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The Relationship Between Early Maladaptive Schema and Problematic Mobile Phone Use Among Adolescent Female

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Abstract

This study aimed to investigate the relationship between early maladaptive schemas (EMS) and problematic mobile phone use among adolescents. To collect data, the Young Schema Questionnaire Short Form-3 (YSQ-SF3) and Mobile-phone Addiction Questionnaire were given to 103 female students (between 16 and 20 years of age) studying at a high school in Diyarbakır. Results showed that there was a positive and significant correlation between five schema domains and three sub-dimensions of the mobile phone addiction questionnaire. All schemas except punitiveness and total score of mobile phone addiction were significantly correlated. Furthermore, path analysis (SEM) indicated that some schema domains have had significant effects on sub-dimensions of the mobile phone addiction questionnaire. For example, impaired autonomy and performance have had a positive effect on lack of control, impaired limits have a positive effect on tolerance and unrelenting standards have had a positive effect on tolerance and abstinence.

Key Words

Addiction • Adolescents • Early maladaptive schemas • Problematic mobile phone use

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In recent years, the global popularity and development of multifunctional smartphones has made changes to the communication and information environment; reshaped the interest, values, and desires of users; increased concerns about overuse and addiction (Panova & Carbonell, 2018). According to the International Telecommunication Union (ITU), there were more than 7 billion mobile cellular subscriptions at the end of 2015, and data records accounted for 97% of the world's population (Lian & You, 2017). By WAS (We Are Social) report the rate of smartphone users between 16 and 24 years of age in Turkey is 97.2% (webolizma.com, 2021).

Koivusilta et al. (2007) stated in their study that there was a relationship between mobile phone use and being unhealthy in adolescents. Similarly, the research among Finnish female adolescents showed that excessive phone use was directly and indirectly associated with sleep problems and waking up tiredness (Punamäki et al. 2007).

Individuals may be addicted to a substance like drugs and alcohol as well as they may suffer from behavioral addictions like internet, games, computers, television, and shopping (Kim & Kim, 2002). The concept of gaming disorder (a type of behavioral addiction) has been first included in the appendix of DSM-5 in 2013 as one of the conditions that needed further research (APA, 2013). it has been included in the diagnostic system of ICD-11 in 2018 (WHO, 2018). However, other behavioral addictions were not included in DSM-5 and ICD-11, except gambling and internet gaming disorder. In general, similar addictions were discussed as behavioral addictions in the literature. Although there is no official definition of smartphone addiction, based on the definition of internet addiction, it is defined as excessive use of a phone that negatively affects users' daily lives (Demirci et al., 2014)

It has been focused on the presence of symptoms of behavioral addictions and its cause and peculiarities have been rarely investigated (Aloi et al., 2020). According to Griffiths (2014), the reasons for the acquisition, development, and maintenance of addictive behaviors are psychological or biological predisposition (genetics, attitudes, beliefs, personality factors, unconscious motivation, etc.) and multifactorial points including the individual's environment in which the individual lives. Also, Davis's cognitive-behavioral model demonstrates that internet addiction is associated with maladaptive cognitions and social problems (obsessive thoughts or cognitive distortions, depression, loneliness, social isolation and lack of social support, etc.) (as cited in Ostovar et al., 2021).

According to the theoretical model of Schema Therapy which is influenced by Cognitive Behavioral Therapy, early maladaptive schemas that emerge in response to unmet needs in childhood lead to psychiatric disorders (Aloi et al., 2020). Schemas develop from childhood unmet needs, traumatic events, maladaptive environments, and internalization of other schemas. In the meanwhile, they continue because of the triggering of negative experiences or dysfunctional behaviors that affect the quality of life. Young et al. (2003) determined 5 schema domains and 18 schemas: Disconnection/rejection (abandonment, mistrust/abuse, emotional deprivation, defectiveness/shame social isolation), impaired autonomy (dependence/incompetence, vulnerability to harm/ illness, enmeshment/undeveloped self, and failure), impaired limits (entitlement/grandiosity and insufficient self-control/self-discipline), other-directedness (subjugation, self-sacrifice, and approval/recognition-seeking); and over vigilance/inhibition (negativity/pessimism, emotional inhibition, unrelenting standards, and punitiveness). Then, early maladaptive schema (EMS) was defined into four categories (leaving/rejection, impaired autonomy, and performance; excessive responsibility and high standards; impaired limits) (Bach et al., 2017).

Maladaptive schemas including cognitive, behavioral, and emotional elements are cognitive infrastructures that cause irrational beliefs (Shajari et al., 2016). Maladaptive schemas are associated with many psychopathological conditions such as personality disorder, substance disorder, anxiety disorder, depression, eating disorder, and PTSD (as cited in D'Souza, 2019). Cudo et al. (2020) stated that early maladaptive schemas were extremely persistent and stable themes that developed during childhood and continued throughout the individuals' life. They also suggested that thanks to giving an emotional-cognitive representation of the information about themselves, schemas were important to understand the development of problematic behaviors (like Facebook use). Likewise, a study conducted by Bojed and Nikmanesh (2013) revealed that individuals with early maladaptive schemas were more likely to abuse substances.

As a whole, the relationship of early maladaptive schemas with eating disorders and substance abuse was examined in the context of behavioral addictions. A study conducted on 195 college students by Shajari et al. (2016) reported that there was a significant relationship between early maladaptive schemas and internet addiction among the students. In another study conducted by Aloi et al. (2020), they investigated the relationship between EMS and behavioral addiction. It was concluded that eating disorder was associated with disconnection/rejection schema, and internet addiction was associated with all schemas.

Arpaci (2021) examined the relationship between smartphones and EMS and found that there was a significant correlation between EMS and smartphone addiction in intermittent phone users. It was also revealed that individuals with high early maladaptive schemas scores were more likely to have a smartphone addiction.

Rationale of the Study

Nowadays, smartphones use is rapidly increasing among adolescents because it provides many opportunities in terms of visual and verbal communication, interaction in social networks, ease of accessing information, and playing online or offline games. Along with the increase among adolescents, it may cause daytime sleepiness, a decrease in sleep quality (Sülün et al., 2021), anxiety (Cheever et al., 2014), loss of control (Erkişi & Sağlam, 2020), and a negative impact on life satisfaction (Köse, 2016). Due to the increasingly negative effects of smartphone use among adolescents, clarifying the reasons for its prevalence based on psychological explanation becomes important. Explaining dysfunctional behavior with different approaches will also increase the practices to make change the behavior. Schema therapy, which is a third-generation approach in Cognitive Behavioral Therapy, is effective in reducing an individual's behavioral and psychological problems by teaching the individual about early maladaptive schemas and increasing their awareness (Bal, 2019). When considering the relationship of EMS with addiction, it draws attention to the importance of understanding problematic phone use and working with EMS to change behavior.

Even though there are studies examining the relationship between EMS and addiction (Shajari et al., 2016; Aloi et al., 2020; Bojed & Nikmanesh, 2013), studies examining the relationship between EMS and smartphones are not enough. Therefore, this study aims to investigate early maladaptive schemas related to smartphone addiction and determine which individual beliefs are associated with this problematic behavior. Understanding these relationships

will contribute to the prevention and treatment of smartphone addiction as part of behavior change in Cognitive Behavioral Therapy.

Method

Research Design

In this research, the correlational design was implemented to examine the relationship between early maladaptive schemas and problematic mobile phone use. The correlational studies examine the relationship among two or more variables without providing information about cause and effect (Büyüköztürk et al., 2015).

Participants

Participants consisted of 103 female students studying at a high school in Diyarbakır in the 2021-2022 academic year. The mean age was 17.19 (between 16-20).

Measurement Tools

Personal Information Form: Personal Information Form consisted of questions designed to find out some information about participants in terms of age, grade level, smartphone ownership, and spending time on the phone in a day.

Young Schema Questionnaire Short Form-3 (YSQ-SF3): In the frame of Schema Therapy, Jeffery Young (2003) developed YSQ-SF3 with 18 subscales into five schema domains. Schema domains are rejection, impaired autonomy and performance, impaired limits, other-directedness, over vigilance, and inhibition. The subscales are successive: Abandonment/instability, mistrust/abuse, emotional deprivation, defectiveness/shame, social isolation/alienation, dependence/incompetence, vulnerability to harm and illness, enmeshment/undeveloped self, failure, entitlement/ grandiosity, insufficient self-control/self-discipline, subjugation, self-sacrifice, approval-seeking/recognition seeking, negativity/pessimism, emotional inhibition, unrelenting standards/hyper criticalness, and punitiveness. The scale consists of 90 items that are rated on a 6-point Likert-type scale (1= completely untrue of me, 2= mostly untrue of me, 3= slightly more true than untrue, 4= Moderately true of me, 5= mostly true of me, 6= describe me perfectly). High scores obtained from items indicate the prevalence of early maladaptive schemas (as cited in Soygüt, et al., 2009).

Soygüt et al. (2009) investigated the psychometric properties of the third version of the Young Schema Questionnaire by using 1071 university students in Turkey. In their study, five schema domains and 14 subscales were described. Results showed that the internal consistency coefficient for the YSQ-SF3 subscales was between α =.63 and .80, and for the schema domains varied between α= .53 and .81. According to the test-retest reliability analysis, Pearson's correlation coefficient for subscales changed between r = .66 and .83 ($p<.01$), and for schema domains changed between r=.66 and .82 ($p<.01$). In this study, Cronbach's alpha reliability coefficients were calculated. Cronbach's alpha was found consecutively for rejection (.86), impaired autonomy (.90), impaired limits (.66), other-directedness (.72), and unrelenting standards (.75).

Mobile Phone Addiction Scale: Mobile Phone Addiction Scale was developed by Choliz (2012) to investigate mobile phone addiction among adolescents by using DSM-IV-TR addiction criteria. The research was conducted with 2833 participants between 12 and 18 years of age. In the first instance, the scale included 101 items, and then it was reduced to 22 items after reliability and validity analysis. The Cronbach's Alpha for the original form was calculated as .94. The first factor was labeled Abstinence which consisted of 9 items (8, 11, 13, 14, 15, 16, 20, 21, and 22). The second factor was labeled Lack of Control/Problems which consisted of 6 items (1, 2, 3, 4, 7, and 10). Finally, the third factor was labeled Tolerance/Interference composed of 7 items (5, 6, 9, 12, 17, 18, and 19). The first 10 items are rated on a 5-point Likert-type scale ranging from 0 (never) to 4 (frequently). The remaining items are rated on a 5-point Likert-type scale ranging from 0 (completely disagree) to 4 (completely agree).

Turkish adaptation study for the scale was completed with 412 students between 13 and 18 years of age by Fırat and Çelik (2017). Cronbach's alpha reliability coefficients were found for Abstinence (.87), Lack of Control/Problems (.77), and Tolerance/Interference (.82). Finally, Cronbach's alpha for the total was .92. Additionally, Cronbach's alpha for current research was calculated consecutively: Abstinence (.92), Lack of Control/Problems as (.81), Tolerance/Interference (.86), and total (.95).

Procedure Data Analysis

The ethics committee approval was obtained from Hasan Kalyoncu University Scientific Research and Publication Ethics Committee. Participants were informed about the study and asked whether they would like to participate in study. The consent form, which includes the purpose of the study, the protection of confidentiality, the right to withdraw from the study, and volunteering, was signed by the participants. Administration of the scale took approximately 25 minutes.

Data Analysis

In the present study, the first descriptive statistics of the variables were calculated. By using Kim's (2013) recommendation as a reference for the normality test, z-scores were obtained by dividing the skewness and kurtosis by their standard errors. Since the sample size was between 50 and 300 in this study, obtained z-score which was less than 3.29 was interpreted as a normal distribution. When the distributions of the subscale of early maladaptive schema were examined, it was figured out that all subscales except emotional deprivation, abandonment, defectiveness, and failure showed normal distributions. Therefore, non-parametric techniques were used for the analysis for non-normally distributed variables. Pearson Product-Moment Correlation and Spearman's Rank-Order Correlation were performed to examine whether there was a significant relationship between schema domains of the early maladaptive schema questionnaire and subscales of the mobile phone addiction scale. Path analysis in the context of Structural Equation Modeling (SEM) was used to figure out whether early maladaptive schema domains significantly predicted mobile phone addiction scores in adolescents. As goodness of fit Chi-square/degree of freedom, CFI, NFI, GFI, and RMSEA were employed. IBM SPSS-24 (Statistical Package for Social Sciences) and AMOS 16 were used to analyze the data.

Findings

Descriptive Statistics and Correlation Analysis

Initial statistics showed that 78.4% (n=80) participants have smartphone, 21.6% (n=22) don't have a smartphone. Before analyzing the relationship between early maladaptive schemas and problematic phone use, scale scores were reviewed and shown in Table 1.

Table 1

Data Collection Instrument Statistics

		N	M	SD	Skewness	$SE_{skewness}$	Kurtosis	$SE_{Kurtosis}$	Min	Max
EMS	Rejection	103	55.08	17.65	.48	.24	-.25	.47	23.00	103.00
	Impaired autonomy	103	77.06	25.02	.40	.24	-.31	.47	30.00	135.00
	Impaired limits	103	25.73	6.76	-.23	.24	-.10	.47	9.00	42.00
	Others directedness	103	35.62	9.24	-.08	.24	-.16	.47	14.00	58.00
	Unrelenting standards	103	29.77	8.58	-.08	.24	-.37	.47	12.00	49.00
MPAS	Abstinence	103	17.32	10.61	-.14	.24	-1.12	.47	.00	36.00
	Lack of control	103	6.19	5.38	.73	.24	-.31	.47	.00	20.00
	Tolerance	103	11.25	7.17	-.06	.24	-1.21	.47	.00	24.00

Table 2. *Pearson Product-Moment Correlation Analysis for Examining Relationship Between Early Maladaptive Schema Domains and Subscales of Mobile Phone Addiction Scale*

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Rejection (1)	1							
Impaired autonomy (2)	.81**	1						
Impaired limits (3)	.41**	.53**	1					
Others directedness (4)	.53**	.55**	.27**	1				
Unrelenting standards (5)	.53**	.64**	.50**	.49**	1			
Abstinence (6)	.40**	.45**	.35**	.28**	.48**	1		
Lack of control (7)	.47**	.54**	.34**	.36**	.39**	.71**	1	
Tolerance (8)	.40**	.46**	.44**	.28**	.46**	.83**	.75**	1

Note: **p<.01, n=103

As seen in Table 2, a positive significant relationship was determined between the rejection and all sub-dimensions of the mobile phone addiction scale. There was a moderate positive correlation between abstinence (r=.40 and p=.000), lack of control (r=.47 and p=.000), and tolerance (r=.40 and p=.000).

A positive significant relationship was determined between the impaired autonomy and all sub-dimensions of the mobile phone addiction scale. There was a moderate positive correlation between abstinence (r=.45 and p=.000), lack of control (r=.54 and p=.000), and tolerance (r=.46 and p=.000).

There was a positive significant relationship between the impaired limits and all sub-dimensions of the mobile phone addiction scale. There was a moderate positive correlation between abstinence (r=.35 and p=.000), lack of control (r=.34 and p=.000), and tolerance (r=.44 and p=.000).

It was determined that there was a positive significant relationship between the other-directedness and all sub-dimensions of the mobile phone addiction scale. There was a weak positive correlation between others' directedness and abstinence (r=.28 and p=.000) and tolerance (r=.28 and p=.000). Also, there was a moderate positive correlation with lack of control (r=.36 and p=.000).

There was a positive significant relationship between the unrelenting standards and all mobile phone addiction scale sub-dimensions. There was a moderate positive correlation between abstinence (r=.48 and p=.000), lack of control (r=.39 and p=.000), and tolerance (r=.46 and p=.000).

Table 3

Spearman's Rank-Order Correlation Analysis for Relationship Early Maladaptive Schemas Sub-dimensions and Mobile Phone Addiction Scale

Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Emotional deprivation(1)	1														
Emotional inhibition(2)	.32**	1													
Social isolation(3)	.52**	.58**	1												
Defectiveness(4)	.55**	.32**	.44**	1											
Enmeshment(5)	.55**	48**	.59**	.51**	1										
Abandonment(6)	.44**	.40**	.57**	.56**	.57**	1									
Failure(7)	.48**	.33**	.55**	.71**	.64**	.56**	1								
Negativity/pessimism(8)	.41**	.41**	.51**	.41**	.49**	.48**	.47**	1							
Vulnerability to harm(9)	.46**	.37**	.59**	.50**	.63**	.53**	.59**	.56**	1						
Insufficient self-control(10)	.28**	.33**	.43**	.22*	.44**	.19	.40**	.48**	.52**	1					
Self-sacrifice(11)	.48**	.33**	.52**	.40**	.47**	.45**	.38**	.43**	.39**	.21**	1				
Punitiveness(12)	.29**	.20*	.30**	.16	.30**	.36**	.25*	.26**	.35**	.18	.30**	1			
Unrelenting standards(13)	.27**	.20*	.38**	.19	.31**	.34**	.23*	.34**	.33**	.26**	.24*	.32**	1		
Approval-seeking(14)	.44	.40**	.40**	.32**	.51**	.39**	.42**	.52**	.57**	.54**	.32**	.35**	.50**	1	
Mobile phone addiction scale(15)	**.29****	**.36****	**.37****	**.33****	**.43****	**.37****	**.35****	**.44****	**.43****	**.42****	**.40****	**.11****	**.29****	**.52****	**1**

Note: *p<.05, **p<.01, n=103

In table 3, there was a weak positive correlation between total score of mobile phone addiction scale and emotional deprivation (rho=.29 and p=.003), unrelenting standards (rho= .29 and p=.00). It was determined that there was a moderate positive correlation between emotional inhibition (rho= .36 and p=.000), social isolation (rho= .37 and p=.000), defectiveness (rho= .33 and p=.000), enmeshment (rho= .43 and p=.000), abandonment (rho= .37 and p=.000), failure (rho= .35 and p=.000), negativity/pessimism (rho= .44 and p=.000), vulnerability to harm (rho= .43 and p=.000), insufficient self-control (rho= .42 and p=.000), self-sacrifice (rho= .40 and p=.000), approval-seeking (rho= .52 and p=.000). Finally, there was no significant relationship between total score of MPAS and punitiveness (rho= .11 and p=.288).

