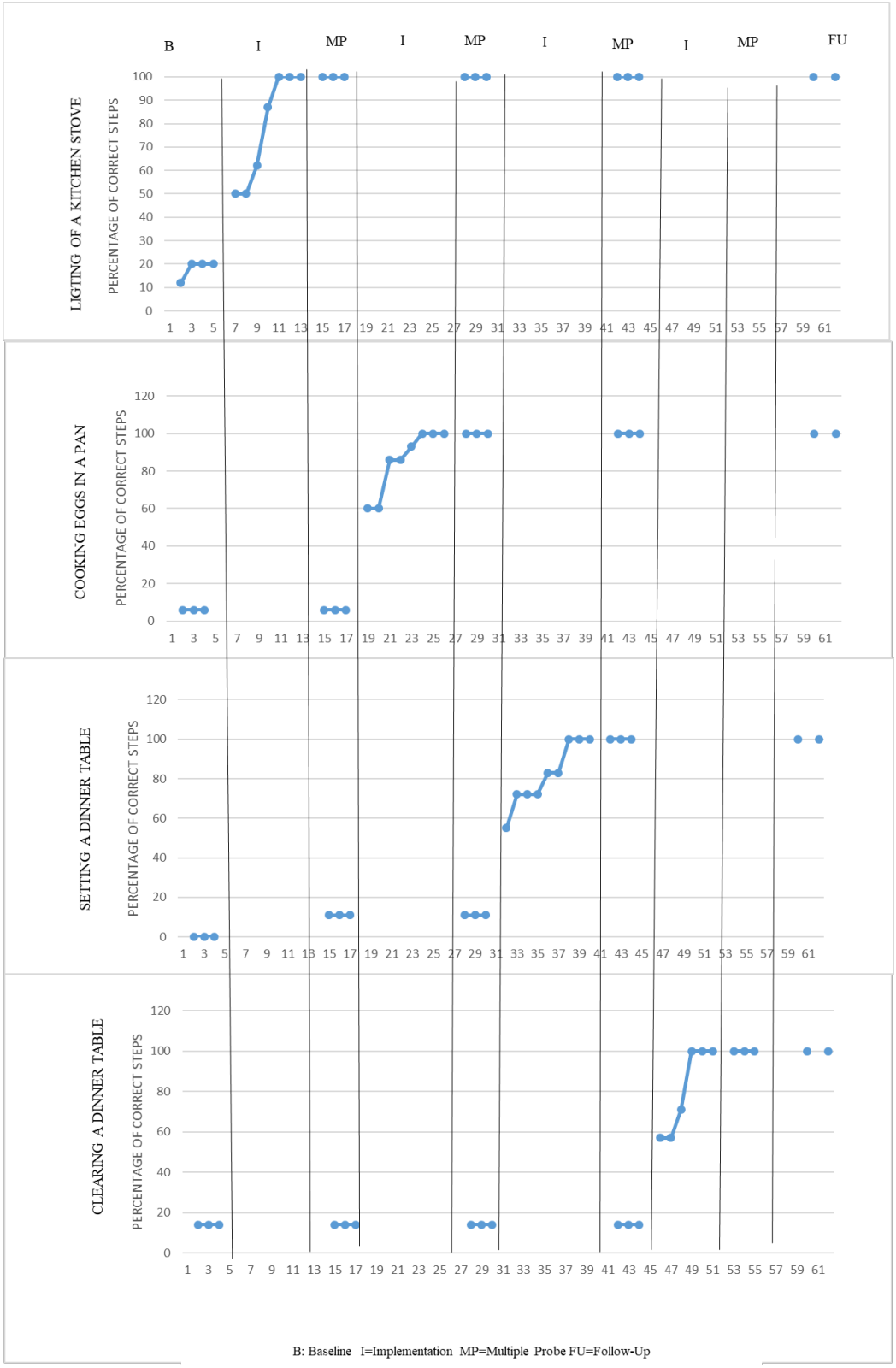

Figure 4. Results for Cansu

Generalization data for three participants were gathered simultaneously for all the DL skills held in the cafeteria within the school. Participants were required to listen to the researcher and then apply their relative DL skills. The following table represents the generalization data results.

Table 5. Generalization Results

Participant	Pretest-Posttest	Lighting Stove (%)	Cooking Eggs in a Pan (%)	Setting a dining table (%)	Clearing a dining table (%)
Ahmet	Pretest	12	0	0	0
	Posttest	100	86	94	92
Ayşe	Pretest	0	13	11	14
	Posttest	100	83	100	100
Cansu	Pretest	20	6	0	0
	Posttest	100	100	100	100

After the study, each participant's mother and teacher were interviewed to measure the intervention's social impact. The parents thought the animation-based teaching package was handy and effective in helping the participants learn DL skills. All the families stated that their children independently performed the skills they learned at home. The students' families also highlighted that their children enjoyed participating in the study. Furthermore, parents indicated that they would like their children to participate in future studies and learn other skills they need in an animation-based learning environment. According to the teacher, participants highly enjoyed the intervention procedure. They favored that the animations were a good motivator for the participants and helped them to improve their independence.