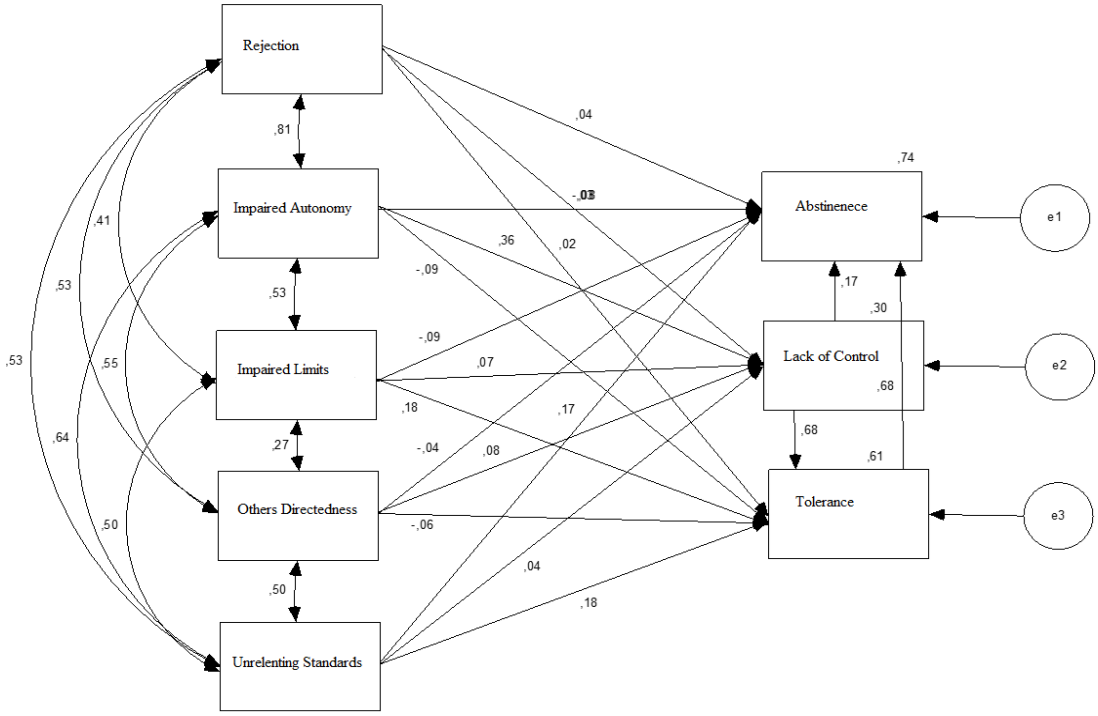
Structural Equation Modeling (SEM)

In the first stage of SEM, confirmatory factor analysis (CFA) was conducted for early maladaptive schemas and sub-dimensions of the mobile phone addiction scale. According to path analysis, the goodness of fit incidences was $\chi 2$ /df=18.49 (517.681/28), RMSEA=.41, GFI=1.00, NFI=1.00 and CFI=1.00. While examining fit values, χ 2 /df and RMSEA were higher than the desired critic levels; GFI, NFI, and CFI represented excellent goodness of fit.

It was tested whether early maladaptive schemas had a significant effect on mobile phone addiction. The path values (standardized beta coefficient) of the structural model were shown in Figure 1.

Figure 1

Standardized Path Values of Structural Model of the Relationship Between Early Maladaptive Schemas and Mobile Phone Addiction Scale.



The path analysis revealed that when impaired autonomy increased by one point, the likelihood of lack of control increased by .08-points (β=.36 and p=.024), and when impaired limits increased by one point, the likelihood of tolerance increased by .19-points (β=.18 and p=.019), one-point increase in the unrelenting standards resulted in a .15-point increase in the tolerance (β=.18 and p=.001), and one-point increase in the unrelenting standards resulted in a .21-point increase in abstinence (β=.17 and p=.020).

One-point increase in lack of control resulted in a .90-point increase in tolerance (β=.68 and p=.001), one point increase in tolerance resulted in one-point increase in abstinence (β=.68 and p=.001), and a one-point increase in the lack of control resulted in a .34-point increase in abstinence (β=.18 and p=.034).

Lastly, it was seen that early maladaptive schemas explained 74% of the change in abstinence scores, 30% of the change in lack of control scores, and 61% of the change in tolerance scores.

Discussion

The aim of the current study is to examine the relationship between early maladaptive schemas and problematic mobile phone use among adolescents. Although the scale in the study was the Mobile Phone Addiction Scale, ‘‘the concept of problematic use’’ which expresses the risk of addiction was preferred instead of the ‘‘concept of addiction’’ in this study. This is because addiction can be diagnosed as a result of a clinical interview. When investigating literature, there are limited studies on the relationship between problematic phone use and early maladaptive schemas. According to Shorey et al. (2012), early maladaptive schemas have corresponding characteristics with addiction and dependent personality disorder. To understand the degree to which relevant to literature, studies about schemas associated with addiction were examined for this study.

In the current study, it was found that there was a significant relationship between five schema domains and the total score mobile phone addiction scale as well as its sub-dimensions. Consistent with the findings, Arpaci (2021) researched to examine the relationship between early maladaptive schema and smartphone addiction and found that participants with a high score in EMS were more likely to be addicted to smartphones.

In this study, it was shown that there was a significant positive relationship between rejection and phone addiction. Similarly, early maladaptive schemas especially rejection played an important role in predicting addiction (as cited in Imperatori et al., 2017). Razavi et al. (2012) concluded that emotional deprivation and defectiveness as sub-dimension of the rejection schema domain had a part in addiction severity.

It was found that impaired autonomy, impaired limits, and unrelenting standards predicted mobile phone addiction. Arpaci (2021) showed that approval-seeking and insufficient self-control as sub-dimension of impaired limits were positively associated with smartphone addiction for addicted users. On the other hand, the results indicated that social isolation/mistrust as a sub-dimension of rejection, approval-seeking sub-dimension of unrelenting, and abandonment as a sub-dimension of impaired autonomy were positively associated with smartphone addiction for intermittent users. In another study, it was found that self-control which enables the individual to perform functions such as initiating and stopping a behavior, making decisions, and implementing the decisions taken, was low in individuals with a high level of internet addiction (Durak-Batıgün & Kılıç, 2011). Similarly, Akın

et al. (2015) revealed that lack of self-control could explain problematic internet use. While there is a positive relationship between lack of self-control and the development of addiction (Kim et al., 2008), it is found that low self-control is an important factor in the development of internet addiction (Slater, 2003). In addition to all these studies, Akkuş-Çutuk (2020) studied 295 students between 19 and 25 years of age in Turkey and found that there was a significant negative relationship between self-control and internet addiction, and also self-control predicted internet addiction.

Aloi et al. (2020) conducted a study to examine associations between EMS, internet addiction, gambling addiction, and food addiction. By using the four schema domains model belonging to Bach, it was figured out that the scores of participants with high internet addiction and food addiction were high in all four schema domains. Subsequently, it was concluded that participants with high gambling addiction had higher scores in the impaired autonomy and impaired limits schema domains.

The research findings revealed that there was a relationship between impaired autonomy and lack of control. Bolle (2014) emphasized that phone addiction is the loss of one's control as a result of his study on phone addiction in Germany. Also, it was shown that enmeshment and vulnerability to harm as sub-dimensions of impaired autonomy were strongly predicted by addiction (Razavi et al., 2012). A research conducted in India indicated that there was a relationship between self-esteem, psychological distress, and phone use in research conducted in India (Pundir et al., 2016). Pundir et al. (2016) stated that individuals, who had both dependence and negative relationships with their environment, increased the frequency of mobile phone addiction. It was also figured out that there was a relationship between shyness described by self-esteem and problematic phone use. Al-Barashdi et al. (2014) suggest that one of the reasons for smartphone addiction is the tendency of people to shyness temperament. This is because shyness makes face-to-face communication difficult; therefore, communicating with a smartphone is an excellent way to establish social interaction and new social relationships.

Limitations of The Study and Suggestions for Future Studies

As in many studies, the current study has certain limitations. First, the study group consisted of only female adolescents. Therefore, future studies should be conducted on a sufficiently large group that also includes male adolescents to take into consideration gender factors. Another limitation is the lack of sufficient literature regarding the relationship between early maladaptive schemas and mobile phone addiction. To handle it, the results of this study were discussed based on theoretically similar other addiction types such as internet-related addictions, and gambling addiction. Future studies should be compared with current studies examining the relationship between early maladaptive schemas and mobile phone addiction.

As a result, mobile phone addiction is a problem that is constantly increasing and becoming a widespread problem among adolescents. Despite all limitations above, it is thought that the current study will benefit mental health professionals working in the field of mental health as well as researcher to understand the relationship between them and the psychological factors underlying addiction. On the other hand, it will be a source for studies that aim to reduce addiction among adolescents.

Ethic

According to the decision of Hasan Kalyoncu University Scientific Research and Publication Ethics Committee, dated 23/11/2021 and numbered 2021-080, this study received ethical approval.

Author Contributions

This article was written with the joint contributions of two authors.

Conflict of Interest

The authors declare that they have no conflict of interest.

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The Mediating Role of Organizational Commitment in the Effect of School Administrators' Servant Leadership Behavior on Teacher Motivation

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Abstract

This research aims to examine the mediating role of organizational commitment in the effect of school administrators' servant leadership behavior on teacher motivation. For this purpose, the relational survey model was used in the research. 304 teachers from different regions of Turkey participated in the research. 166 of the participants were female and 138 were male. In the research, Organizational Commitment Scale, Servant Leadership Scale and Intrinsic Motivation Scale were used. The data were collected online. Data showed normal distribution. Cronbach's alpha coefficients of this study were found to be sufficient. It was found that school administrators' servant leadership behavior had a significant effect on organizational commitment. Similarly, organizational commitment had a positive effect on teacher motivation. Additionally, school administrators' servant leadership had an indirect effect on teacher motivation. In the study, the mediating effect of organizational commitment on the effect of school administrators' servant leadership behavior on teacher motivation was significant.

Key Words

Motivation • Organizational commitment • Servant leadership

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Educational institutions are people-centered organizations with people as their input and output. As the principal staff of these institutions, teachers have a direct impact on the quality of the institutions and, consequently, the training of the students. One of the factors that will increase the quality of teachers and enable them to perform better is their motivation for their work. (Coşgun, 2019). The most crucial part of the learning-teaching process, teachers have important responsibilities including giving students the greatest education possible, guiding them toward the right goals, and assisting them in becoming contributing members of society. However, order to accomplish these goals, teachers must be motivated and feel prepared to offer services in education and training (Dviren & Okçu, 2020). Since instructors' willingness and motivation have a big influence on students, educational leaders and administrators are very concerned with teacher motivation. While it's a common complaint of teachers to have trouble getting students interested in learning, if the teachers themselves lack enthusiasm for teaching, it will be considerably harder to get students interested in learning (Neves de Jesus & Lens, 2005).

According to Örücü and Kanbur (2008), motivation is "a varied range of internal or environmental factors that stimulate the action of individuals." Another definition of motivation states that it involves "filling individual expectations and wants and directing them in line with corporate goals" (Karaköse & Kocabaş, 2006). Extrinsic and intrinsic motivation are two general categories of motivation. External motivational components connect to the organization, whereas intrinsic motivational elements link to the teachers themselves (Köse et al., 2018). For the teaching profession, it's necessary to have both internal and external motivation sources (Yazıcı, 2009). The benefits of motivated teachers include improving communication with the school administration, successfully conducting their duties, fostering cooperation among workers, and boosting student achievement (Atkinson, 2000).

School administrators have the greatest responsibility for increasing teacher motivation in educational organizations (Polat, 2010). Studies show that there is a significant relationship between the leadership behavior of school administrators and teachers' job satisfaction, motivation and morale levels (Aksel & Cevat, 2016; Çoban, 2019; Yıldırım, 2011). Many leadership theories and styles have been put forward based on the idea that leaders will maximize efficiency and effectiveness by motivating individuals (Özgan et al., 2013). Servant leadership, which is assumed to have a positive impact on organizational outcomes and is expected to enable educational institutions to achieve the goals they set, is thought to be a approach that should be adopted by school principals (Beştaş-Marakçı & Boz, 2022; Black, 2010; Güçlü & İhtiyaroğlu, 2012).

Greenleaf (1970) defined the servant leader as "a leader who serves with a natural feeling." In other words, what is important in servant leadership is not pretend leadership aimed at influencing the environment; it is leadership that is done sincerely and sincerely (Ekinci, 2015). Leaders with servant leaders gain leadership characteristics by serving the people around them and focus on cooperation by giving importance to the development of the individuals under their command (Türkmen, 2016). Additionally, servant leaders allow the holistic development of people, strive to ensure the peace and happiness of the people around them and serve by centered on ethical values (İş & Balcı, 2017). The goal of these leaders, who have adopted the principle of serving without considering their own interests and expecting nothing in return from their employees, is to increase their employees' commitment to the organization and to make them ultimately a servant leaders (Günaydın, 2016).

It is thought that the servant leadership approach, in which organizational needs are prioritized rather than individual interests, will also impact the development of schools, which are an organization (Akyüz & Eren, 2013). As a matter of fact, it is seen that the job description of the person who manages the school and functioning of the school administration is based on the idea of serving employees, students and parents of students (Taylor, 2008). In schools where servant leadership is dominant, the concepts of cooperation, respect and cooperation come to the fore (Türkmen, 2016). However, organizations should have leaders who are compassionate, patient, honest, visionary, and center on people and knowledge to be successful and for the progress of humanity. These characteristics emerge as the characteristics of leaders who adopt servant leadership (Bakan & Doğan, 2012)

When studies on the subject are examined, it is revealed a significant relationship between school principals' servant behavior and positive teacher behavior and positive school outcomes (Beştaş-Marakçı & Boz, 2022). Servant leadership increases the motivation of employees and contributes to the formation of a quality learning climate by adopting a strong school culture (Polatcan, 2020; Spears, 2010).

Considering that the commitment of the employees to the institution provides the desire and effort required for the institution to achieve its goals, another concept that is thought to impact the motivation of the teachers appears as "organizational commitment" (Ertan, 2008). Employees with organizational commitment are more satisfied with their jobs and performance increases in this way that they enjoy their job (Shore & Martin, 1989). Employees with high organizational commitment are expected to show higher performance (Steyrer et al., 2008).

Motivation and organizational commitment have a significant impact on the quality and efficiency of teachers, who are the most effective and dynamic elements of educational institutions, and therefore on the quality of institutions and students. The most important task falls to school principals to increase the motivation of teachers and increase their commitment to the institutions they work for. It is predicted that school principals' adopting the servant leadership approach will both directly motivate them and indirectly motivate them because it increases their organizational commitment. Considering the studies conducted in this context in the literature, there are studies in which teacher motivation is investigated with the servant leader behavior and organizational commitment levels of school principals (Ateş & Buluç, 2018; Beştaş-Marakçı & Boz, 2022; Ertürk & Aydın, 2016; Memişoğlu & Kalay, 2017). Likewise, the relationship between school principals' servant leadership behavior and teachers' organizational commitment levels is also been investigated in the literature (Özkan, 2021; Türkmen, 2016). However, no study was found in the literature in which these three variables were studied together. In this sense, it is thought that the study will contribute to the literature. The ability of teachers, who are at the center of both public authorities and parents' expectations, to conduct the education process brings with it the need for a high level of motivation (Köse et al., 2018). From this perspective, it is thought that the studies to be conducted on this subject can guide policy makers and practitioners. In this context, the mediating effect of organizational dependence on the effect of servant leadership on organizational commitment was investigated within the scope of the research. In particular, this study established a mediation model to test the following hypotheses:

H1. School administrators' servant leadership positively predicts organizational commitment.

H2. Organizational commitment positively predicts teacher motivation.

H3. Organizational commitment plays mediating role between school administrators' servant leadership and teacher motivation.

Method

Research Model

In this study, we examined the mediator role of organizational commitment in the effect of school administrators' servant leadership behavior on teacher motivation. For this purpose, the relational survey model was used in the research (Karasar, 2009).

Study Group

The study included 304 teachers from various regions of Turkey. There were 166 female participants (54.6%) and 138 male participants (45.4%). The participants ranged in age from 24 to 58, with an average age of 36.94.

Data Collection Instruments

Personal Information Form: The researchers prepared this form to determine the characteristics of the participants (gender, age).

Servant Leadership Scale: Kılıç and Aydın (2016) translated and adapted the scale to the Turkish language. The scale consists of seven items, such as "I would seek help from my manager if I had a personal problem." The scale is one factor and his factor could explain 66.61% of the total variance item factor loads of the scale varied between .65 and .83. Cronbach's alpha coefficient for the Turkish form was .87. The fit indicates was obtained $X2/df=2.65$; GFI=.97; CFI=.97; TLI=.96; IFII=.97; RMSEA=.06.

Organizational Commitment Scale: Dağlı et al., (2018) translated and adapted the scale to the Turkish language. The scale consists of 18 items, such as "This school has a special place for me." The scale is there a factor and his factor could explain 52.71% of the total variance. Cronbach's alpha coefficient for the Turkish form was .88. Item factor loads of the scale vary between .33 and .80. The fit indicates was obtained $X2/df=2.10$; GFI=.88; CFI=.90; AGFI=.84; RMSEA=.07.

Intrinsic Motivation Scale: Aydemir Dev et al. (2022) translated and adapted the scale to the Turkish language. The scale consists of four items, such as "My job is meaningful." The scale is one factor and his factor could explain 68.71% of the total variance. The factor loads of items varied from .72 to .90. The internal validity reliability coefficient of inventory item was .85. Also fit indicates was obtained $X2/df=3.07$; GFI=.99; CFI=.99; RMSEA=.10; SRMR=.02.

Period

Ethical standards were compliance in the collection, analysis and reporting of research data. The data were collected online. Informed consent was obtained from all individual participants included in the study. Demographic information forms and scales were applied electronically. We shared the study link on social media accounts (e.g.,

WhatssApp) which enabled us to reach out to a diverse population. We have also kindly asked potential participants to share our study link with others. This research was carried out with volunteer participants.

Analysis of Data

In that study, firstly, missing data analysis was performed. The SPSS package program was used to calculate the normality test and Cronbach alpha values of the data. Direct and indirect impact analyzes between variables were calculated using SPSS PROCESS (Hayes, 2018). Boostraping was performed with 5000 samples and a 95% confidence interval.

Findings

Table 1 shows the mean, standard deviation, skewness and kurtosis values, and Cronbach's alpha coefficients. The skewness and kurtosis values were found to be in the 1.96 range, indicating a normal distribution (Karagöz, 2016). All Cronbach's alpha coefficients were found to be adequate because they were 0.70 or greater (Pallant, 2016).

Table 1

Descriptive Statistics

	α	**M**	**SS**	**Skew.**	**Kurt.**
Servant Leadership	0.66	22.82	5.47	0.52	-0.56
Organizational Commitment	0.86	75.65	7.61	-0.66	1.28
Teacher Motivation	0.65	16.65	1.94	-0.11	-0.11

$^{**}p < .01$

Figure 1 shows the mediating role of organizational commitment in the effect of school administrators' servant leadership behavior on teacher motivation. According to the bootstraping result, school administrators' servant leadership behavior have a significant effect on organizational commitment (β = 0.73, CI = [0.61, 0.87]). Similarly, organizational commitment had a positive effect on teacher motivation (β = 0.12, CI = [0.09, 0.14]). Additionally, school administrators' servant leadership has an indirect effect on teacher motivation (β = 0.09, CI = 0.07, 0.11). In the study, the mediating effect of organizational commitment on the effect of school administrators' servant leadership behavior on teacher motivation is significant. Additionally, servant leadership and organizational commitment explain 41% of the variance (R2) of motivation (Figure 1).

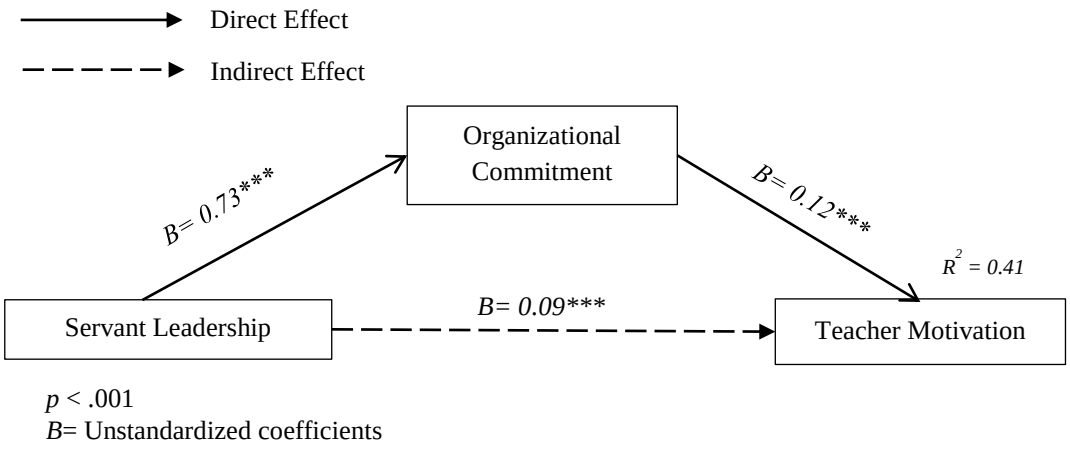

Figure 1. Mediation Effect Model

Discussion

According to the study's findings, school administrators' servant leadership actions had a strong and significant impact on teachers' motivation. The study of Beştaş-Marakçı and Boz (2022) supports this finding. According to the study, teacher motivation was meaningfully explained by the school administrators' adoption of the servant leadership style in administrative practices. Additionally, it was noted in the study that improved teacher motivation would have a good impact on instructional strategies. Similar to this, Sulistyorini (2009) claimed (as reported in Wahyuni et al., 2014) that the servant leadership responsibilities of the school principle have a substantial impact on the motivation of teachers in their instructional activities. According to Polatcan (2020), school principals that exhibit servant leadership traits inspire teachers to make their best efforts, which increases the likelihood that the school will succeed in achieving the shared objectives it has set. The servant leadership approach behavior of school administrators and teachers' work motivations was shown to have a positive and important relationship in Kuanprasert and Phetsombat's (2019) study, which studied the relationship between servant leadership and teachers' work motivations. The servant leadership model has a favorable impact on all of the aforementioned factors as well as teachers' job performance, job happiness, and overall well-being (Çoban, 2019; Öter, 2021; Liana & Hidayat, 2021). In addition to these, research findings have shown that additional leadership behavior and teacher motivation have beneficial associations (Aydınoğlu, 2020; Okçu et al., 2020; Özgan et al., 2013; Üstel, 2022).

The research's conclusions indicate that school administrators' servant leadership practices have a favorable and significant impact on teachers' organizational commitment. Barbuto and Wheeler (2006) stated that thanks to servant leaders, teachers will perform better, and this will increase teachers belonging to the school and their organizational commitment. Cerit (2010), in his study with primary school teachers, found a positive relationship between servant leadership and organizational dependence. In addition to these, there are studies in the literature showing that the organizational dependencies of individuals working in different institutions are affected by the servant leadership

behavior of leaders (Harwiki, 2016; Lapointe & Vandenberghe, 2018; Ramli & Desa, 2014). Servant leadership also has a positive effect on organizational trust and health (Del & Akbarpour, 2011; Öter, 2021).

The study finds that teachers' organizational commitment positively impacts their levels of motivation. According to Ertürk and Aydın (2016), instructors with a high organizational commitment will benefit their schools, and if they are useful, their internal motivation will increase. According to Steyrer et al. (2008), personnel with strong organizational commitment participate heavily in both production and the organization, work to advance the interests of the latter and exhibit more original and creative thinking. Another study found that educators with high levels of emotional commitment may be driven by both internal and external factors (Oran al., 2016).

In this study, it was found that organizational commitment had a mediating effect on the effect of servant leadership on teacher motivation. Servant leaders support employees' ability to express their own ideas by including employees in decision-making processes and strive to increase employees' commitment to the organization. In this manner, servant leaders contribute to the self-development of employees, which increases their commitment to the leader. Since the leader also represents the organization, this commitment spreads throughout the organization, and individuals continue to work in the organization they work for because of the kindness done to them, and they do not want to go to another organization (Koç & Özyılmaz, 2020). As organizational commitment increases, turnover decreases, stability increases, morale and motivation increases (İbicioğlu, 2000). Individuals spend more effort to do the task assigned to them. In contrast, individuals with low organizational commitment cannot devote themselves to their work and cannot show sufficient success (Gül, 2002).

As explained in the literature, increasing the motivation level of teachers and their commitment to the organization increases their performance and job satisfaction. Increasing efficiency and effectiveness of teachers positively affects the success and performance of both the student and institution. Since servant leadership behavior contributes to both teacher motivation and organizational dependency, school administrators can be given in-service training on this subject to increase their awareness of servant leadership and its benefits. Simultaneously, it can be aimed to increase the motivation of teachers and their commitment to the organization by determining the servant-leader characteristics of school principals. However, the present study has several limitations. First, a sample of teachers was used, so the results may not be generalizable to other groups. The study is a cross-sectional study and is far from examining the course of teacher motivation.

Ethic

I declare that the research was conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Author Contributions

All authors contributed equally.

Conflict of Interest

There is no conflict of interest in this research.

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Analysis of the Scientific Research on Inclusive Education

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Abstract

This study aimed to examine the scientific research, including postgraduate theses and scientific articles related to inclusive education, carried out in Turkey in terms of some various variables. The study was designed using the document analysis technique, which is one of the qualitative research methods. The study data were collected from postgraduate theses in the Higher Education Council (CoHE) National Thesis Center and scientific articles found in the TUBITAK ULAKBIM TR-Index database. A descriptive analytic method was used to analyze the data of the study. The results revealed that the scientific research on inclusive education in Turkey is currently not at a sufficient level. A total of nine different universities published postgraduate thesis studies about inclusive education. These postgraduate theses are carried out in nine different fields of study. In particular, social studies education was found to be the field of study that examined the subject of inclusive education the most among postgraduate theses. On the other hand, it was found that the teaching activities or practices were mostly addressed in those research on inclusive education, and the sample group mostly consisted of teachers. Furthermore, the results showed that the scientific research was mostly designed using qualitative research methods, and that the interview method was mostly used as a data collection method. In light of the findings of this study, some recommendations were made to researchers.

Key Words

Document analysis technique • Inclusive education • Scientific research

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Introduction

Education, which is recognized as a fundamental human right, is a wide process that meets the requirement to secure the individual's personal development and integrity freely and ethically (Nugroho, 2016). The goal of education is to prepare people to understand and make sense of the world's realities, as well as to construct new cultural structures, and prepare children to exist in the reality of life with a critical-inquiring awareness (Daimah, 2018). Education is provided not only to gifted children but also to children who are perceived to be different or deficient in comparison to other children (Juliandari & Pasaribu, 2021). As a result, every child in the world has the right to access basic education, and every child has the potential to achieve and retain an appropriate level of education during that schooling (UNESCO, 1994). To this understanding, all children should have the opportunity to learn together, have equal access to the general education system, and be able to receive individual education when necessary due to disabilities or other distinctions (United Nations, 2021). This refers to an inclusive culture in which education systems and schools share a commitment to providing equal access to learning opportunities for all students and a shared understanding of the ideals of respect for differences (Ainscow & Miles, 2008).

In the United Nations Committee on the Rights of Persons with Disabilities, inclusive education is defined as a fundamental human right to access equitable education that involves identifying and removing barriers that prevent all pupils from having equal access to education (United Nations, 2016). Inclusive education as an educational agenda is established in response to the requirements of various children, and the term "inclusion" refers to the placement of all students, regardless of ability levels, in regular schools and classes (Luciak & Biewer, 2011). Inclusive education is simply a manifestation of everyone's right to get an education, based on the premise of education for all (Stubbs, 2008). This new perspective is a fundamental component of the Salamanca Statement on Principles, Policy, and Practice in Special Needs Education, which was supported by representatives from 92 nations and 25 international organizations in June 1994 (UNESCO 1994).

The Salamanca Declaration is an inclusive education arrangement that puts the child first and is designed with the concept of education for all in mind. It also adds to the subject of special education. According to the Salamanca Statement, schools should accept all children "despite their specific peculiarities or difficulties" (UNESCO, 1994). This regulation aims to remove educational barriers, improve outcomes, and prevent social exclusion or prejudice (Lindsay, 2003). According to UNESCO, inclusion is a dynamic strategy that responds favorably to student diversity and views individual differences as possibilities to deepen learning. The notion of inclusion states that ordinary schools are accountable for serving the needs of all children. In order to be inclusive, instructors must believe that all children can learn, have confidence in their own talents, and have a responsibility to support all students' development (UNESCO, 1994).

According to UNESCO, inclusive education is the process of expanding the educational system's capacity to reach all students (UNESCO, 2017). There is a distinction between "full participation," which believes that all student needs should be supplied through general arrangements, and "soft participation," which contends that needs should be met through the regular system but with some supplementary aid when necessary (Norwich, 2002). According to UNESCO, the term "inclusive education" stems from the phrase "education for all," which signifies

inclusive education with an approach to education that reaches all without exception. Inclusive education aims to increase student learning and active participation and minimize the impact of barriers to learning and democratic participation. It emphasizes overcoming barriers within the system to help all students reach their full potential (Dreyer, 2017).

Schools should adapt to accommodate the requirements of various pupils in order to provide an inclusive education. The primary goals of this education are to promote personal development and human dignity, to construct an inclusive education model for children with special needs, and to provide circumstances for self-actualization (Bektiningsih et al., 2020). Inclusive education presents a method that considers how educational institutions, other learning environments, and curriculum may be altered to respond to the diversity of all students, rather than being a side issue of how some children might be integrated into general education. This approach is described as a widely supported endeavor to teach kids with various disabilities and learning challenges in the same building as typical kids, on an equal footing with typical kids, and by giving them equal opportunity in all areas, regardless of their strengths and weaknesses (Singh, 2016).

The goal of inclusion is to increase all children's acceptance of and participation in regular education, including those who have disabilities (Brownell et al., 2010; Farrell, 2000; Lindsay, 2007). This vision implicitly highlights the social component of learning by emphasizing the importance of the student body as a learning resource. This is comparable to a holistic paradigm where schools are in charge of kids' academic, cultural, emotional, and cognitive growth (Leicester, 2008). Researchers have argued that regardless of their disability, every individual should be respected, that these individuals should feel confident and secure in order to learn and develop their skills in order to survive in society (Khanna & Kareem, 2021). Therefore, inclusive education presents the chance to redesign the entire educational system in light of student variety, personal growth, educational programs, methodology, assessment, and, most importantly, the purpose of education (Jha, 2007).

Ainscow (2002) emphasized that, for inclusive education, it is not enough to regulate only the physical conditions. Furthermore, it is necessary for all components of education and their stakeholders to understand and support the philosophy of inclusion and to reorganize education programs and teaching practices to include every child. In the end, inclusive education views individual diversity as a way to democratize and enhance learning and spur new ideas that can help all students (Aas, 2022). This education can provide both quality education and social development for all students, including the disabled, and guarantee universality and non-discrimination in education (United Nations, 2016). However, in order to achieve the goal of inclusive education, it is very important to train teachers to include students with disabilities in normal classrooms (United Nations, 2001).

The Current Study

The focus and trends of scientific research on inclusive education in Turkey were examined through a study of the literature, but there were very few studies found (Amaç, 2021; Sarı, Nayir, & Kahraman, 2020). However, because inclusive education has been acknowledged as one of the most successful strategies to establish inclusive communities, an inclusive society, and education for all (Stubbs, 2008). It is thought that conducting scientific research on inclusive education will increase awareness of participation and gain in cultures and communities,

reduce exclusion in and from education in schools, and raise awareness to address and respond to the diversity of all students' needs (Britain, 2000). It is expected that conducting scientific research on inclusive education will provide researchers, educators, practitioners, and teachers with ideas in terms of inclusive education and inclusive practices. This also makes it an important component to have certain beliefs and attitudes about inclusive education and to be knowledgeable about the planning and implementation of inclusion (Ismailos et al., 2022).

The purpose of this study is to investigate and review previous scientific research on inclusive education in Turkey in terms of some different variables. Analysis of the research on inclusive education can help us develop an understanding of the conceptual framework of inclusive education and explore contextual factors and insights into its applications. This exploratory process has the feature of being an enlightening literature guide for researchers who aim to conduct research on inclusive education. In this context, this study is aimed at evaluating the previous scientific research related to inclusive education in the context of the following research questions:

1- How are scientific research on inclusive education distributed by year of research?

2- How are postgraduate theses (i.e., Master's and doctoral theses) on inclusive education distributed by universities?

3- How are postgraduate theses on inclusive education distributed by the field of study?

4- How are scientific research on inclusive education distributed by subject area?

5- How are scientific research on inclusive education distributed by research methods?

6- How are scientific research on inclusive education distributed by sampling methods?

7- How are scientific research on inclusive education distributed by sampling groups?

8- How are scientific research on inclusive education distributed by data collection tools?

9- How are scientific research on inclusive education distributed by the data analysis method?

Method

Research Design

This study was designed according to the qualitative research model. This study, which was conducted to examine scientific research (i.e., postgraduate theses and articles) carried out on inclusive education in Turkey in terms of some variables, was carried out with the document analysis method. Document analysis is a systematic procedure for reviewing or evaluating both printed and electronic materials. Like other methods in qualitative research, document analysis requires detailed examination and interpretation of data in order to derive meaning, gain understanding, and develop empirical knowledge (Bowen, 2009; Corbin & Strauss, 2008; Rapley, 2007).

Data Source

The data source for this study consisted of studies on inclusive education, including postgraduate thesis studies in the National Thesis Center of the Council of Higher Education (CoHE) and scientific articles published in the

Turkish Scientific and Technological Research Council (TUBITAK) ULAKBIM TR-Index in Turkey. Study data are limited to postgraduate theses about inclusive education that have access to the CoHE database and scientific articles in the journals found in the ULAKBIM TR-Index database. The criterion sampling technique was used in the selection of the data to be used in the study. In this study, inclusion criteria is used as the criteria. The inclusion criteria are as follows:

- Postgraduate thesis studies that are found in the National Thesis Center of the Council of Higher Education (CoHE) and that have the word "inclusive education" in the thesis title and are accessible online.

- Scientific articles that are found in the TUBITAK ULAKBIM TR-Index database for the field of social sciences, have open access, have the word "inclusive education" in the title, and the content of the article is relevant to the inclusive education.

Data Collection

The first set of data to be collected within the scope of this study includes postgraduate thesis studies. The thesis studies were accessed throughout the CoHE National Database Center in May 2022. The word "inclusive education" is written in the search term field. As a result of the search, 30 postgraduate thesis studies were found. A second review was conducted, taking into account the inclusion criteria. As a result of the second review, 14 postgraduate thesis studies were included in the study. The second type of data to be collected within the scope of the study are scientific articles. It was entered into the ULAKBIM TR-Index database in May 2022 in order to access scientific articles on the subject. The word "inclusive education/"kapsayıcı eğitim" is written in the search term field. Social sciences database, open access, and document type article criteria were selected and searched. As a result of the search, 130 scientific articles published between 2012 and 2022 were found. A second review was conducted, taking into account the inclusion criteria. In the second review, 20 articles with the word "inclusive education" in the title of the article were reached. The selected articles were examined one by one, and 5 articles outside the scope of the research were excluded. As a result of the examinations, 15 scientific articles were included in the study. As a result, a total of 29 publications, 14 of which were postgraduate thesis studies and 15 of which were scientific articles, were included in the research. After a list of the publications included in the research was created, the PDF files were saved in the computer and subjected to document analysis. The process of accessing the data source in this study is shown in Figure 1.