DISCUSSION AND CONCLUSION

The present study contributes to the literature, providing information about the effect of animation-based video instruction with computers for teaching DL skills to individuals with ID. The findings that the animation-based teaching package, in conjunction with direct instruction, can facilitate learning progress for individuals with ID is a positive step forward in developing evidence-based practices for this population.

The fact that the results of this study are consistent with previous studies that have shown positive learning outcomes with animation-based instruction, both for students with special needs (Yeni et al., 2020) and without (Barak & Dori; Rosen, 2009), reinforces the idea that animation-based instruction can be a powerful tool for teaching a wide range of skills. The idea that animation-based instruction can aid in the transition from abstract to concrete thinking is also essential. This is because abstract concepts can be complicated for individuals with ID to grasp, and animations can visually represent these concepts, making them more concrete and easier to understand. Overall, this study provides valuable insights into the effectiveness of animation-based video instruction for teaching DL skills to individuals with ID and adds to the growing body of literature supporting animations in education.

According to the visual analysis of the three participants' (Ahmet, Ayşe, Cansu) single-subject data, three student participants presented substantial progress with the correct percentage step test based on the 80% success criterion for three skills and 100% for lighting a stove. Participants performed between 0 and 20% of the steps correctly in all baseline sessions.

Intervention sessions were conducted until three probe sessions met the 80% criteria. Intervention for all students was changed in the desired direction. Ahmet reached the success criterion for the stove burning after seven sessions, Ayşe reached 80% success after eight sessions, and Cansu learned after five sessions. Despite Ayşe's changing results while learning these skills, it did not cause her to be unsuccessful since the behavioral change was in the desired direction. After six sessions, Ahmet and Ayşe reached the success criterion for cooking eggs in a pan.

In comparison, Cansu reached it after three sessions and experienced a substantial increase in the correct percentages. After five sessions, all participants reached the success criterion for preparing the dining table.

Despite Ahmet and Cansu's changing results, they became successful. Their changing results were only observed in learning these skills, which might be related to the existence of more steps. Lastly, Ahmet reached the success criterion for collecting dining tables after five sessions, while Ayşe and Cansu reached it after four sessions. All participants learned that skill in a shorter time. This might be related to the fact that it is a skill that complements the skill of setting the table. The generalization phase supported the desired change of behaviors during training, and all students maintained positive change in all behaviors. Despite the first skill (lighting a stove) having the least number of steps among other skills, participants' learning process of that skill seems to take longer. Since the intervention was started with that skill, this situation might relate to their inexperience with the learning environment, so familiarizing themselves with the environment might take longer.

Based on the findings, it can be revealed that properly and attractively designing the animation-based package with an appropriate teaching strategy can achieve success. This result implies that individuals with ID can successfully perform DL skills independently when provided with adequate intervention. This finding parallels the literature, which emphasizes that individuals with special needs, need effective teaching materials, strategies, and techniques (Sulaimani & Bagadood, 2022). Many studies in the literature have shown that CAI is a critical component of educational success in a particular education context (Ayres & Cihak, 2010; Goo et al., 2016, 2019; Ivey et al., 2015; Kang et al., 2021; Smith et al., 2017), which is considered necessary for individuals with ID, due to the challenges they face in learning, concentrating, and communicating (Rose et al., 2005) stem from deficits in verbal reasoning and short-term memory (Quill, 1997). In the literature, there have been limited studies on animation-based video instruction for the learning improvement of individuals with ID (e.g., Çakmak & Çakmak, 2015; Fujisawa et al., 2011; Geçal & Eldeniz Shepherd, 2012; Yeni et al., 2020). Thus, this study contributed to the existing CAI knowledge base by presenting the findings of animation-based instruction with a direct instruction model.

Limitations

The current study has limitations that should be acknowledged. One of the limitations is the small sample size of only three cases, which makes it difficult to generalize the results to a larger population. Therefore, further studies with larger sample sizes are needed to provide more evidence-based practices regarding the efficacy of the teaching package for individuals with ID.

Another limitation of the study is its internet dependency, as the animation-based teaching package was delivered through a web-based platform. This may limit the accessibility of the package for individuals with limited internet access. Future studies may address this limitation by developing mobile applications that can be accessed offline, which could increase the availability and accessibility of the teaching package for individuals with ID and their families.

Overall, while this study provides important insights into the potential benefits of animation-based instruction for individuals with ID, further research is needed to understand its effectiveness better and to develop more accessible and flexible approaches to teaching using this technology.

Implications

The results suggest that adequately designed animation-based packages and appropriate teaching strategies can lead to successful learning outcomes for individuals with ID. This reinforces the need for educators to consider incorporating animation-based instruction as part of their teaching approach when working with individuals with special needs.

The development of the animation-based package in this study is an essential advantage for educators and families working with individuals with ID. The standardized nature of the teaching approach ensures that individuals with special needs receive consistent and practical instruction, regardless of practitioner-based limitations. This can ultimately lead to better learning outcomes and increased independence for individuals with ID.

Future studies can build upon the findings of this study by developing new animation-based learning environments that can support unique education curricula and improve a wide range of skills for individuals with different disabilities. By exploring different approaches to animation-based instruction and developing new packages that target specific learning goals, educators and researchers can continue to refine their understanding of how best to use this technology to support the needs of individuals with special needs. The findings of this study provide an essential foundation for further research in this area and highlight the potential benefits of incorporating animation-based instruction into unique education curricula.

Statements of Publication Ethics

Researchers followed ethical principles throughout the research and publication processes. Researchers secured all participants' well-being, safety, and privacy throughout the implementation process. Also, researchers followed ethical principles while reporting the findings and ensured confidentiality of the participants and data confidentiality. The Aksaray University Ethics Committee of Human Research approved the IRB with the decision number 2019/I-54 on 27.12.2019.

Researchers' Contribution Rate

The first author was responsible for literature review, designing on the environment, and writing the article. The second and third authors were responsible for implementing the study and data gathering. All three authors equally contributed to designing the research and discussing the findings.

Conflict of Interest

The authors declare no potential conflicts of interest.

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Adaptation and Validation of the We-ness Questionnaire in a Turkish Sample

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Abstract

We-ness refers to a feeling of unity between partners and a mental representation of the relationship as a shared identity. Despite its relevance, research on understanding partners' sense of we-ness is limited in collectivist cultures such as Turkey. A psychometrically sound measure of we-ness is needed to increase research on we-ness. Hence, this study aimed to examine the basic psychometrics of the We-ness Questionnaire. Two hundred and nineteen married individuals participated in this study. They completed the Turkish versions of the We-ness Questionnaire, the Couple Satisfaction Index, Self-developmental Orientation Subscale, and Inter-relational Orientation Subscale of the Balanced Integration and Differentiation Scale. The one-factor structure of the We-ness Questionnaire was confirmed via confirmatory factor analysis. Adequate convergent and discriminant validity, besides satisfactory internal consistency results, were achieved as a result of these analyses. Based on the preliminary investigation, the Turkish We-ness Questionnaire proved to be a promising measure of we-ness in Turkish married individuals. As such, the findings of this study were discussed regarding the previous literature, limitations were pointed out, and suggestions for future research were given.

Keywords: we-ness, couple satisfaction, self-developmental orientation, inter-relational orientation, scale adaptation

Biz-Olma Ölçeğinin Türkiye Örnekleminde Uyarlama ve Geçerlik Çalışması

Öz

Biz-olma, partnerler arasındaki birlik duygusunu ve ilişkinin paylaşılan ortak bir kimlik olarak zihinsel temsilini ifade eder. İlişkiler dikkate alındığında oldukça önemli bir konu olmasına rağmen, partnerlerin ilişkide biz-olma hissine ilişkin araştırmaların Türkiye gibi kolektivist bir kültüre sahip ülkelerde sınırlı olduğu görülmektedir. Bu sebeple de, biz-olma üzerine araştırmaları artırmak için psikometrik olarak güçlü bir biz-olma ölçeğine ihtiyaç vardır. Alanyazındaki bu boşluğu gidermek için, bu çalışma Biz-Olma Ölçeğinin temel psikometrik özelliklerini incelemeyi amaçlamıştır. Araştırmanın örneklemini 219 evli kişi oluşturmuştur. Bu çalışma kapsamında veriler Biz-Olma Ölçeği, İlişki Doyum İndeksi, Kendileşme Alt Ölçeği ve İlişkililik Alt Ölçeği kullanılarak toplanmıştır. Biz-Olma Ölçeğinin tek faktörlü yapısı, doğrulayıcı faktör analizi ile doğrulanmıştır. Ayrıca, ölçeğin psikometrik özellikleri incelendiğinde, yeterli yakınsak ve ıraksak geçerliğe ek olarak, kabul edilebilir iç tutarlığının olduğu sonucuna erişilmiştir. Yapılan geçerlik ve güvenirlik çalışmaları sonucunda, Biz-Olma Ölçeğinin Türk evli bireylerle kullanılabilen bir ölçek olduğu sonucuna erişilmiştir. Son olarak, mevcut çalışmanın bulguları alanyazın bulgularıyla ilişkilendirilerek tartışılmıştır.

Anahtar kelimeler: biz olma, ilişki doyumu, kendileşme, ilişkililik, ölçek uyarlama.