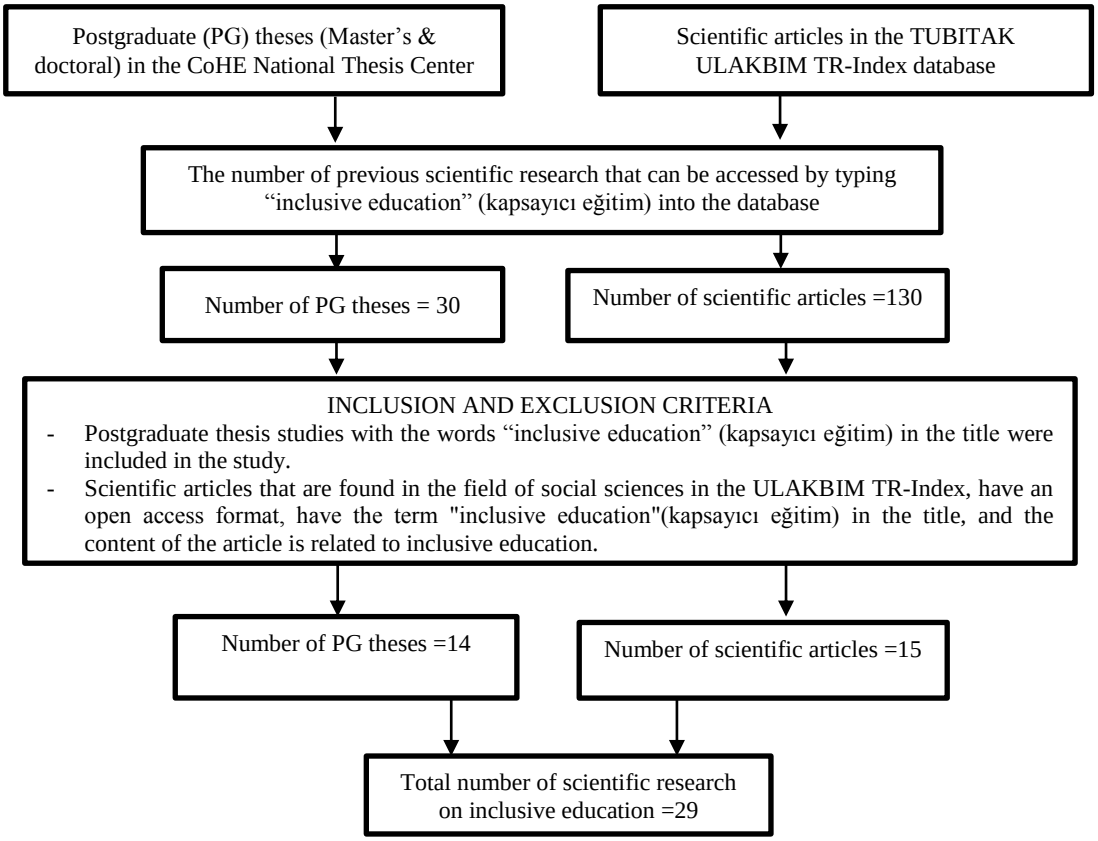

Figure 1. The process of accessing the data source of this study

Data Analysis

The data gathered for this investigation was analyzed using a document analysis technique. Postgraduate thesis studies and scientific articles about inclusive education were accessed, and descriptive analyses were made by associating them with sub-research questions. Document review consists of accessing documents, examining and understanding the originality of documents, and analysing and reporting data. Document analysis enables the analysis of a research problem in a time period based on documents produced in a specific time period or documents produced in multiple sources at different intervals related to the research problem (Yıldırım & Şimşek, 2005).

The scientific research examined within the scope of this study was classified and tabulated according to publication year, higher education institutions, branches of science, subjects, research methods, sampling methods, study/sample groups, data collection tools, and data analysis methods. The data table was converted into numerical data and entered into a separate table, frequency calculations were performed, and the results were interpreted and reported. The findings that emerged as a result of the analysis were interpreted and discussed, and a conclusion was reached. The study data were obtained from official research websites. The authors evaluated the collected data objectively. The originality of the data was analysed without impairing it. The data obtained were not used outside of the study. In order to ensure consistency between the data in the process of examining the documents, the researchers exchanged views where necessary throughout the analysis process.

Results

In this part of the study, the scientific research carried out for inclusive education were analyzed and interpreted in terms of various variables. In this context, the distribution of research by year of research, distribution by institutions, distribution by field of study, distribution by subject area, distribution by research methods, distribution by sampling method, distribution by sample groups, distribution by data collection tools, and distribution by data analysis method were examined.

Results of the First Research Question

In the first sub-research question in this study, the distribution of postgraduate theses and articles on inclusive education by year of research was examined. The results are shown in Table 1.

Table 1

Distribution of Scientific Research by year of Research

Year	Article *(f)*	Postgraduate Theses		Total *(f)*
		Master's *(f)*	Doctoral *(f)*	
2017	1	---	1	2
2018	2	---	---	2
2019	4	5	1	10
2020	5	1	---	6
2021	3	2	3	8
2022	---	1	---	1
Total	15	9	5	29

When Table 1 is examined, it is seen that scientific research on inclusive education began to be published in 2017. As 2017, 29 research studies have been conducted, 15 of which are scientific articles found in the ULAKBIM TR-Index database and 14 of which are postgraduate theses published in the CoHE National Thesis Center. Of the postgraduate theses, nine are at the master's level and five are at the doctoral level. As seen in Table 1, it was found that postgraduate theses on inclusive education in Turkey have been published for the last six years, and the theses on the subject have mostly been published in 2019, but there has been a decrease in the last three years.

Results of the Second Research Question

In the second sub-research question, the distribution of postgraduate theses on inclusive education by university was examined in Turkey. The results are shown in Table 2. Postgraduate theses on inclusive education have been published in nine different universities in Turkey, as shown in Table 2. While two postgraduate theses were published at the Erciyes University, the following universities, namely the Anadolu University, the Ankara Social Sciences University, the Gaziantep University, the İhsan Doğramacı Bilkent University, the Pamukkale Universit, the Trabzon University, and the Zonguldak Bülent Ecevit published one theses each. Five postgraduate theses were published at the Gazi University. In the 14 postgraduate thesis studies examined, the Gazi University seems to be the higher education institution where most of the postgraduate thesis studies on inclusive education were published.

Table 2

Distribution of Postgraduate Theses by University

University (Alphabetical order)	*(f)*
Anadolu University	1
Ankara Social Sciences University	1
Erciyes University	2
Gazi University	5
Gaziantep University	1
İhsan Doğramacı Bilkent University	1
Pamukkale University	1
Trabzon University	1
Zonguldak Bulent Ecevit University	1
Total	14

Results of the Third Research Question

In the third sub-research question, the distribution of postgraduate theses on inclusive education by field of study was examined. The results are shown in Table 3.

Table 3

Distribution of Postgraduate Theses by Field of Study

Field of Study	*(f)*
Child development and education	1
Curriculum and instruction	2
Social and historical foundations of education	1
Education management	1
Science education	1
English language education	1
Elementary school education	2
Social studies education	4
International relations	1
Total	14

Table 3 shows that postgraduate theses on inclusive education were published in nine different fields of study. As inclusive education is an issue that affects all stakeholders in the field of education (UNESCO, 2017), it is expected that several fields of study would investigate the subject. When Table 3 is examined, social studies education is found to be the field of science that has examined the subject of inclusive education the most, with four postgraduate theses. While two postgraduate theses were published in the fields of curriculum and instruction and in the field of elementary school education; one for each postgraduate thesis was carried out in the fields of child development and education, social and historical foundations of education, educational administration, science education, English language education, and international relations.

Results of the Fourth Research Question

In the fourth sub-research question, the distribution of scientific research on inclusive education by subject area was examined. The results are shown in Table 4.

Table 4

Distribution of Scientific Research by Subject Area

Subject Area	*(f)*
Perceptions, attitudes, or views towards inclusive education	5
Educational needs of asylum seekers or children with special needs	5
Teaching activities implemented within the scope of inclusive education	8
Teacher training for inclusive education	2
Country comparisons on inclusive education	1
Student development in the inclusive education process	2
Scale development studies for inclusive education	3
Document reviews for inclusive education	3
Total	29

As seen in Table 4, the distribution of subject areas covered by scientific research on inclusive education was collected into eight different categories. The most examined subject among these categories was the examination of teaching activities implemented within the scope of inclusive education. This finding showed that researchers attempted to obtain a viewpoint on the subject by focusing on inclusive teaching practices applied in educational institutions. In addition, examining the perceptions, attitudes, or views of the participants towards inclusive education and determining the educational needs of asylum seekers or children with special needs are among the subjects that researchers mostly focused on. On the other hand, scale development studies, document reviews, student development, country comparisons, and teacher training were among the less studied topics related to inclusive education.

Results of the Fifth Research Question

Table 5

Distribution of Scientific Research by Research Methods

Research Method	Research design	*(f)*
Qualitative	Case study	7
	Action research	2
	Phenomenology	3
	Unspecified	2
Quantitative	Experimental	1
	Descriptive	2
	Correlational	1
	Development of measurement tools	3
Mixed	Exploratory sequential pattern	1
	Intervention pattern	1
	Unspecified	3
Compilation	Literature review	2
	Meta-analysis	1
Total		29

In the fifth sub-research question, the distribution of scientific research carried out for inclusive education by research methods was examined. The results are shown in Table 5. According to Table 5, it was found that scientific research conducted for inclusive education is designed according to four different research methods: qualitative, quantitative, mixed, and compilation. Almost half of the studies were carried out using the qualitative research method. Most of these studies, which were carried out according to the qualitative research method, were designed according to the case study pattern. On the other hand, it was determined that scientific research designed according to action research and phenomenology patterns are less. Some of the scientific research on inclusive education has also been designed using the quantitative research method. Among these studies, it was found that the studies designed in descriptive design and the studies carried out to develop measurement tools were more than the studies designed in correlational and experimental research designs. On the other hand, it was seen that mixed methods and compilation studies were fewer in number.

Results of the Sixth Research Question

In the sixth sub-research question, the distribution of scientific research carried out for inclusive education by sampling methods was examined. The results are shown in Table 6.

Table 6

Distribution of Scientific Research by Sampling Methods

Sampling Method		*(f)*
Qualitative	Easily accessible sample	4
	Purposeful sampling	7
	Maximum diversity sampling	1
	Criteria sampling	8
	Typical case sampling	1
	Unspecified	3
Quantitative	Random sampling	2
	Stratified sampling	1
	Unspecified	4
Compilation	Eligibility criteria	1
Total		32

As seen in Table 6, the most often utilized sampling strategies in scientific research on inclusive education are criterion (criterion) sampling and purposive sampling. However, it was observed that the methods of easily accessible sampling, random sampling, maximum variation sampling, typical case sampling, and stratified sampling were utilized less frequently.

Results of the Seventh Research Question

In the seventh sub-research question, the distribution of scientific research on inclusive education by sample groups was examined. The results are shown in Table 7. As seen in Table 7, the sample groups included in the scientific research on inclusive education, can be grouped under seven categories: primary school students, middle school students, high school students, higher education students, families, teachers, and documents. According to the findings of those studies, the most common group among these groups is teachers, with the least common group

being high school students. It is a result that should be considered that the other sample groups mentioned in the studies are much less included compared to the teachers group.

Table 7

Distribution of Scientific Research by Sample Groups

Sample Group	*(f)*
Primary school students	3
Middle school students	2
High school students	1
Higher education students	2
Families	2
Teachers	19
Documents	3
Total	32

Results of the Eighth Research Question

In the eighth sub-research question, the distribution of scientific research on inclusive education by data collection tools was examined. The results are shown in Table 8.

Table 8

Distribution of Scientific Research by Data Collection Tools

Data Collection Tools	*(f)*
Questionnaire	6
Interview	16
Observation	7
Document analysis	9
Scale	11
Total	49

As seen in Table 8, the data in the scientific research on inclusive education in Turkey were collected with five different data collection tools: interviews, observation, questionnaire, scale and document analysis. The results indicated that interviews and scales were more preferred, and questionnaire, observation and documentary screening were used less by researchers while carrying out studies on inclusive education. The number of data collection tools used in twenty-nine scientific research examined within the scope of this present study was found to be forty-nine.

Results of the Ninth Research Question

The distribution of scientific research on inclusive education by data analysis method was analyzed and shown in Table 9. When Table 9 is examined, it is found that content analysis, descriptive analysis, thematic coding, and document analysis methods are selected among the qualitative data analysis methods in the analysis of the data collected in scientific research on inclusive education. In these studies, it was found that content analysis is preferred more than the other data analysis methods. On the other hand, it is seen that the quantitative data analysis methods

collected in the scientific research carried out for inclusive education are grouped under two categories: quantitative descriptive and quantitative predictive.

Table 9

Distribution of Scientific Research by Data Analysis Method

Data Analysis Method		*(f)*
Qualitative	Content analysis	12
	Descriptive analysis	4
	Thematic coding	4
	Document analysis	2
Quantitative Descriptive	Frequency & percent	7
	Mean-standard deviation	1
Quantitative Predictive	Correlation	4
	T-Test	6
	Analysis of Variance (ANOVA)	5
	Covariance	1
	Chi-Square	1
	Mann Whitney-U test	2
	Kruskal Wallis-H test	2
	Kolmogorov-Smirnov	1
	Shopiro Wilk	1
Total		53

Discussion, Conclusion & Suggestions

Advances in the direction of inclusive education include a series of changes to be made in the field of education and social areas, as indicated by a large number of international legal documents (UNESCO, 2005). International documents addressing inclusive education as a right have contributed to the development of inclusive education. Among these, the "World Program of Action for Persons with Disabilities" realized in 1982, the "Standard Rules on Equalization of Opportunities for Persons with Disabilities" announced in 1993, and the "Salamanca Declaration and Framework of Action for Special Educational Needs" realized in 1994 are some prominent international documents. In particular, the "UN Convention on the Rights of Persons with Disabilities" adopted in 2006 has highlighted that inclusive education is a right. This agreement is accepted as the first legally binding international document (Stubbs, 2008). On the other hand, the "World Education Forum" was held in 2000 in Dekar to evaluate the "Education for All" movement, which was started in Jomtien in 1990. It was decided in this manner to ensure that all children have access to and complete free and compulsory primary education by 2015, with an emphasis on marginalized children and girls (Stubbs, 2008; UNESCO, 2005).

The findings of this study show that in the recent six years, publications of scientific research, particularly postgraduate theses undertaken for inclusive education in Turkey, have started to appear. Considering the developments on the subject at the international level for the last forty years, an idea can be formed about the importance of research that has been done and will be done in Turkey. The results showed that it is a thought-provoking result that there has been a decrease in the number of thesis studies on the subject in Turkey after 2019, and that no doctoral thesis studies have been carried out in 2022. This situation can be attributed to the COVID-19

pandemic, which affects many social areas as well as the field of education. However, considering the developments in the world, it can be said that there is a need for scientific research on inclusive education in Turkey.

Various institutions and organizations, such as TUBITAK, Turkish Academy of Sciences (TÜBA), and the Turkish Statistical Institute (TÜİK) provide scientific research services in Turkey. On the other hand, universities are among the important institutions that carry out scientific research and projects as institutions of higher education. As Erdem (2005) stated, universities generally have three basic functions. These are: to provide education and training services, to carry out basic scientific research and to provide community services. Higher Education Law states that "*As higher education institutions, to conduct high-level scientific studies and research, to create information and technology, to disseminate scientific data, to support national development and development, to become an outstanding member of the scientific world by cooperating with domestic and foreign institutions*. *The phrase contribute to modern progress*" (T.C. Resmî Gazete, 1981), which draws attention to the most basic mission of universities. The results of this study demonstrated that there are few postgraduate thesis studies on inclusive education, which has been studied in international literature for many years but has just begun to be researched in Turkey. It is a thought-provoking result that these postgraduate thesis studies were carried out at only nine universities. At this point, it is considered important that other universities in Turkey need to conduct postgraduate thesis research on the subject in order to enrich the national literature on inclusive education.

Inclusion education is defined as a process of addressing and responding to the diversity of all learners' needs through boosting involvement in learning, cultures, and communities while decreasing exclusion from education within education. It entails alterations to the content, tactics, structures, and strategies used to educate all students, even those of the proper age range, in order to develop a shared vision (Stubbs, 2008). At this point, inclusive education should be a research topic that concerns all departments of universities related to the field of education. In this study, the results showed that the postgraduate thesis studies carried out for inclusive education in Turkey were carried out in nine different fields of study. In this respect, the fact that inclusive education has been researched across various academic disciplines is a beneficial development. When the results were examined, it was found that social studies education, elementary school education, and curriculum and instruction have taken a leading role by conducting more postgraduate thesis research on inclusive education. From this point of view, if other fields of study related to the field of education at universities also carry out postgraduate theses on the subject, it will contribute to the development of a common understanding about inclusive education in the national literature.

When the literature is examined, it was found that the priority issues to be investigated in inclusive education are as follows: Designing inclusive education programs, creating learning environments for inclusive education, supporting peer teaching in inclusive education, and supporting cooperative learning in inclusive education In addition, determining the needs of working children, poor children, nomadic children, children with ethnic and linguistic minorities, children with health problems, children with disabilities, and children with special learning needs and their integration into education are among the important issues (Stone, 2017; Topping, 2005; UNESCO, 2009). According to the results of this study, it was found that the educational activities and student development applied within the scope of inclusive education were examined in the scientific studies carried out in Turkey, and the

educational needs of refugees and children with special needs were investigated. The results suggest many research carried out in Turkey examine important issues within the scope of inclusive education. On the other hand, there are also studies that reveal perceptions, attitudes, or views towards inclusive education, and that conduct teacher education, document reviews, and scale development studies. Within the scope of the literature on the subject, it is important to examine the educational needs of children at risk, their access to education, their integration, peer teaching, cooperative learning, and the creation of a training program.

When the research methodologies used to create the studies on inclusive education in Turkey are examined, it becomes clear that these studies were primarily created using qualitative research methods. By using qualitative data collection techniques like observation, interviewing, and document analysis, qualitative research aims to learn more about the research subject in-depth and comprehensively (Şişman, 2006). It also attempts to reveal perceptions and events in their natural environment in a realistic and comprehensive way (Yıldırım & Şimşek, 2005). Therefore, it is considered positive that the aforementioned research on the subject aims to collect in-depth information on the subject in its natural environment. Another finding of this study was that the case study design was mostly preferred in the studies designed by the qualitative research method, while action research was less involved. According to Yıldırım and Şimşek (2005), action research is a research approach that reveals the problems related to the implementation process or aims to understand and solve a problem that has already emerged. Undoubtedly, conducting more research on inclusive education according to the action research design will contribute to the literature on the subject. When international literature is examined, research on inclusive education conducted with action research methods is limited (Ainscow et al., 2004; Armstrong & Moore, 2004; Sanahuja et al., 2021). According to the results of this study, fewer studies on the subject were carried out according to the quantitative research method. A remarkable result is that only one experimental study was conducted. According to Kaptan (1977), if it is desired to create new situations or change existing conditions on a subject, the research to be carried out on this subject should be designed with an experimental method. Therefore, examining issues such as the development of inclusiveness in our education system, the integration of disadvantaged groups into the normal school system, and the design of learning-teaching processes within the scope of inclusiveness can be carried out with the experimental method. In this respect, the result of this study showed that the scientific research to be carried out in the experimental method will enrich the literature. When international literature is examined, empirical research on inclusive education is quite limited (Lüke & Grosche, 2018; Pingle & Garg, 2015).