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INTRODUCTION

Research on relationships has long focused on understanding partners' shared interdependence. To refer to the nature of interdependence, researchers have come up with several explanations and definitions, such as mutuality (Singer et al., 2015), couple identity (Acitelli et al., 1999), and interdependence in stress experience (Bodenmann, 2005; Bodenmann et al., 2016), all of which ultimately lead to a feeling of we-ness in the relationships (Buehlman et al., 1992). According to the Investment Model of Rusbult (1983), since the partners' behaviors influence each other heavily, romantic partners develop interdependence (Kelley, 1979; Kelley & Thibaut, 1978). Based on the fundamental premises of the Investment Model (Rusbult, 1983), Agnew et al. (1998) developed the concept of cognitive interdependence. The basic tenets of cognitive interdependence depict that partners develop cognitive, emotional, and behavioral patterns specific to their relationship. Moreover, partners begin to diminish the distinctions between self, other, and the relationship and perceive higher levels of similarity with their partners (Agnew & Etcheverry, 2006). Overall, in the case partners are satisfied and happy with their relationships, lack good quality alternatives, and have invested in their relationships, they choose to stay together (Agnew et al., 1998; Panayiotou, 2005; Whitton & Kuryluk, 2012) which in turn increases the feeling of we-ness in the relationship reflecting a cognitive dimension of we-ness (Agnew et al., 1998; Arriaga & Agnew, 2001).

Acitelli et al. (1999) define couple identity as individuals' perception of seeing themselves as part of a binary system as they progress in their relationships. As Topcu-Uzer et al. (2020) suggested, couple identity, which is the emotional part of we-ness, does not mean that individuals identify and include the partner in the self. Still, they have a relationship that results in a healthy relationship. In terms of mutuality, it is defined as awareness among the partners that they are a part of something bigger than their selves. It includes sentiments, thoughts, and actions that advance the relationship's welfare while remaining conscious of each partner's personal concerns (Singer et al., 2015), and mutuality is generally used interchangeably with the term "we-ness."

Lastly, the Systemic Transactional Model (STM; Bodenmann, 2005) states that coping strategies and partners' experiences of stress are interrelated. There are two distinct ways that one partner's experience with stress might affect the other's experience: spillover and crossover (Falconier et al., 2015). Couples cope with stress better when they think it is "we-stress" (our-stress) rather than one partner having to deal with it alone. As seen, various perspectives have been used to define individuals' we-ness experiences in their romantic relationships, including cognitive (Agnew et al., 1998), emotional (Acitelli et al., 1999), and behavioral (Bodenmann, 2008; Singer et al., 2015) dimensions.

Taking into consideration these explanations and the findings in the literature, Topcu-Uzer et al. (2020) have come up with a conceptualization of we-ness which depicts that we-ness refers to the extent to which romantic partners see themselves as a single entity (we/us) as opposed to two distinct self (I/me or you/him/her/they) regarding behavioral, emotional, and cognitive dimensions. Moreover, it refers to the partners' sense of togetherness, doing things together, being emotionally and cognitively connected (Meier et al., 2021), and making mutual investments in their relationships (Gildersleeve, 2015). Partners have a shared "we-experience" of behaviors and emotions in their relationship (Fergus & Reid, 2001). It is commonly thought that we-ness develops as a result of partners' commitment to their relationship, putting effort into their relationship, and contributing to their partner's everyday life and well-being (Cutrona, 1996). Moreover, couples' sense of we-ness has been shown to have beneficial impacts on their resilience (Skerrett, 2003), relationship stability (Gottman, 2011), and benefits to partners' physical and mental health (e.g., Acitelli et al., 1999).

The extent to which people commit to close relationships varies among individuals and cultures (Terzino & Cross, 2009). In collectivist cultures like Turkey, people´s self-image is commonly defined in the context of we (Hofstede, 1980); being loyal to the group that they live with is the price of belongingness to that group (Hofstede et al., 2010), and they are to be other-oriented (Markus & Kitayama, 1991), and value and prioritize religion and extended family (Cukur et al., 2004; Hofstede et al., 2010). As such, "we-ness" can be considered foundational in belonging and feeling committed to one's relationship, especially for those living in a collectivistic society like Turkey. Despite its relevance, there has been limited research on the concept of "we-ness" in Turkish culture, which can provide a fruitful avenue for both research and clinical practice, and there is a lack of psychometrically sound measure to assess we-ness in Turkish. Therefore, the present study aims to validate the We-ness Questionnaire (WQ) in married individuals living in Turkey.

METHOD

Recruitment and Participants

Participants were recruited via convenient and snowball sampling by posting research flyers on social media (e.g., Instagram and Facebook). Interested participants were screened via the following eligibility criteria: (1) being at least 18 years of age or older, (2) living in Turkey, and (3) being married for at least three months.

Two hundred nineteen participants (n = 143 women and n = 76 men) who had been married for at least five months participated in the study. The participants' age ranged between 22 and 60 (M = 38.66, SD = 8.40). When examined separately for women and men, the mean age was 36.35 (SD = 7.10) for women and 43.01 (SD = 8.97) for men. One hundred twenty-two of the women were Muslim (85.3%), 15 of them were non-religious (10.5%), and the remaining 6 participants reported believing in other religions (4.2%). Of men, 65 of them were Muslim (85.5%), 7 of them were non-religious (9.2%), and 4 of them reported believing in other religions (5.3%). Most women (43.4%, n = 62) and men (57.9%, n = 44) had at least undergraduate degrees. While 104 women had a job (72.7%), 39 were not working at the time of data collection (27.3%). Of men, 70 reported having a job (92.1%), and six were not working (7.9%). Approximately 67.9% (n = 97) of women and 60.5% of men (n = 46) reported having an income between 4000 Turkish Liras and 10000 Turkish Liras. The poverty line was announced to be 9.533,28 Turkish Liras by August 2021 within the data collection period of this study. Participants reported being in a marriage for approximately 12 years (M = 140. 51 months, SD = 110. 25 months; Range = 5 – 468 months). Of the participants, 174 (79.5%) had children while 45 (20.5%) had no children. Most of the participants who had children had one child (32.4%, n = 71) or two children (34.7%, n = 76).

Procedure

Prior to collecting data, ethical board approval was obtained (granted to the second author). Data were collected between January 2021 and August 2021. Interested participants were screened to guarantee they met the eligibility criteria noted above. Eligible participants were directed to the online research questionnaire hosted on Google Forms, which took about 30 minutes to complete. Participants did not receive compensation for their time.

Data Collection Tools

We-ness Questionnaire

The original We-ness Questionnaire (WQ; Topcu-Uzer et al., 2020) is a measure based on individuals' self-reports. It was created to evaluate the partners' experiences of behavioral, emotional, and cognitive we-ness in their romantic relationships. The We-ness Questionnaire (WQ; Topcu-Uzer et al., 2020) has 17 items (e.g., "We tolerate and support each other's unique characteristics") which are scored on a 5-point rating scale (1= not at all to 5 = to a great extent). Topcu-Uzer et al. (2020) conducted an exploratory factor analysis to explore the factor structure of the WQ and found a one-factor solution. The Cronbach alpha coefficient was reported as .95 for the whole sample, while it was found to be .94 for women and .95 for men separately (Topcu-Uzer et al., 2020). Additionally, strong evidence was provided by Topcu-Uzer et al. (2020) for the convergent validity of the WQ by presenting its correlation with mutuality and common dyadic coping and for discriminant validity by presenting the correlation between the WQ and perceived choice. For further validity evidence, researchers have examined the gender differences in the We-ness Questionnaire (Topcu-Uzer et al., 2020). The results have displayed that women's scores were higher than men's scores in we-ness. Overall, there were not any reversed items in the measure.

Procedures for Translation and Face Validity of We-ness Questionnaire

In the current study, after receiving permission from Topcu-Uzer et al. (2020), we followed the recommendations of Hambleton and Patsula (1999) for the translation of WQ. First, four Turkish professionals who are advanced in English (a Ph.D. candidate, two assistant professors, and an associate professor, who were all heterosexual women) in the counseling field translated the WQ items from English to Turkish. Second, the translated items were reviewed by the first and second authors of the current study for adequacy and cultural appropriateness. Then, two Turkish professionals who hold a Ph.D. in counseling, who are all heterosexual women and fluent in English, ran the back translations. The back-translated final version was compared to the original English version of the WQ (Topcu-Uzer et al., 2020).

The translation of the word "meaning" in two items ("We share similar meanings about life" and "We share similar meanings about the future of our relationship") did not correspond to any Turkish words. After discussing alternative words, expert opinion from the fourth author of the present study was obtained, and an alternative word for "meaning" was chosen in Turkish. An experienced Turkish, university instructor in the Turkish language

reviewed the final version of the scale regarding the structure, wording, and meaning of the items. This person suggested corrections on punctuation and using singular/plural forms of the words, which were implemented in the final version. To assure the readability of the WQ, a focus group was conducted with 16 individuals between the ages of 21 and 43 (M = 30.50, SD = 7.81) (n = 15 women, n = 1 man). Seven were in a committed relationship (43.8%), three were in a committed relationship and living together with their partner (18.8%), and six were married (37.5%). All items were evaluated individually by the participants in a group interview facilitated by the first and second authors of the current study.

Participants stated that the following items were not easily understood: Item 3 ("We share similar meanings about life"), item 9 ("We share similar meanings about the future of our relationship"), item 11 ("When we disclose something meaningful [i.e., information, thoughts and/or feelings] to each other, there is mutual understanding and validation"), and item 17 ("When we disclose something meaningful [i.e., information, thoughts and/or feelings] to each other, there is mutual acceptance and caring"). Participants commented that they had difficulty differentiating between items 3 and 9 and items 11 and 17 since they sounded similar.