Teachers, parents, society, school administrators, program developers, and entrepreneurs in the education sector are important stakeholders that can support inclusion in education. Teachers, parents, and communities from various stakeholders are critical to ensuring that all components of the inclusion process are supported. Relationships among instructors, parents, other students, and the community play a significant role in creating the ideal learning environment for inclusion. Ideally, effective coverage includes practice both in school and in the community at large. However, it is very rare for such a relationship to exist between a school and society. Therefore, the greatest responsibility for students and their daily learning lies with teachers (UNESCO, 2005). The findings of this study reveal that the sample population in studies on inclusive education in Turkey consists primarily of instructors and a small number of families. Therefore, it is a positive result that these studies were carried out with teachers and

families. On the other hand, it is seen in the research that there is much less work with primary, secondary, high school, and higher education students. Children of travelers, asylum seekers, refugees, minority ethnic and religious groups, children with a different mother tongue, children with special educational needs and children cared for by the government, according to the UK Office for Standards in Education (OFSTED, 2022), children are disadvantaged groups in terms of inclusive education. More investigation into vulnerable students in Turkey will advance the body of knowledge at this time.

The results of this study showed that the interview method is mostly used as a data collection tool in scientific research on inclusive education. It is argued that the interview method, which provides the opportunity to collect data through verbal communication, is the most common data collection method used in research in the field of social sciences (Şişman, 2006; Yıldırım & Şimşek, 2005). The most important feature of the interview method that distinguishes it from other data collection methods is that the interview questions can be repeated, incomprehensible points can be clarified, and explanatory information can be given (Kaptan, 1977). In addition, observing nonverbal behaviors, confirming the data source, and collecting in-depth information are the strengths of the interview method (Yıldırım & Şimşek, 2005). In this respect, it is a positive result that the interview method is used in most of the research on inclusive education. Surveys, observation, documentary screening, and scale are other preferred data collection tools in research. The remarkable research finding is that while the number of scientific studies included in the study is twenty-nine, the number of data collection tools is forty-nine. At this point, it can be said that data diversity is provided in many studies on the subject. On the other hand, according to Yıldırım and Şimşek (2005), a large number of studies have been carried out using metaphors in different disciplines of the social sciences. From this point of view, data can be collected through metaphors in research to be carried out for inclusive education. In international literature, it was found that data was collected through metaphors in previous research on inclusive education (Domović et al., 2017; Walton & Lloyd, 2011).

The results showed that it is a remarkable result that content analysis is preferred more in qualitative and mixed studies conducted for inclusive education. Although the data is summarized and analyzed in descriptive analysis, the data are put through a more thorough process in content analysis, and concepts and themes that are missed with a descriptive approach can be found through content analysis (Yıldırım & Şimşek, 2005). As a result, the fact that the data in qualitative research on inclusive education were mostly subjected to content analysis can be interpreted positively. When the international literature is examined, it was determined that similar data analysis methods are used in previous research studies conducted with qualitative research methods (Bhatnagar & Das, 2014; Karin et al., 2012; Sulasmi & Akrim, 2019). On the other hand, it was found that quantitative predictive and quantitative descriptive data analysis methods are used in quantitative and mixed studies conducted for inclusive education, and various statistical methods are used in quantitative predictive analysis.

In this study, different aspects of scientific research on inclusive education were attempted to be examined in Turkey. It is thought that the findings can provide a perspective to researchers for future studies. According to the results obtained, the following recommendations can be made:

- Considering that the scientific research on inclusive education in Turkey is not sufficient, it can be suggested that more postgraduate thesis studies and scientific articles can be carried out on the subject.

- It can be recommended that all fields of education connected to the field of education at universities need to do postgraduate thesis studies on the subject in order to create shared knowledge about inclusive education in the national literature.

- Considering the developments on inclusive education, it is recommended to examine the following issues: the educational needs of children at risk, access to education, and integration of children at risk, peer teaching in inclusive education; cooperative learning in inclusive education; and developing a training program on the basis of inclusive education.

- Considering the gap in the national literature on the subject, it can be suggested to carry out research that will be designed by the experimental method and action research design.

- Considering the studies on the subject, it can be suggested that the sample groups to be selected in future studies should be students, families, and other stakeholders in education.

Ethic

I declare that the research was conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Author Contributions

This article was written with the joint contributions of two authors.

Conflict of Interest

The authors declare that they have no conflict of interest.

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EFL Students' Language Needs Assessment in General English Classes

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Abstract

Undoubtedly English language has become a universal language and mastering it has become a norm and a must for all students who will embark on the labor market after graduation. Therefore, a lot of students resort to language centers to learn English language in Turkey. However, students' language needs ought to be determined to ensure the students' utmost language development. This research aims to determine students' language needs within the four macro skills (reading, listening, speaking, and writing). A quantitative descriptive approach was used to determine the students' required skills to learn and become proficient in English Language. A survey was conducted at Akin Dil language centers in Konya city in Turkey. 101 questionnaires were distributed, and 97 were considered eligible for the research. Data were analyzed through SPSS and the results showed that there is an extensive gap between the current students' language level and the level they want to achieve.

Key Words

English Language Learning • Needs Assessment • EFL

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According to Aydoğan & Akbarov (2014), Language educators have referred to reading, writing, listening, and speaking as "macro-skills" of language. On the other hand, spelling, vocabulary, grammar, and pronunciation are language's "micro-skills" whereas, language's four essential elements, i.e., micro-skills are related to each other by two elements; communication's mode (either written or oral) and the direction of communication (either receiving or producing a message). Listening comprehension is a receptive skill within the oral mode. Reading is also a receptive language but within the written mode where it can develop independently of speaking and listening skills but very often advances along with them. On the other hand, both writing and speaking are productive skills. Speaking is a productive skill in the oral mode where it is more difficult than just pronouncing words. Writing is also a productive skill but in the written mode and sometimes perceived to be one of the hardest skills since it does not only involve language itself but also the development of ideas and a sequenced structure of thoughts.

According to Astik (1999) a needs assessment must be regarded as a crucial aspect of any English language curriculum design or development. Needs assessment does not only involve the students but also all the elements involved in the teaching-learning process. Needs analysis in language teaching can be performed to attain many purposes whereas it is performed to identify which language skills learners need to acquire in order to perform specific roles, to determine if an existing course or program appropriately addresses the students' needs, to pinpoint the gap between what the students are able to do and what they need to be able to do, and finally to compile information about the problems that are being experienced (Richards, 1998).

English as a Foreign Language in Turkey

A Brief View

According to Köksal, language determines the identity and personality of a person and ensures the socialization of the individual. Language has a great effect on the increase of intellectual creativity. A transparent thought is provided with transparent language (Köksal & Ulum, 2018). The first language learned is called the mother tongue or the first language, and the languages learned after that are called foreign languages. For a person living in a bilingual or multilingual socio-cultural environment (for example, a Turkish child in Germany), the language acquired after or together with his/her mother tongue is called a second language. Second language acquisition is perceived as a social-psychological necessity while learning a foreign language is perceived as a cultural and professional necessity (Demircan, 1990). In many areas of life, people need to learn the common languages spoken in the international environment so that they can establish and use all kinds of relationships. If a nation demands to learn a foreign language, it means that it sees that language as a superior language of science and culture (Özdemir, 2006). Today, when foreign language education in Turkey is mentioned, the teaching of English, German and French languages come to mind first among the Western languages. Among these languages, the most learned language is English (Özdemir, 2006).

The Turkish education system adopts the principle of teaching a foreign language to every student. This principle could not give the expected result due to the increase in the number of students after 1960 and the insufficient number of schools opened. In other words, the quality of teaching has decreased in increasingly crowded

classrooms. The number of private schools and private tutoring schools opened in response to this has gradually increased. As a result of these developments, three different regulations have emerged in terms of foreign language teaching. 1. In public schools, 3-5 hours of foreign language teaching and learning in secondary education and 4-6 hours in higher education have been made compulsory, and a 'foreign language branch in high schools has been established. 2. In private secondary education institutions, 8-10 hours of 'predominantly' foreign language teaching per week, and 20-25 hours of 'preparatory' education in the first year in higher education institutions have started to be implemented. 3. In the Middle East Technical University, Boğaziçi University, and other [some] universities [all of the education], and some departments of some universities, one-third of the education has started to be taught in English (Demircan, 1988).

According to Sezer (1992), the reason why English teaching is given importance in Turkey can be explained by Turkey's desire to develop in the economic and technological field; Turkey, which has intensified cultural, economic, and technological relations with other countries, has to maintain these relations in English. Because of this necessity, teaching English has become a mobilization in Turkey.

General Lines of Foreign Language Education and Foreign Language Education Program in the Turkish Education System

With the 'eight-year education reform' that entered into force in 1997, primary schools with a five-year education period were transformed into primary education institutions and the duration of compulsory education was increased to eight years. According to this, the first level of primary education, which is carried out by public and private schools, is 1-4. grade students (7-11 years old), the second grade, 6-8. grade students (12-15 years old). High school education, which lasts for three years, starts after the 8th grade and is provided by general high school education or vocational education within a dual system that includes both school and workshop. As it is known, pre-school education, primary education, and high school education in the Turkish education system are carried out within the framework of the principles determined by the Ministry of National Education (Haznedar, 2004).

Foreign language teaching starts in the 4th grade and continues until the 11th grade. However, it is worth emphasizing that, unlike in public schools, foreign language teaching can start in the pre-school period in some private schools. In recent years, some private schools have included one of the languages such as French or German as a second foreign language in their education programs. After this short introduction to foreign language education in the Turkish education system, in this section, the main features of the foreign language teaching program, which was put into practice with the "Eight-year continuous education reform" in 1997 and is still in effect, will be examined. In this framework, the Primary School Foreign Language (English) Curriculum for the 4th and 5th grades, approved by the Ministry of National Education Board of Education and Discipline on 17.09.1997, will be evaluated within the framework of second language acquisition in literature (Haznedar, 2004).

Needs Assessment

Definitions

According to Kılıç et al (2019), a needs assessment is the process of revealing the needs that are felt to lack within a program or a course of study. During the assessment process, a need is identified by determining the difference between the current position and the one desired to happen in the future. Identifying needs when considering a method can be seen as a tool to support consensus on a subject, a tool used to determine how effective the application is, and the process of measuring gaps and inadequacies. It is very important to compare the existing situation with the desired situation, to identify the problem(s), to determine the behaviors that contribute to the existing situation and which behaviors and mechanisms should be changed to reveal the desired situation, to advance the solution methods, and to follow the processes of getting support for the activity to be done.

Royse et al. (2009) define need assessment as a method used to predict deficiencies, an effort to reveal the need, and a study to identify gaps and inadequacies. For this purpose, some actions have to be performed. First of all, the purpose and respective fields should be decided. Also, the basis on which needs are going to be determined should be identified as well. Afterward, appropriate planning, determination of the target audience, data collection and analysis, ordering of needs according to their degree of priority, comparison, time and financial evaluation, and reporting phase are followed. These studies can be sustained by one individual (Gupta, 2011).

According to Matusky (2018), a needs assessment identifies gaps that already exist between a current and future situation. The purpose of the assessment is to help the user identify which gaps exist and which need immediate attention. The prioritization of gaps is often done through a framework that focuses on several different factors, including the organization's mission, vision, and goals. On the other hand, a needs analysis is used to analyze the gaps discovered through a needs assessment. Needs analysis can be thought of as a root cause analysis for gaps. The analysis will provide the "who", "what", "where", "when" and "why" information for these gaps. It also enables training programmers to prioritize needs, thus completing the first phase of structured and well-founded program development. In short, needs analysis and needs assessment to complement each other and serve each other's purposes. Needs assessment is the study of identifying gaps in an education system, curriculum, or program while a needs analysis is the process of organizing these needs in a hierarchical order to serve the strategic and educational goals of the institution.

Needs Assessment Aim

Needs assessment does not only reveal the shortcomings of students but it also reveals the achievements by focusing on revealing the current situation of the students. Needs assessment is a continuous process throughout the curriculum. The results of the needs assessment have a great impact on the teaching practices of a curriculum. While the needs assessment process is carried out at the beginning of the program to determine what is in the content of the course, during the implementation of the program, needs assessment can be done to understand whether the demands of the students and this program are met and whether there is a need for a revision of the program. Due to the various

characteristics of individuals and groups, determining needs is a necessity in terms of both individuals and institutions in the field of education in terms of revealing the characteristics that will be gained by the individual and improving this process (Matusky, 2018).

Benefits of Needs Assessment

A needs assessment can be a systematic process that guides decision-making. This process does not only provide a step-by-step guide, but it also provides a set of key procedures that an organization can reflect upon, customize, and continually improve to enrich its decisions. In addition, needs identification can justify before decisions are made. Needs assessment proactively identifies (a) performance data that identifies the organization's needs, (b) needs prioritization, (c) performance criteria to evaluate potential interventions, and (d) information needed to justify the selection of one or take further action to improve performance. All in all needs assessment can provide a systematic perspective for decision-makers (Watkins et al., 2012).

Needs Assessment Models

Needs assessment models help professionals address and determine performance gaps in institutions and organizations. Below is a number of needs assessment models, however Hauer and Quill model was chosen since the main aim of this research is to determine, anaylze and prioritize students' language needs.

Altschuld Model

Altschuld (2010) identified three main phases of large-scale needs assessment studies i.e.; Preliminary examination, examination, and final examination. Planning, data collection, analysis, and evaluation processes are carried out by integrating these stages.

Hauer and Quill Model

Hauer and Quill listed several steps in order to carry a needs assesssment. First, the purpose, stakeholders, scope and resources need to be identified. Then data have to be collected, analyzed and prioritized (Kılıç et al., 2019).

Kaufman and Harsh Models

Kaufman and Harsh (1969) stated that at least three specific models can be defined for determining the need for an educational institution. They named them Type 1, Type D, and Type C. These models are again an approach to identifying their needs; It was created according to the deductive approach, the inductive approach, and the classical approach.

Kaufman and English System Process Model

The systems approach is an approach that consists of successive steps, evaluates each step, and moves on to the next step accordingly. There are two basic measures of the system approach model. These; Identifying and solving the problem. The first two steps of the model are only about uncovering and explaining the current situation, while

the other steps are about taking action and evaluating. In other words, the first two actions are to determine "what" and "how". (Kaufman and English, 1979).

Needs Analysis Process

Program development is a continuous, systematic, and cyclical process. This cycle begins with revealing needs and requirements. A new program is designed or an existing program is revised based on the information obtained as a result of the needs assessment. Then, the designed program is put into practice and the continuity and development of the program is ensured by evaluating the strength and effectiveness of the implemented program, as well as its weaknesses and shortcomings (Kılıç et al., 2019).

Needs Analysis Tools

Questionnaires, Delphi technique, focus groups, interviews, DACUM, tests, observations, and document analysis are among the needs analysis tools. However, only questionnaires will be discussed since it is the solely used tool to complete this research.

Questionnaires

A questionnaire is a data collection tool widely used in academic studies. The purpose of advancing the survey; Collecting the correct information from the respondents, putting forward a logical structure to understand the questions asked, building a standard system in which the answers can be recorded, and facilitate data entry and analysis through coding. Using the questionnaire, a structured set of questions is asked to the people, and information is obtained from the people on various subjects such as demographic information and knowledge levels. There are two types of questionnaires, depending on the type of question used. These are open-ended questionnaires and closed-ended questionnaires. There are studies in the literature that reveal that open-ended questionnaires are interview forms. Descriptive analysis methods can be used to analyze the content while using open-ended questions. In closed-ended question analysis, descriptive statistics such as the standard deviation of the mode, median and arithmetic mean can be made (Adıgüzel, 2016).

Rationale and Purpose of the Study

Although Turkish students start learning English from an early age, they still suffer from several grammatical, linguistic, and comprehension problems for years. As a result, a dilemma has been created between themselves and English language. Students want to learn this foreign language because they realize its importance nevertheless, they still feel bound and insecure when endeavoring to learn English language for they lack some language basics. Starting from this point, a language needs analysis is the first thing that should be done to determine the students' language needs before developing or changing a certain curriculum or teaching strategy, or before commencing a new language project or policy. Even though several research concerning this topic was made, this research tries to focus directly on the source of the problem which is the gap between the current students' language status and the status they want to achieve in the future, thereby this research aims to determine the students' language needs in four

skills, reading, listening, writing and speaking to help to ensure the students' language development. Therefore, the purpose of this research is to answer the following questions:

1- What are the English language needs of students in General English classes concerning writing, speaking, listening, and reading?

2- What gaps are present between the students' language program and their own language needs?

Method

Research Design

A descriptive method of quantitative approach was utilized for the implementation of this study. The purpose of doing so is to provide an understanding, analyze and prioritize the English language needs of General English students at Turkish language centers. However, since needs assessment models are comprehensive and since curriculum objectives are profoundly significant, for they establish the roadmap to a sound curriculum, it was decided to perform a needs analysis on the English language objectives in General English classes.

Research Sample/Study Group/Participants

Population: Students studying English language at English language centers in Turkey.

Sample: 101 male and female students whose ages range from 15 and 45 years old studying General English within its 4 levels, from A1 till B2 at Akın Dil Language Centers in Konya/Turkey. The participants are university or high school students, or students who have graduated before but want to improve themselves professionally. They learn English to improve themselves, to be able to travel abroad, or because they need it to improve their career. Participants learn English 10 hours per week for the duration of 2.5 months. By succeeding in the course of study they get to enroll in the next level.

Research Instruments and Processes

Questionnaire: Onhe hundred one questionnaires were distributed where only 97 questionnaires (n=97) were fully completed and therefore considered eligible for the research. Four questionnaires were not fully answered by students as some items were left out without answering and therefore deemed ineligible for the research. The survey was a part of a study conducted in a Catholic HEI in Calamba, Laguna and Mandaluyong, NCR (Briana et al., 2019). The questionnaire was presented to the opinion of an expert in educational sciences and quantitative research, Further, the questionnaire was translated to Turkish since the students are still in the process of learning English and haven't mastered it yet. Also, the questionnaire was subjected to a language assessment by two experts. The survey consists of two parts. The first part gathers general information from the respondents about their gender, education level, age, and the reason for studying English. The second part is a Likert scale rating of several sub-skill under each macro-skill of English. The respondents are required to provide two responses for each item. If a student were to answer the survey, first they will have to rate how much the skill is needed in their studies and second how much

they think the skill is needed in their university education or career later on. The questionnaire aimed to examine the students' language needs in each language skill i.e. reading, listening, speaking, and writing. After obtaining approval from the Akın Dil language center administration, the survey was distributed amongst the students in its two branches in Zafer and Yazır regions in A1, A2, B1, and B2 General English classes.