Lastly, we tested the final questionnaire's language equivalency with 18 bilingual individuals between the ages of 21 and 43 (M = 27.44, SD = 6.77) (n = 14 women, n = 4 men); fluent in Turkish and English. Of the 18 participants, ten were dating (55.6%), three were in a committed relationship and living together (16.7%), and five were married (27.8%). Three participants had children (16.7%) and 15 did not have children (83.3%). Participants were first administered the English version of the WQ (Topcu-Uzer et al., 2020), and after three weeks, they were given the Turkish version. The Pearson correlation coefficient between the Turkish and English forms was .77 (p = .01).

Couple Satisfaction Index

To provide evidence for convergent validity, the Turkish Couple Satisfaction Index (CSI; Ozdemir & Sagkal, 2021) was utilized to measure relationship satisfaction. CSI is a self-report measure and has four items (e.g., I have a warm and comfortable relationship with my partner) with three items on a 6-point rating scale (0 = not at all true, 5 = completely true) and one item on a 7-point rating scale (0 = extremely unhappy, 6 = perfect). The higher the scores on the scale, the greater the relationship satisfaction. In the present study, Cronbach's alpha coefficient was .96 for the whole sample, .96 for women, and .95 for men.

Balanced Integration and Differentiation Scale

The Turkish version of the Balanced Integration and Differentiation Scale (BIDS; İmamoğlu, 1998, 2003) was used to evaluate WQ-TR's convergent and discriminant validity. BIDS is used to assess an individual's degree of individuation. The scale has 29 items and two subscales: Self-developmental Orientation Subscale (SOS) and Inter-relational Orientation Subscale (IOS). The Self-Developmental Orientation Subscale is a 13-item scale that concerns intrapersonal differentiation toward individuation (e.g., It is important for me that I develop my potential and characteristics and be a unique person). The Inter-relational Orientation Subscale is a 16-item scale that measures relatedness and connectedness with family and others (e.g., I emotionally feel very close to my family). Participants were requested to indicate their responses on a 5-point rating scale (0 = totally disagree, 4 = totally agree) with higher mean scores reflecting higher self-developmental or inter-relational orientation. In the scope of the present study, the internal consistency coefficient of the Self-developmental Orientation Subscale for the whole sample was .76 for women and .71 for men. Internal consistency of the Inter-relational Orientation Subscale for the whole sample was .88; .88 for women and .87 for men.

Data Analyses

Before starting data analyses, we completed the preliminary procedures, such as data screening and cleaning. Then, the assumptions (missing value analysis, sample size, outliers, normality, linearity, and multicollinearity) were checked. Afterward, descriptive statistics were run to understand the sample profile better and test the relationships among variables. Lastly, we conducted Confirmatory Factor Analyses (CFA) via AMOS Version 21 software (Arbuckle, 2012) to examine the construct validity of the Turkish version of the We-ness Questionnaire (WQ). To evaluate the model fit χ^2/df-ratio (< 3; Kline, 2005), comparative fit index (CFI > .90), Tucker-Lewis Index (TLI > .90), the root mean square error of approximation (RMSEA < .08), and the standardized root mean square residual (SRMR < .10) were used (Kline, 2005). To test the convergent validity of the WQ-TR (Authors), Pearson correlation coefficients between the WQ, couple satisfaction (Ozdemir & Sagkal, 2021), and Inter-relational Orientation Subscale (İmamoğlu, 1998) were calculated. The Pearson correlation coefficient between the WQ-TR and Self-developmental Orientation (İmamoğlu, 1998) was calculated for the discriminant validity of WQ-TR. The cutoff point for the correlations was determined as follows: ±.10 is small; ±

.30 is medium; ±.50 is large (Field, 2005). Preliminary analyses and Pearson correlation coefficients were calculated with SPSS Version 22 (IBM Corp., 2013).

Research Ethics

Before collecting data, the ethical permissions of this research were obtained from a university ethics committee (granted to the second author). After the ethical approval was obtained, the information about the study was shared via social media. The eligible individuals were asked to read the informed consent form before collecting data. They were informed that their identity would not be revealed. Hence, they were not asked for any identification. The ones who accepted participating in the current study were asked to go on with answering the online questionnaires.

FINDINGS

Testing the Factor Structure of the We-ness Questionnaire

A confirmatory factor analysis (CFA) was run to test the original one-factor structure of the WQ. The assumptions of confirmatory factor analyses (sample size, normality, missing values, outliers, multicollinearity, and linearity) (Ullman, 2001) were checked before running CFA. Afterwards, results indicated an inadequate model fit [χ^2 (119) = 360.09, p = .00; χ^2/df-ratio = 3.03; CFI = .91; TLI = .89, RMSEA = .10, and SRMR = .05]. The examination of the modification indices starting with the highest value revealed that the error covariance of items 10 and 14, items 3 and 9, and items 1 and 4 were freely estimated. After examining the items, it was discovered that the covariance of errors of these items was theoretically related. The modifications improved the model fit [χ^2 (116) = 306.30, p = .00; χ^2/df-ratio = 2.64; CFI = .93; TLI = .91, RMSEA = .09, and SRMR = .05] as displayed in Figure 1. Standardized factor loadings were greater than .55.

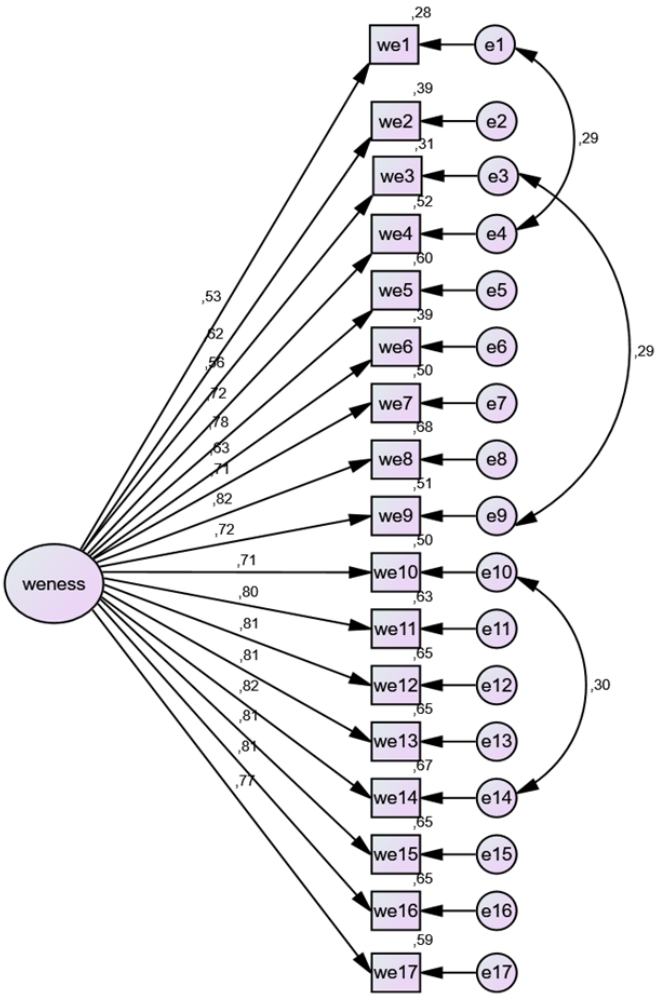

Figure 1. Confirmatory Factor Analyses of We-ness Questionnaire

When Figure 1 is examined, it is understood that the one-factor structure of the We-ness Questionnaire has been confirmed with the data in the current study.

Reliability, Convergent, and Discriminant Validity of the WQ

The Cronbach's alpha coefficient for one-factor 17 items WQ was found as .95 for the whole sample, .95 for women, and .94 for men in this study, which indicated high reliability. The Pearson correlation coefficient between relationship satisfaction and we-ness was significant ($r = .79$, $p < .01$), and the association between we-ness and inter-relational orientation was significant ($r = .37$, $p < .01$), both in the expected directions. The findings supported the convergent validity of the Turkish version of the WQ (Authors). Furthermore, the association between we-ness and self-developmental orientation was non-significant ($r = .11$, $p > .05$), supporting the discriminant validity of the WQ. Taken together, the Turkish version of the WQ was found to be a psychometrically sound and reliable measure.

Other Evidence for Further Validity of WQ

We performed an independent samples t-test to investigate whether there are gender differences in terms of we-ness in marriages. The results revealed that there was not a significant difference in we-ness between women ($M = 71.22$, $SD = 12.47$) and men ($M = 74.33$, $SD = 10.11$); $t(217) = -1.87$, $p = .06$. Besides, the association between we-ness and the duration of relationship was explored via Pearson correlation coefficient. It was found to be non-significant ($r = -.06$).

DISCUSSION AND CONCLUSION

The study aimed to validate the English version of the WQ (Topcu-Uzer et al., 2020) for use with heterosexual married individuals living in Turkey. The original one-factor structure of the WQ was confirmed in the present study. The 17-item version of the WQ (Authors) demonstrated acceptable reliability and validity for use with individuals in Turkey. Also, confirmatory factor analysis results were consistent with the previous validation studies (e.g., Topcu-Uzer et al., 2020). However, different from the study of Topcu-Uzer et al. (2020), in the present study, the modification corrections were made between some items. Modifications were carried out considering the meaning of items, and it was observed that the fit indices increased significantly after the modifications.