Data Analysis

Spss v.25 was used to analyze the questionnaire results. In order to measure the internal consistency and the reliability of the scores, Cronbach Alpha test was administered and the result was 0.95 which means that the questionnaire was reliable. Upon analyzing the data from the questionnaire, the mean of each response was calculated. Also, since 4 items are used, the following formula is used to calculate the data range. Range = (number of items – 1) divided by the item's number. In order to get a general view of the macro-skills, the mean of each macro-skill was computed twice, once for the current objectives and one for the target goal objectives. The scale in table 1 was used to interpret the mean responses. Besides, each item under each macro-skill was ranked based on the mean in order to identify which skills are the most important.

Table 1

Depicts the Mean Interpretation Guide That was Conducted Through the Questionnaire

Scale	Mean Range	Interpretation
4	3.25 – 4	Very Good
3	2.5 – 3.25	Good
2	1.75 – 2.5	Not Good
1	1 – 1.75	Not Sure

Findings

As mentioned before, the study aims to determine the students' English language needs within General English classes in Turkey. Under each macro-skill, the mean was calculated for each subskill. According to the mean results, the subskills were given a number and arranged in order. They were also given the importance worth based on the mean interpretation guide above.

Table 2

Questionnaire Results for the Listening Skill and Its Subsequent Subskills

Students' Level	SD	Mean	Listening Subskills	Ranking
Good	.80	3.01	Listening to lectures/ lessons	1
Good	.83	2.91	Understanding the language of daily life dialogues	2
Good	.85	2.72	Understanding verbal instructions	3
Good	.99	2.61	Taking notes	4
Good	.80	2.53	Listening to small group discussions	5
Not Good	.91	2.29	Retelling the main parts of dialogue, speech, or lesson	6
Not Good	.84	2.28	Understanding long verbal explanations	7
Not Good	.86	2.20	Listening to large group discussions or discussions	8
Not Good	.80	2.18	Extracting the main and sub-ideas in a dialogue	9
Not Good	.77	1.93	Understanding academic language	10

As can be seen, students perceive themselves as "good" in only 5 skills out of 10. This means that they have not acquired the necessary skills to achieve proficiency in listening.

Table 3

Questionnaire Results for the Reading Skill and Its Subsequent Subskills

Students' Level	SD	Mean	Reading Subskills	Ranking
Good	.83	2.73	Slowly reading a text to understand the details of the text	1
Good	.81	2.58	Understanding the main point of the text	2
Good	.85	2.50	Determining the meaning of unknown words in a text	3
Not Good	1.00	2.46	Quickly looking at a text to find specific information	4
Not Good	.77	2.45	Summarizing important information	5
Not Good	.89	2.36	Interpret charts, graphics, pictures…etc.	6
Not Good	.85	2.30	Quickly reading a text to form a general idea of the content	7
Not Good	.78	2.26	Understanding text organization	8
Not Good	.87	2.26	Reading fast	9
Not Good	.83	2.15	Determining and explaining the formal features	10
Not Good	.89	2.07	Understanding an author's attitude	11

Not Good	.77	1.86	Understanding the specialist dictionary in a text	12
Not Good	.87	1.83	Reading critically	13
Not Good	.78	1.81	Reading from the author's point of view	14

As can be seen, students perceive themselves as "good" in only 3 skills out of 14. This means that they still need to acquire the necessary skills to achieve proficiency in reading.

Table 4

Questionnaire Results for the Writing Skill and Its Subsequent Subskills

Students' Level	**SD**	**Mean**	**Writing Subskills**	**Ranking**
Not Good	.96	2.49	Lesson note-taking	1
Not Good	.94	2.47	Expressing what you want to say clearly	2
Not Good	.84	2.46	Expressing ideas correctly	3
Not Good	.92	2.37	Writing the introduction and results	4
Not Good	.90	2.36	Evaluate and review your article	5
Not Good	.95	2.31	Adopting the appropriate style and style	6
Not Good	.89	2.31	Developing ideas	7
Not Good	.83	2.30	Summarizing factual information	8
Not Good	.84	2.26	Using correct punctuation and spelling	9
Not Good	798	2.26	Interpreting the texts	10
Not Good	.83	2.21	Creating consistent arguments	11
Not Good	.83	2.19	Using a variety of grammatical structures and extensive vocabulary	12
Not Good	.82	2.17	Composition writing	13
Not Good	.84	2.05	Editing paragraphs	14
Not Good	.90	2.04	Explaining objects or procedures	15
Not Good	.93	1.93	Creative Writing	16
Not Good	.80	1.78	Critical writing (analysis and evaluation information)	17

As can be seen, students perceive themselves as "not good" in all of the writing skills. This means that the students did not acquire any of the writing skills which is an alarming issue.

Table 5

Questionnaire Results for the Speaking Skill and Its Subsequent Subskills

Students' Level	SD	Mean	Speaking Subskills	Ranking
Not Good	.86	2.31	Pronouncing words correctly	1
Not Good	1.26	2.30	Use English fluently (for example, in the right situation, appropriately with other people)	2
Not Good	.86	2.28	Communicate effectively with peers in small group discussions, joint projects, or out-of-class study groups	3
Not Good	.97	2.27	Communicate effectively with peers in small group discussions and collaborative projects	4
Not Good	.85	2.25	Asking for explanation	5
Not Good	.79	2.18	Participate in discussions	6
Not Good	.86	2.16	Pronounce words, phrases and sentences with correct intonation and stress patterns	7
Not Good	.72	2.03	Communicate effectively with your superiors	8
Not Good	.85	2.03	Creating consistent arguments	9
Not Good	.77	2.02	Explaining objects or procedures	10
Not Good	.79	2.02	Participate in discussions effectively	11
Not Good	.86	1.90	Making official speeches/presentations	12
Not Good	.79	1.89	Making an oral presentation	13
Not Good	.87	1.86	Speaking in public	14
Not Good	.82	1.82	Participating in interviews (eg job interviews, scholarships, etc.)	15
Not Good	.84	1.81	Attending meetings	16

As can be seen, students perceive themselves as "not good" in all of the speaking skills. This means that the students did not acquire any of the speaking skills which is an another alarming issue.

Table 6.

The Overall Mean and İts İnterpretation

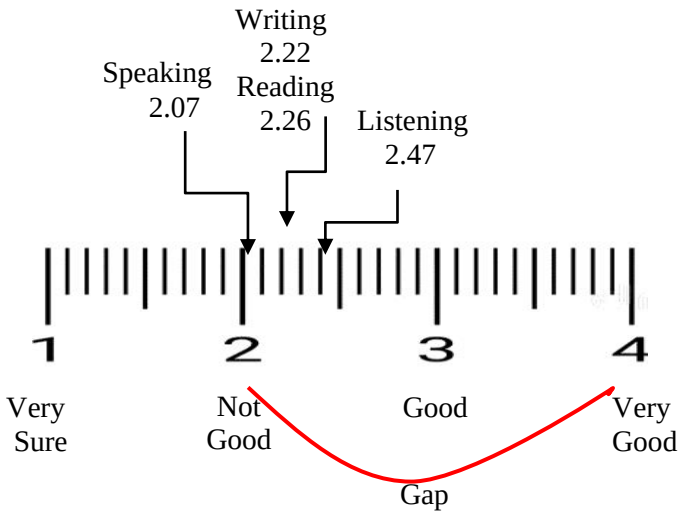
Importance Rank	Macro-skills	Overall Mean of the students' present status	Interpretation
1	Listening	2.47	Not Good
2	Reading	2.26	Not Good
3	Writing	2.22	Not Good
4	Speaking	2.07	Not Good

According to the overall mean of the students' present status and keeping in mind the level that should be achieved, it can be seen that the students' language needs are not met and they are below level in all the skills which is an alarming issue.

According to the questionnaire results, it can be seen that the students suffer a great deal when learning English where the level they have achieved so far is still not satisfactory. Based on the questionnaire, writing and speaking are the most challenging skills to learn for General English students in Turkey. Within the questionnaire, only one relatively high mean was recorded with 3.01 for "listening to lectures/lessons" within the listening macro-skill. Based on the mean interpretation guide, all other results were labeled as "not good" which proves that a greater effort is needed to be exerted on behalf of both teachers and students to achieve success in those subskills. Figure 1 illustrates a summary of the results.

Figure 1

The Students' Overall Mean Score for Every Language Macro-Skill



Discussion, Conclusion & Suggestions

Discussion

Again, the main reason for carrying out this research was to determine the students' language needs; therefore based on the questionnaire results and means interpretation, it can be seen that there is an alarming and extensive gap between the language level they want to achieve and the level they have now. Starting from this point, teachers need to attentively tackle all the subskills with a mean less than 3.25 and not neglect one skill on behalf of the other. Further, based on the overall mean of the macro-skills, it can be told that students are better in listening while speaking and writing had the lowest means which means that they are the most difficult skills for them which support (Aydoğan & Akbarov, 2014) argument that language productive skills are harder than receptive skills. Also, according to (Watkins et al., 2012) the conducted needs assessment can provide a systematic perspective for decision-makers at the institution to improve the process of language teaching and learning.

Conclusion

Generally, students pay great importance to speaking as they want to master it and speak fluently but they encounter several obstacles. Only teaching grammar or vocabulary separately is not enough to learn a language since language should be learned as a whole with all its macro and micro-skills. Also, teaching only speaking is impossible since it is a productive skill which means that there must an input that has to be delivered.

It is wistful to say, based on the questionnaire, that students do not feel that they are on-level when learning English and there is a huge gap between their level and the level they aspire to achieve. Without a doubt, students encounter a lot of hindrances when learning a new language, and identifying their needs is merely one step of a long way that has to be fulfilled by teachers, students, and curriculum writers as well.

Suggesstions

Teaching and learning a language is a gradual process that needs to be firmly monitored to make sure that any mishaps are accurately addressed. General English courses must have a clear set of objectives for every language macro-skill. These objectives must be continuously evaluated to cater to the student's and society's new demands. Gaps should be addressed strategically at the proper time and during instruction, importance must be given to all macro-skills with their sub-skills, after all the input made is the output gained. Also, Speaking and writing skills have to be reinforced more in the classroom and they should be given more importance within the course of instruction as students are unable to perform them well. Also, since the overall results of the language need assessment were not satisfactory enough, curriculum elements must be examined to determine the latent flaws in the curriculum. Through addressing these flaws and evaluating all the elements, curriculum development can be accomplished.

As mentioned before, needs assessment is the cornerstone of curriculum development and in light of the research findings, language needs analysis on the students' level has been made. However, more research can be conducted and different needs assessment tools can be used to determine the teachers' points of view toward the curriculum that should be taught to achieve better results. Also, a needs assessment targeting the orgnaization's needs can be accomplished as well.

Ethic

I declare that the research was conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Author Contributions

This article was written with the joint contributions of two authors.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Appendix A – Questionnaire

Dear participants, this questionnaire is prepared within the scope of an article application at Necmettin Erbakan University, Institute of Educational Sciences, department of curriculum and instruction. The questionnaire consists of two columns where you are required to answer both sides, left and right. You ought to specify your current language level (left) and the level you aspire to (right). The purpose of this questionnaire is to determine the students' language needs in General English classes in Turkey. Participants in this survey are kept anonymous. Please circle the number that matches what you perceive in both the right and left columns. DO NOT LEAVE ANY ITEMS BLANK. Thank you very much for participating in our research and being a stakeholder in this scientific study.

Part 1: Participants' background information

Gender: ( ) Female
( ) Male

Age: _____

Education level: ( ) preparatory class
( ) BA
( ) Masters
( ) PhD
( ) Other _____

Part 2: Please state the reason why you are studying English _____

Part 3: Please choose a number from 1 to 4 that best suits your perception. The table below shows the meaning of each number

Your current language skill				**Reading Subskills**	**The level you want to achieve**			
1	2	3	4	1- Understanding the main idea of the text	1	2	3	4
1	2	3	4	2- Quickly reading a text to form a general idea of the content	1	2	3	4
1	2	3	4	3- Slowly read a text to understand its details	1	2	3	4
1	2	3	4	4- Skimming a text to find specific information	1	2	3	4
1	2	3	4	5- Determining the meaning of unknown words in a text	1	2	3	4
1	2	3	4	6- Understanding text organization	1	2	3	4
1	2	3	4	7- Understanding the specialist dictionary in a text	1	2	3	4
1	2	3	4	8- Understanding the author's attitude	1	2	3	4
1	2	3	4	9- Summarizing important information	1	2	3	4
1	2	3	4	10- Reading fast	1	2	3	4
1	2	3	4	11- Reading critically	1	2	3	4
1	2	3	4	12- Reading for the author's point of view	1	2	3	4

1	2	3	4	13- Determining and explaining the formal features of a text	1	2	3	4
1	2	3	4	14- Interpreting charts, graphics, pictures…etc	1	2	3	4

Your current language skill				**Listening Subskills**	**The level you want to achieve**			
1	2	3	4	1- Listening to small group discussions	1	2	3	4
1	2	3	4	2- Listening to the lectures	1	2	3	4
1	2	3	4	3- Listening to large group discussions or discussions	1	2	3	4
1	2	3	4	4- Taking notes	1	2	3	4
1	2	3	4	5- Understanding long verbal explanations	1	2	3	4
1	2	3	4	6- Understanding verbal ins tructions	1	2	3	4
1	2	3	4	7- Understanding the language of daily life dialogues	1	2	3	4
1	2	3	4	8- Understanding academic language	1	2	3	4
1	2	3	4	9- Extracting the main and sub-ideas in a dialogue	1	2	3	4
1	2	3	4	10- Retelling the main parts of a dialogue, speech or lesson	1	2	3	4

Your current language skill				Writing Subskills	The level you want to achieve			
1	2	3	4	1- Using correct punctuation and spelling	1	2	3	4
1	2	3	4	2- Editing paragraphs	1	2	3	4
1	2	3	4	3- Expressing ideas correctly	1	2	3	4
1	2	3	4	4- Developing ideas	1	2	3	4
1	2	3	4	5- Expressing what you want to say clearly	1	2	3	4
1	2	3	4	6- Adopting the appropriate style	1	2	3	4
1	2	3	4	7- Evaluating and review your article	1	2	3	4
1	2	3	4	8- Interpreting texts	1	2	3	4
1	2	3	4	9- Course taking notes	1	2	3	4
1	2	3	4	10- Composition writing	1	2	3	4
1	2	3	4	11- Creative Writing	1	2	3	4
1	2	3	4	12- Critical writing (analysis and evaluation information)	1	2	3	4
1	2	3	4	13- Explaining objects or procedures	1	2	3	4
1	2	3	4	14- Writing the introduction and results	1	2	3	4
1	2	3	4	15- Creating consistent arguments	1	2	3	4
1	2	3	4	16- Summarizing factual information	1	2	3	4
1	2	3	4	17- Using a variety of grammatical structures and extensive vocabulary	1	2	3	4

Your current language skill				Speaking Subskills	The level you want to achieve			
1	2	3	4	1- Making an oral presentation	1	2	3	4
1	2	3	4	2- Pronouncing words correctly	1	2	3	4
1	2	3	4	3- Asking for explanation	1	2	3	4
1	2	3	4	4- Making official speeches / presentations	1	2	3	4
1	2	3	4	5- Participating in discussions effectively	1	2	3	4
1	2	3	4	6- Communicating effectively with peers in small group discussions, joint projects, or out-of-class study groups	1	2	3	4
1	2	3	4	7- Explaining objects or procedures	1	2	3	4
1	2	3	4	8- Creating consistent arguments	1	2	3	4
1	2	3	4	9- Pronouncing words, phrases and sentences with correct intonation and stress patterns	1	2	3	4
1	2	3	4	10- Participating in discussions	1	2	3	4
1	2	3	4	11- Communicating effectively with your superiors	1	2	3	4
1	2	3	4	12- Attending meetings	1	2	3	4
1	2	3	4	13- Speaking in public	1	2	3	4
1	2	3	4	14- Communicating effectively with peers in small group discussions and collaborative projects	1	2	3	4
1	2	3	4	15- Participating in interviews (eg job interviews, scholarships, etc.)	1	2	3	4
1	2	3	4	16- Use English fluently (for example, in the right situation, appropriately with other people)	1	2	3	4

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The Relationship Between Modern Art and Children's Painting in The Context of The New Visual Perception Theory

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Abstract

Art has been the only shelter for artists against the alienation that came with Modernism, which covers a hundred-year period between 1860-1960. In modern art, instead of classical art rules, it is seen that the surface, form and color are given importance in painting with the desire to reach the new, and basic forms gain value in line with the desire to reach the essence. However, children's pictures have broken these rules as an innate feature. However, children's pictures have broken these rules as an innate feature. Recognizing that children paint objects as they perceive, not as a representational reality, and that they follow a very original way while doing this, caused children's paintings to be a source for modern art. Along with modern art, Manet deferred form by chasing light in the open air, and did not refrain from deforming Cezanne forms with the help of geometric forms. The forms used in modern art, where the depth is reduced to two dimensions on the surface, are no longer imitating nature. For painters who chose the path of conveying their spiritual experiences and pure emotional intensities by moving away from the reality of the world seen in modern art, children's paintings included a unique and rich visual language that took them to a metaphysical universe. The aim of this research is to emphasize the effect of children's painting on modern art by revealing similarities between children's paintings and the works of artists such as Gris, Kandinsky, Klee, Cezanne and Chirico, who are among the important names of Modern Art.

Key Words

Art education • Children's paintings • Cubism • Modern art • Visual perception

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Introduction

The period when the aesthetic aspect of children's paintings was realized is the second half of the 19th century. “19. At the end of the 19th century, the aim of art education shifts from the service of industry to the development of one's aesthetic judgment. (Kırışoğlu, 2005, p. 17). Before this understanding, the period when psychologists, as well as pedagogues, art critics, aestheticians and art historians, started to be interested in children's drawings was the end of the 19th century. Toomela (2002) states that children's drawings are closely related to their psycho-motor development, imagination, memory and perception capacities. As it can be understood from these statements about children's painting, when it was understood that the drawings made were almost a mirror of the child's inner world, they entered the field of psychology and many psychologists began to conduct research on children's drawings. We see the early 20th century as the period when the development of the child began to be considered as a whole, and the experience in education gained importance for the individual to learn by doing and living. On the other hand, ignoring the fact that children's paintings can have an artistic and aesthetic dimension, it is seen that the paintings made by children are only considered as a mirror of the child's mind.