Given the well-documented positive association between relationship satisfaction and we-ness in the literature (e.g., Reid et al., 2006), the association between couple satisfaction and we-ness was tested. As predicted, the Turkish version of the WQ was positively and significantly associated with relationship satisfaction, reflecting evidence of its convergent validity. We-ness also significantly affected couples' ability to foster positive emotions and resolve marriage conflicts (Gildersleeve et al., 2017). Daily stressors in the relationship affect the feelings of togetherness and dyadic coping (Randall & Bodenmann, 2017), and acute and chronic stressors influence relationship outcomes, such as relationship satisfaction (e.g., Hocker et al., 2022). These findings do depict that the Turkish WQ exhibits convergent validity. However, additional research is required to determine the associations between the Turkish WQ and acute and chronic stressors and other related constructs, such as dyadic coping and couple resilience.

The Turkish WQ was unrelated to self-developmental orientation. Interestingly, in the original article, Topcu-Uzer et al. (2020) reported a positive relationship between the need for autonomy scale and the WQ. This difference may stem from the different cultural orientations of samples of these studies, as in Topcu-Uzer et al.'s study (2020) a U.S. sample was used. While not reported, those from the U.S. commonly adopt a more self-focused, individualist culture. In contrast, the Turkish sample of the current study follows the rules of a collectivist culture, adopting normative patterning such as behaving in line with society and avoiding individuation (Güler, 2004; Hofstede, 1980). On the other hand, the Turkish version of the WQ was positively related to inter-relational orientation. Since inter-relational orientation focuses on feeling attached to one's family, feeling connected to personal relationships, and belonging to a group (İmamoğlu, 1998, 2003), its significant association with we-ness is understandable due to the interdependent nature of we-ness. In addition to the models that emphasize intercultural differences such as individualism and collectivism (Kağıtçıbaşı, 2005), the Balanced Integration and Differentiation (BID) Model (İmamoğlu, 1998, 2003), which includes self-development orientation and inter-relational orientation components, is one of the main approaches that explain self-construals in Turkish culture. This model mainly focuses on intracultural differences (Imamoğlu, 1998, 2003). Considering intracultural differences, it is predicted that we-ness of married individuals will show changes in Turkey's urban and rural areas.

Although further evidence is needed, the study's results indicate that the presence of inter-relational orientation strengthens the feeling of we-ness in marriage.

In addition, these findings demonstrate that there is no gender difference in the we-ness of Turkish participants. On the other hand, men in the US sample scored lower on the we-ness scale than women, according to the scale analyses (Topcu-Uzer et al., 2020). Furthermore, some previous studies revealed no differences between husband and wife on we-ness scores (Reid et al., 2006; Seider et al., 2009). However, there is a need for additional studies to examine the sense of we-ness by gender. As a result, using the Turkish version of the WQ will increase the empirical knowledge in the literature in the realization of cross-sectional and longitudinal studies that address the relationships between we-ness, relationship quality, and psychological adjustment processes in married individuals.

Limitations

This study carries several limitations. Firstly, data collection was conducted with self-report online measures in which the volunteer participants could sign in via their smartphones or PCs. Relying on online survey methods was limited to participants with access to such technology. Data were collected with convenient samples and using snowball sampling strategies. The sample comprised individuals between the ages of 22 and 60, with the length of marriages varying from five months to 39 years, which are all quite wide ranges.

Additionally, participants identified themselves as Muslim, came from a collectivist culture, were highly educated, were from middle to upper-middle SES groups, and all were in heterosexual relationships. Together, these demographics limit the study's generalizability. In addition, the study's sample mainly consisted of females, which can be considered one of the limitations. Also, the participants of this study were in their first marriages and free from problems related to their previous spouses or stepchildren.

Future Directions and Conclusion

By translating and validating the WQ in a Turkish population, we filled a significant gap in the literature in this study. This validation may lead researchers to assess and explore individual and relational mechanisms of cultural context and their associations with we-ness, especially considering the changing Turkish cultural values and characteristics. In addition, this study may help family and couple practitioners working with individuals and couples develop relationship-strengthening programs and interventions. Future studies could collect data from diverse age groups, gender identities, and relationship durations to examine measurement invariance. Additionally, future studies may include dyadic data to investigate interdependence's effect on we-ness. In future studies, it is essential to conduct longitudinal studies to examine we-ness in a couple relationship and its changes in marriage over time. Since participants in this study consisted of a married and heterosexual group, examining the construct validity of the scale with couples who are engaged, dating, cohabiting, and in a same-sex relationship will contribute to an understanding of we-ness based on other contexts. Future research may also examine the sense of we-ness of individuals with a sample of Turkish-speaking participants in Turkey and immigrant participants from other countries (such as other Asian nations, Europe, and the USA).

Statements of Publication Ethics

We declare that we obey the principles of publication ethics. The ethical permission for this research was obtained from ADÜ Educational Research Ethics Committee dated 10.12.2020 and numbered 84982664-050.01.04.

Researchers' Contribution Rate

The first and second authors contributed to the research by conceiving the study and collecting the data. The first author was also responsible for the data analysis. All of the authors were involved in the writing of the manuscript. The first author was responsible for the submission of the article.

Conflict of Interest

We hereby declare that there is no conflict of interest in this study.

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