Between the years of 1860-1960, when modern art was seen, artists took the place of psychologists who focused on the child's understanding of painting his own world and were not interested in its aesthetic aspect. The most important reason for this is that the artist, who moved away from the understanding of imitating nature with the influence of modern arts, tried to find different sources for himself with the changing aesthetic taste. “The main sources that avant-garde artists turned to for this purpose were the art of primitive cultures and children with similar characteristics such as simplicity and sincerity, and they began to use them in their own works”. (Cited from Aman 1990, İşler, 2004, p. 55).

Apart from art educators, psychologists who were interested in children's drawings were interested in the developmental language system of children's drawings with symbolic values rather than artistic aspects. “Many important qualities peculiar to children's art such as originality, intensity of emotion, directness, saving of expression, symbolic expression, and liveliness have been ignored. However, these qualities specific to children's art and primitive art overlap with the logic of an artist in modern understanding of seeing and expressing the world at many points” (İşler, 2004, p.55).

With this understanding that started to change in the 20th century, children's painting began to be considered as an artistic expression. Especially the new modernist views in the art movements supported this view. As a result, it has begun to be noticed that children's painting has an artistic aspect. Regarding this situation, Aytaç stated that "in the painting class, instead of the mechanical ornamentation practices and model copies of the old, an art lesson based on life was given, and with the influence of contemporary art movements (such as expressionism), it was given importance to the child's expressionist painting". (Aytac, 2006, p.20).

It is often claimed that children are talented artists because they have a natural talent for free, spontaneous and creative features in their work. With the 20th century, many artists became interested in children's paintings. “Among these, it is seen that many modernist artists such as Marc Chagall, Juan Gris, Wassily Kandinsky, Joan Miró,

Dubuffet, Pablo Picasso and Paul Klee collect children's paintings and use their unique images and forms in their own works" (Kümmerling-Meibauer, 2013, p. 15).

Modern Art and Children's Painting

Modern art has made art free by leaving the known classical measures and the necessity of fulfilling the rules, and as a result, the artist has the chance to reflect his individual worldview and inner world. "Now, the artist was not subject to the visible objects in nature, to the conditions of a subject, a description, a story, but to the characteristics of painting, the artistic qualities of creation and the conditions of plastic form" (Şahindokuyucu, 1997, p. 4).

The modern artist has chosen to reinterpret the objects around him within the framework of his inner world and views by analyzing them. While examining the nature of the artist, observation in parallel with modern science was replaced by theoretical thought, and concepts were handled with the influence of theoretical thought, leading to abstraction in modern art. While the artist was repainting the objects and colors he saw in nature by subjecting them to deformations and transpositions in line with his inner world, they were plastically transformed into different forms and brought into a much different state than they actually were.

"Impressionists and expressionists stated that the works reflect changing behaviors, and in this sense, the realist form and color of things, based on expressionism, were now emotionally distorted, and the Renaissance perspective disappeared. It was emphasized that personal views and perceptions now come to the fore, and that what is presented to the art audience is the artist's feelings" (Denvir, 1989, p. 109).

In the period when these developments in art were experienced, it is seen that children's paintings in Germany started to be reproduced alongside the paintings of European avant-garde artists in Der Blaue Reiter, founded by Wassily Kandinsky and Franz Marc.

It should be underlined here that the urge to collect drawings made by children probably arose with Kandinsky at the beginning of this century. In later years Gabriele Münter joined him. It is no longer clear exactly when this common collection began. But the children's drawings that have survived to the present day date back to the years 1905-1906 to 1914. Münter's interest in drawings made by children continued even after he parted ways with Kandinsky (Strauss, 2007). For the artists, these drawings were like a treasure trove of images created by the rich imagination of children.

Inspired by these rich visual treasures, the Blaue Reiter group, which includes artists such as August Macke and Klee, was founded in 1911 and represented the pinnacle of German Expressionism. The works produced as a result of these inspirations were included in the Futurist Exhibition in Milan, Italy in 1911, where children's drawings were also included (Fineberg, 1997).

Herman von Helmholtz and the New Theory of Visual Perception

Paintings made contrary to perspective drawing in modern art appear as the most important similarity between children's drawings and the works of avant-garde artists. Towards the end of the 19th century, Cézanne started to use drawing systems close to parallel systems instead of perspective. Many painters, especially the Cubists, gave up

perspective in their works. One of the reasons for this can be explained by the new theory of visual perception developed by psychologist Herman von Helmholtz in the mid-19th century. It led to the development of vision theories and perspective based on the optical laws of the Renaissance. However, Helmholtz tried to explain the term vision by emphasizing not only the images that light reflects on the retina, but also how these images are processed by the human visual system. This term, which Helmotz calls psychological optic vision, is the opposite of physiological optics. This theory of the visual process was the precursor to the theory of vision developed by Marr (1982).

"Helmholtz is an empiricist; he argues that science and perception are gained through experience and not innate. Depth perception is achieved through axioms of geometry and experiences, contrary to what Descartes and Kant think. These are learned between events consists of relationships. Of course, the importance of such an empiricist attitude in terms of experimental psychology cannot be disputed" (Karakaş & Bekçi, 2003, p. 252).

Another contribution of Helmholtz to experimental psychology is the theory of perception. According to Helmholtz, experiences related to objects and events in the external world do not only include sensory patterns caused by stimuli. At the basis of these experiences are the images, that is, the ideas, created by previous impressions. Thus, what is perceived at a given moment; Along with stimuli in the current state, past experiences and related images or ideas are determined. It would not be wrong to say that these views of Helmholtz are also the basis of the perception explanation accepted today. Helmholtz's explanation of the sense of sight and color perception, called the Young-Helmholtz theory, which combines physics, physiology and psychology; on hearing, there is the theory of 'resonance', which is still valid today (Boring, 1950, p. 76; Christman, 1971, 99).

Helmholtz's empiricist side and his explanations on perception are united in another view, the "doctrine of unconscious inference". According to this doctrine, our perceptions are based on inferences derived from experience as well as current sensation. These predictions are made so often that they eventually become a mental habit and appear unconsciously. The inferential feature of unconscious signification is most clearly seen in illusions. As the train tracks move away from the observer, their image on the retina turns into a line. However, the person does not perceive the situation as two rails merging into one. Likewise, objects that are not actually moving in a movie are perceived as moving. Both examples are based on subconscious interpretation of stimuli in line with past experiences (Karakaş & Bekçi, 2003, p. 252).

Teuber expresses the effect of Helmholtz's vision theory on Cézanne and the Cubists as follows: In Georges Braque's early Cubist work "In Houses at L'Estaque", trees are depicted in basic cylindrical shapes (Image 1-a) (Teuber , 1980 cited in Williats, 2005, p. 196). These ideas were also supported by Cézanne in France. In Georges Braque's work "In Houses at L'Estaque", which belongs to early Cubism, trees are depicted in basic cubic prism shapes. Helmholtz, in his book physical optics, stated that we see an optical illusion or perspective transformation of every object rather than a retinal image. In all perspective views, we see the amazing shapes found in nature in cube, sphere and cylinder forms without illusions. This can be explained by Helmholtz's doctrine of "subconscious interpretation"

Image 1. (a) Georges Braque, "In Houses at L'Estaque" 59 x 72.5 cm , Oil on Canvas, 1908, (Golomb, 1992).

(b) The subject of the painting In Houses at L'Estaque. Photograph of the house in L'Estaque, located in Marseille, France.

Helmholtz's doctrine of subconscious interpretation also explains the perception of the images formed on the retina with an object-centered description, the first function of the human visual system. As seen in Figure 1, the shapes of the surfaces of the objects are distorted in perspective images. Alternatively, it is possible to represent these surfaces as real shapes, and this is the system adopted by many of the Cubist painters. It is noteworthy that this is also an application used by many children. Images 2 and 3 below show pictures of Georges Braque and a nine-year-old girl. In both pictures, the edges of the houses are drawn as real shapes as possible.

Image 2. Georges Braque, *L'Estaque: Viaduct and Houses* (detail), 1908, Oil on canvas, 72.5 cm × 59 cm, (Golomb, 1992).

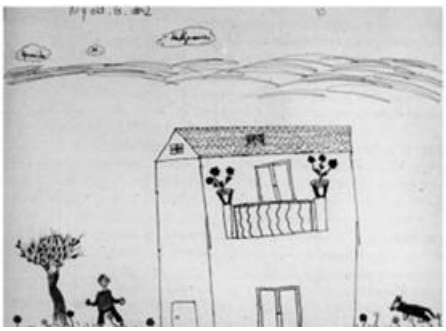


Image 3. Drawing of a nine-year-old girl. Golomb, C. (1992).

Cubism and Children's Paintings

Horizontal and vertically inclined projections were widely used in Early Cubist paintings. Cézanne used these systems in his work "Still Life in Front of a Dresser" (Image 4). The table in the foreground of the painting is in close approximation to the vertical inclined projection, and in front of the dresser behind it is depicted in the horizontal inclined projection.

Image 4. Cézanne "Still Life in Front of the Dresser", 1887-1888, 79.9 x 3.8 cm, TÜYB, Harvard Art Museum. Janson, H. W., & Janson, A. F. (1997).

The majority of later Cubist paintings were still life painting rather than landscape, and the system most commonly used in these paintings was vertical inclined projection. In many of these paintings, besides the objects shown on the table, the faces of these objects and the top and front of the table are usually shown in their real shapes.

As children's paintings affected the art understanding of the period, this understanding of art also affected the art education practices of the period. For example, practices similar to Cezanne's understanding of still life started to be used as new methods in art education. In this method, which can be considered as new, it is seen that placing the objects on the paper statically is replaced by a system based on the child's seeing the differences such as angles and distances between the objects and transferring them to the paper by creating the composition from different angles and plans (Image 5-6).

Image 5. Figure 5. Example of a typical model drawing (old method) A picture of a 12-year-old boy. Macdonald, S. (1970).

Image 6. Figure 6. A group of models (new method) A 15-year-old middle school student. (Tomlinson, 1944: 10, 11). Macdonald, S. (1970).

The similarities between cubist paintings and children's paintings seem to prove that children are avant-garde artists. It is seen that the vertical oblique projection system is used between Picaso's painting "Fruit on the Table and Still Life" dated 1914 and the table drawing of an eleven-year-old child (Image 7-8). In Picasso's painting, objects are depicted by overlapping. For example, the various objects on the fruit plate are depicted in such a way that they can be seen from a certain point of view, regardless of their resemblance to the objects they represent. In the child's drawing, the objects are arranged on the farthest edge of the table and are in the form of a folding box drawing (Image 8).

The outside world is very different for children, and the color, smell, sound, light and students are very different. In terms of the individual's proper evaluation of all these trainings. He is sure that he is in the perception in this direction. Our focus is more on education. Selectivity has an effect on perception and ineffective image. He will learn the distinctive line that will help him distinguish between different educations as well as those for children. In this respect, it does not take into account the interests that are outside or small and starts to take it into consideration. It also learns to be directed in a certain way towards this planning. It may have seemed possible to draw attention to these perceptual state drawings.

Both images contain mixtures of drawing systems. It is noteworthy that while the fruits in Picasso's painting and the radio in the children's painting are depicted as seen from the front, the surfaces of the tables in both paintings are depicted from a straight up view. This feature, which is seen both in children's drawings and in the paintings of avant-garde artists, caused the art educators of the period to claim that children are naturally creative.

Image 7. Pablo Picasso, Fruit on the Table and Still Life, 1914–1915, TUYB, 64 cm × 80 cm. Columbus Museum of Art. Willats, J. (2008).

Figure 8. Table Drawing of an 11-Year-Old Child, (Willats, 2008).

Undoubtedly, there are some similarities in terms of the contradictions seen in Cubist paintings and paintings by children, but these similarities do not mean that all children are avant-garde painters. Describing the basic form or thought of an object has been one of the goals of the Cubists (Marr, 1982). Accordingly, the drawing systems seen in the paintings of Cubist painters and children arise for similar reasons, both deriving almost directly from the object-centered definition. The main reason why children make objects this way in their pictures is their perceptual characteristics. Children cannot perceive and distinguish different situations as a whole. Children in this period see objects as a part of their environment. In this context, the distinctive features of the object cannot be distinguished from other non-significant features. The child in the preschool period first perceives a complex shape as a whole and cannot see the details. After the age of six, he pays attention to details and puts a lot of emphasis on them. Finally, the child turns to the unifying, integrative tendency. After such an event, he perceives the whole, the part, the relations of the parts with each other and the whole part at the same time (Fişek & Yıldırım, 1983). The prerequisite for the development of perception is figure-ground distinction. figure-ground distinction is not just about visuals. It is any consciously perceived pattern of sound, touch, taste, and smell. The basis for the perception of complex sensory material is hidden in the distinction between shape and ground. Another shape in the figure, overlapping shapes, geometric shapes and real shapes is successful when the 4 age group has the ability to distinguish.

According to Cooper and Tinterow (1983, p. 136), “Gris's main purpose in painting is to represent the three-dimensional experience of reality in two dimensions on the canvas surface without resorting to illusion, which is a goal that Braque and Picasso also have”. One way to solve this problem has been to draw the faces of objects as real shapes. This solution seems to be applied to children's drawings as well, but as Costall (2001, p.17) states, the limitation of this approach is that it is "impossible to connect all the parts of an object".

Many of the anomalies seen in children's drawings and Cubist paintings are the result of attempts to solve this problem. However, there are important differences between a child's intentions and those of avant-garde artists. Children aim to achieve realism. Therefore, when children notice anomalies in their own drawings (such as the transparency due to their failure to reflect absorption, their inability to properly combine faces and vertices in their doubled drawings), they try to find new ways of representing these anomalies to avoid. Recognition of these

anomalies and efforts to overcome them provided the driving force behind the development of drawing. On the contrary, avant-garde artists willingly accepted these contradictions and used them deliberately; their purpose is to explore the nature of the depiction, to achieve expressionism and to flatten the painting surface for visual enjoyment (Willats, 2008).

One of the biggest changes that took place in the art of painting in the nineteenth century was that artists saw that the drawing systems used by artists who grew up in different periods and cultures were different from the perspective and expression systems that were not based on light plays. For example, colored woodblock prints produced by the Japanese became widely known in France in the early 1860s with their content far from traditional perspective understanding and tonal models, and the use of uniform areas containing pure colors. These works offered an alternative to the traditions of European painting, and offered a solution for combining color representation with shape representation through tonal models. In addition to these, the invention of photography has brought painters face to face with a dilemma. The mechanical nature of photography guaranteed its authenticity and fitted perfectly with the exploration of perspective, which is the foundation of Western art. But it also left an impression that weakened the painters' position as artists. Moreover, only a few years after the invention of photography, Helmholtz explained his theory of vision, and while it became possible to produce pictures that capture the light coming from the landscape exactly, the validity of these pictures, which record our real experiences within the scope of vision, began to be questioned. All these conditions have shaken existing ideas about the nature of depiction, so most painters have stopped depicting objects in landscapes and have instead started to use the act of painting as a way to explore this act itself (Willats, 1997).

Turning the normal rules upside down in their own minds and seeing what happens as a result has been one way of making this discovery. In the 1950s and 1960s Chomsky (1965, 1972) constructed sentences containing various contradictions such as "colorless green thoughts sleep in anger", thus trying to investigate language rules. On the other hand, Clowes (1971) and Huffman (1971) used pictures of non-existent objects to investigate the rules of painting made using lines without color and shadow in the 1970s. But long ago, avant-garde artists used the anomaly to explore the rules of painting. The first painter to deliberately and regularly perform this action was probably Juan Gris.

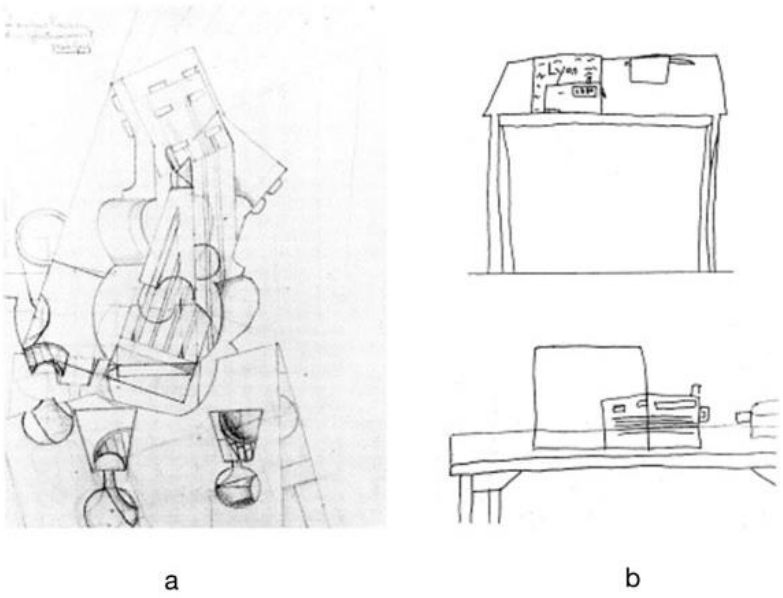


Image 9. (a) Juan Gris, *Gitar*, 1913, Graphite on paper, 65 cm × 50 cm. Willats, J. (2008).

Image 9. (b-top) An 11-year-old child's drawing of objects on the table showing attachments made by incorrect connections, similar to cubist painters (b-bottom) Examples of transparent drawings that violate the rules of stacking objects. Willats, J. (2008).

Figure 9-a shows Gris' work named Guitar (Guitar) drawn in 1913. In this work, the table (or the part of the table we can see) is projected in a vertical and inclined position, while the guitar is projected horizontally and inclined. In other words, the front part of the guitar is shown in its real shape and the sides are added here. The windows, on the other hand, consist of a mixture of a perpendicular (orthogonal) projection and a vertical and inclined projection. In addition to these, there are two types of anomalies in the drawing. At the bottom of the drawing, the frame of a window appears to be attached to the end of another frame on one side, while on the other side it is attached to a line (presumably representing the edge of the shadow of the body of the guitar). The absorption representation is quite difficult to decipher, but there are several outliers. There are many false connections between the rim of the glass on the left and a line representing the foot of the other glass and the edge of the shadow of the guitar. There are many anomalies in this presentation, in which the images are superimposed. The two drawings made by children, shown in Figure 9-b, are also based on a mixture of orthogonal and vertical-tilt presentation.

This situation can be explained by the perceptual object invariance phenomenon for children. It is the child's perception that even if he sees a different version of an object, that object is still himself. Object constancy is studied from two aspects: shape constancy, size and size, shape constancy. In shape constancy, even if people look at a table from any angle, they know that it is a table and perceive it correctly. Children develop and realize this object constancy only as a result of learning. In such a process, the object given to the child realizes the invariance of the object by taking it in his hand and turning it over and looking at it from every angle and discovering it. Another

version is the immutability of size and meaning in object immutability. When adults look at a table from far or near, they know that it is still the same size. But children have trouble with this. He cannot detect the changes in perception by adjusting the images reflected in his eyes from different distances. But as a result of learning, he starts to perceive correctly whether the object approaching and moving away from him is the same or not (Fişek & Yıldırım, 1983).

In both examples, the tables are shown in a vertical-slanting manner (although the top table shows some perspective) while the box and radio are mirrored in an orthogonal fashion. The drawing above contains various unreal connections between the table, the box, the radio and the ceiling. At the bottom of the drawing there is an unreal connection between the lower edges of the box and the radio, and certain transparency can be seen at the far end of the table, which can be seen through the box, radio and pan.

Image 10. Juan Gris, Breakfast (Breakfast), 2014, Paper belt, oil on canvas, 80.9 x 59.7 cm. New York Museum of Modern Art.

In his work, Breakfast (Image 10), which Gris produced a year later, in 1914, a mixture of drawing systems, inversion of normal absorption rules, unreal connection of objects in the picture, unreal bonds between the objects in the picture and the frame , the inversion of the normal rules of atmospheric perspective, the use of real surfaces such as wallpaper, and the use of written expression (Willats, 1997). Apart from the atmospheric perspective that children never use, all such contradictions can be seen in the drawings made by children. Children generally use drawing systems in a mixed manner in their drawings. Some examples of transparency and unreal attachments can be seen in the image. Children do not have any reservations about using text in pictures. For this reason, many of the pictorial anomalies found in the works of Gris and other Cubists can also be seen in the paintings made by children. The difference, however, is that while Cubist painters, especially Gris, deliberately use these anomalies as a way of investigating the nature of the depiction, they occur by chance in children's drawings. When children notice these

anomalies, they see them as mistakes and try to remove them from their pictures in order to perform a more effective representation.

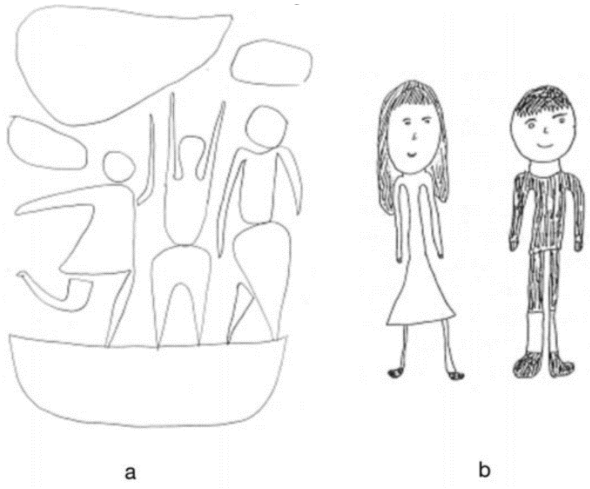


Image 11. (a), Paul Klee, Shipwreck, 1938, 29.5 x 20.3 cm. Kunstmuseum, Berne

Williats, J. (2006). Rudolf Arnheim's graphic equivalents in children's drawings and drawings and paintings by Paul Klee, Ed.Liliana Albertazzi, in Visual Thought: The depictive space of perception (204-235 pp.).

Image 11. (b) Drawing of an eight-year-old boy. Cox, M. (1992).

It is seen that many drawings and paintings produced by Klee in the last period of his life contain pictorial contradictions in terms of 19th century academic painting standards. In many of these anomalies the state of the lines is manipulated (transformed into signs or reverted to a primitive stage of painting) and differs greatly from the anomalies used by the Cubists. Although lines are seen as contours in the artist's work named Ship Wreck (Image 11-a) of 1938, primitive features are included as regions instead of lines in this painting. While the main body of the figure reflects the enlarged form in the drawings of the children resembling spinning threads (as in the drawings shown in Visual 11-b), the shapes denoting the regions have been modified with the second sections added later, thus ensuring that they are "pointed" and "twisted". Therefore, these lines used as markers only define the contours of the regions and the detailed shapes of these lines, which are irregular in both Klee's and the eight-year-old girl's drawings shown in image 12 and are not clear in themselves.

a

b

c

Image 12. (a) Paul Klee, With Green Stockings, Watercolor, 34.9 cm × 21.0 cm, 1939, Felix Klee Collection.

Image 12. (b) Human figure drawn by a four-year-old girl. Willats, J. (2008).

Image 12. (c), Kangaroo drawn by a child. Reith, E. (1988)

The anomalies used in *With Green Stockings*, which Klee completed a year later in 1939, are much more complex (Figure 12-a). Just like in the *Shipwrecked* study, the markings were used instead of lines, but colors were added in the form of spots. However, unlike Shipwrecked, the lines represent different types of primitive stages of painting in different parts of the painting, and the meanings of the lines also change along the way they follow. Figure 12-b shows a drawing made by a four-year-old girl. In this drawing, the arms and legs are represented by a single line. In such drawings, lines replace large areas reflecting the primitive stages of painting and, in turn, indicate long areas expressing arms and legs. In Klee's painting, such single lines represent arms and legs. However, instead of ending at the contours of the body, as in the drawing by the four-year-old girl, these lines continue towards the inside of the girl's body, but in this way their meaning is also changed.

Lines in drawings made by older children can sometimes have different meanings as they progress (Figure 12-c), but the fact that this is a transitional phase is beyond doubt. The line in the lower left part of the figure has a different meaning as it moves towards the leg in the lower part of the body, while the covered surface first remains to the left of this line and then to the right. A line at the top of the drawing also changes its meaning as it progresses from the head contour to the arm contour. At this point, it is seen that the four lines come together. But throughout all these meaning changes, lines continue to express their contours.

In Klee's painting, on the other hand, the changes in meaning of the lines are much more radical. In the lower right part, the line gains volume and expresses the leg, while it becomes a contour as soon as it passes the hem. Therefore, Klee confuses expression systems taken from the extremes of children's drawing development when drawing with single lines. With Green Stockings contains a number of other outliers. There is an untrue addition

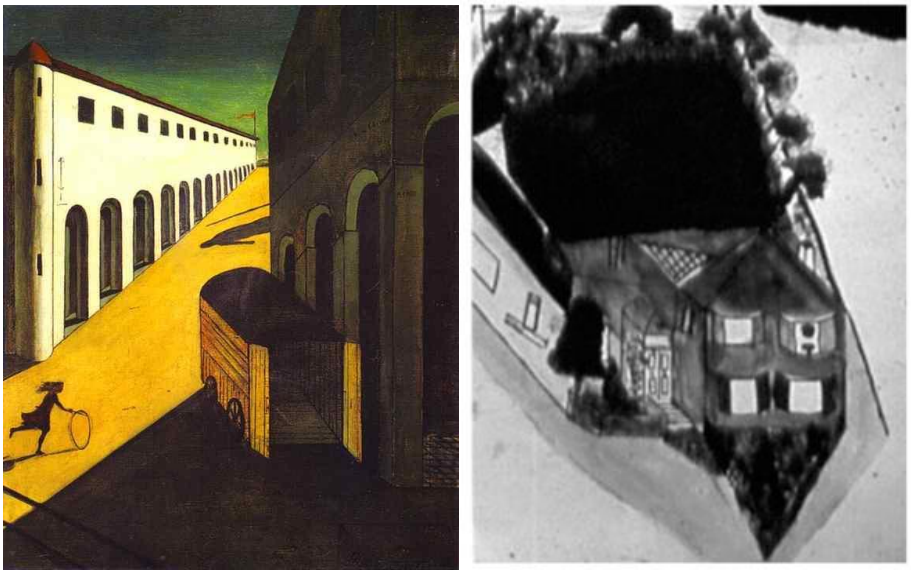
between the lines denoting the right leg and the folded part of the skirt. Likewise, there are also two unreal bonds between the ends of the lines that represent the arms and the upper edge of the paper. There are three other such unreal end-of-line joins: one where the skirt contour ends in the left-middle part of the picture, and the other two due to the lack of closure in the representation of the girl's ball. Even small children are generally careful to avoid such shortcomings in closure. The faint gap in the outline of the plate above the head of the four-year-old girl (Image 12-b) is undoubtedly due only to a minor disruption in motor control.

Changes in the expression states along the path of the lines are rarely seen in children's drawings, and these changes were undoubtedly created unintentionally. As suggested by Reith (1988), the semantic changes in visual 12-c were a "by-product" of this child's addition of schematic shapes to the contour. These "errors" are eliminated at a slightly more advanced stage of development.

On the contrary, Klee undoubtedly used such anomalies deliberately, and similar contradictions are seen in many of the paintings and drawings he produced during this period. For example, from 1937 Oh, but oh! In his work, a single line was first used to denote the edges of a bow tie, then advanced interchangeably to indicate the contour of a cheek, a tonal speck denoting an eyebrow, height denoting the nose, and a scar on the upper lip (Willats, 1997). “I did a lot of experimentation with the laws and used them as a basis,” Klee said. But an artistic step can only be taken when an obstacle arises” (1961: 454). The strongest evidence of Klee's deliberate use of outliers in his With Green Stockings is probably in the painting itself. The use of color in this painting seems very simple and for decorative purposes, and in fact, it is extremely necessary for the meaning of the painting. At the exact point where the lines denoting the arms and legs change meaning, these changes are marked by the edges of the patches of color, yellow for the arms (unfortunately not visible in this black-and-white reproduction) and green for the legs. This is where the picture gets its name: *With Green Stockings*.

The greatest concern of Gris, Klee, Braque and Picasso was to find a way to paint. The contradictions seen in his paintings and drawings also constitute a certain part of his research. Picasso said, “I never create a painting as a work of art. All images are research. I research non-stop, and this research also has a logical sequence” (O’Brian, 2018). Other avant-garde painters such as Chagal, de Chirico, Derain, and Matisse were more concerned with the use of deviant structures used for representation as a means of expressionHowever, in Chirico's painting ‘Mystery and Melancholy of a Street’ seen in Image 13, a contradictory mixture of drawing systems is used expressively.

The subject of this painting is not particularly clear in itself, although the shadow of the concealed statue projected across the empty street probably conveys a sense of threat. The mystery and melancholy that this painting conveys is therefore not very relevant to this obvious subject. Instead, de Chirico used the incongruous mixture of drawing systems in this painting as a form of expression. The arches extending to both sides disappear at different points, while the pickup truck is shown in a slanting way. Therefore, the space system in this painting is inconsistent when considered holistically. Commenting on the spatial systems in de Chirico's paintings, the critic James Soby said that "geometry is deliberately altered to create a poetic expression" (1966, p. 71).



a b

Image 13. Giorgio de Chirico, Mystery and Melancholy of a Street, Oil Painting, 87.0 cm × 71.0 cm, 1914, Private Collection. Willats, J. (2008).

A house painting by a child (Figure 13-a) likewise includes a mix of drawing systems (in this example there is a mix of battered expression and inverted perspective). There are certain expressive features in this painting, as in de Chirico's painting. However, it is very unlikely that these features were deliberately included in the child's picture. Rather, this mix of systems seems certain to be the result of the child's effort to master a new drawing system; just as many of the drawing systems in early Italian painting (though they seem to be an expressive feature) were the result of painters' efforts to master perspective.

Golomb (1992) used the following expressions for older children: "The part with the meaning that generally produces the effect is the head or face, while the body posture is shown essentially undifferentiated." Representation of facial expression is limited to showing the mouth curled up or down, or straight. The expression given by the posture of the body (if given) is much more limited. Moreover, since most children are limited to showing the head completely from the front or completely in profile, expression with the gaze direction, if any, is not possible.

Image 14. A drawing named refugees by an eight-year-old girl. Willats, J. (2008)

Figure 14 shows a picture made by an eight-year-old girl, showing an emotionally intense scene. For a girl of this age, this painting seems to have a rather extraordinary feat of conveying emotions. The facial expressions of the figures are sad; mirroring the body posture is extremely effective, given that the boy's arm wraps around the girl and his feet are turned inward. However, there is no clarity in the expression of the direction of gaze. It is difficult to tell whether the sense of chaos resulting from the inconsistent use of perspective (although appropriate enough for the subject of the painting) was created deliberately or accidentally. There are two unreal or almost unreal points of junction in the painting: the parts between the girl's bag and part of the boy's pants, and the parts between the girl's leg and the shadow stain. However, they appear to have been created by accident. Although the claim that children's drawings are expressive is often expressed, children's expressions are mostly hidden in their choice of subject and the way they reflect their facial expressions. If this picture is compared with the picture named A War Wedding (Image 15); Although one depicts a sad scene (refugees) and the other a happy scene (wedding), it will be difficult to distinguish between the emotional content of these two works (without seeing the title) by looking at how they are portrayed.

Image 15. The painting named wedding in war, made by a 14-year-old boy. Willats, J. (2008)

In Figure 15, it is seen that there is no correct point of view in the painting made by a 14-year-old boy. The door on the right and the door on the left are depicted in a sloping manner so that the eye is directed to the center of the painting area. On the other hand, the figures are arranged horizontally. The figures do not stop directly at the bottom edge of the picture, as in many children's drawings. There is a strong contrast between the image presented in the painting and the subject of the scene depicted. Brush marks are large, separate and clumsy, with gaps left in some areas of the image. All these factors seem to have been carried out to draw attention to the subject of the painting.

These examples show that the formal similarities between children's drawings and the paintings and paintings of avant-garde art produced in the early 20th century are striking. The most obvious of these similarities is the lack of perspective, but there are many other anomalies these paintings have in common. These can be listed as abnormal drawing systems such as folded drawings and the occasional use of inverted perspective, different objects drawn from multiple perspectives located on the same surface, transparent objects, false inserts and edges. The objects and figures in these paintings are often large-scale, rough and clumsy, and the painting surface is often blank. Naturally, these similarities with avant-garde art have led to the claim that children are natural artists.

Discussion

Children may not have the skills and vocabulary to verbalize their feelings, fears, and concerns. It is often difficult for adults to express their feelings, and therefore it can be concluded that it is almost impossible for children. In some studies, it has been determined that children do not always engage in verbal communication that reflects their emotional state (Clatworthy, Simon, & Tiedeman, 1999). For this reason, children use the

painting surface, on which they intervene more freely and comfortably, especially in order to express their inner world, if it is read correctly, as a communication tool.

Children's drawings are works produced as a result of the effect of the child's mental and physical development. While the child is painting, he does not perform this action with a certain consciousness. This process happens naturally by itself. The painting and the child are inseparable parts of each other and complement each other by making sense of each other. Children's drawings are a window to their inner world and contain developmental clues. Children's drawings not only give clues to adults about their inner world, but also give clues about their mental and physical development levels. It was towards the end of the 19th century that it was discovered that children's pictures are a powerful means of expression and an important tool in obtaining clues about their inner world. This discovery caused the child's drawings to be used in different areas and led to the understanding that even the child's intelligence can be measured.

In order to determine the developmental characteristics of children, especially in the period between 1885-1920, researches were made on a large number of children's pictures and thousands of children's pictures were collected and analyzed. With the help of psychology, it has been diversified according to the cognitive, affective and psychomotor development characteristics of the child. In this process, it is seen that the aesthetic value of children's paintings is not emphasized.

The realization that children's paintings have an aesthetic value started with modernism. At this stage, it is seen that many avant-garde artists collect children's paintings and create works by making use of the rich imaginary treasures of these paintings as much as possible. The free and unconventional spatial arrangement seen in children's drawings has been a special source of inspiration for artists of the modern period, and they have collected children's paintings for this purpose. They used the pictures they collected to synthesize different artistic effects, and eventually they reached the point of separation from concreteness and independence.

It can be said that the most important common aspect of modern art and children's paintings is that the individual paints what he perceives, not what he sees. While perceiving nature, the individual used the well-known composition rules and especially perspective differently. This can be explained by the new theory of visual perception developed by psychologist Herman von Helmholtz in the mid-19th century. Classical art rules developed as a result of vision theories based on the optical laws of the Renaissance and led to the development of single point perspective. However, Helmholtz tried to explain the term vision by emphasizing not only the images that light reflects on the retina, but also how these images are processed by the human visual system.

Optical perception forms and their reflection on painting have followed a different path in modern artists and children. For example, while Gris, one of the Cubist painters, deliberately uses perspective perception as a way of investigating the nature of depiction, these contradictions occur by chance in children's drawings. When children notice these contradictions, they see them as mistakes and try to remove them from their pictures.

Ethic

I declare that the research was conducted in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Author Contributions

This article was written with the joint contributions of two authors.

Conflict of Interest

The authors declare that they have no conflict of interest.

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The Relationship between Mathematics Anxiety and Mathematics Achievement: Meta Analysis Study*

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Abstract

The overarching goal of this research is to synthesize previous studies on the relationship between mathematics anxiety in primary school and academic success in mathematics course. The studies that were included in the synthesis were evaluated based on a variety of criteria. As a direct consequence of the searching, a total of 21 studies were incorporated into the investigation. Calculating what is known as "inter-coder reliability" was one of the methods used in the study to guarantee the accuracy of the coding protocol. After performing the necessary calculations, it was determined that a reliability of 0.74 was adequate. The reliability of the research, the potential for bias in publication, and the methods used to evaluate the quality of primary studies. There was no evidence of bias. The findings of the meta-analysis indicate that there is an inverse correlation between math anxiety and math achievement, which corresponds to a moderate effect size. The size of this effect was determined by the number of studies included in the analysis. According to the random effects model, the effect size that was determined to have been produced by 21 separate studies was found to be -.42. The measurement tool that was used for the region, the type of study, the education level, and the achievement score were all taken into account during the analyses of moderator variables. It was determined that the moderators, with the exception of the regional moderator, did not produce a statistically significant change in the magnitude of the effect.

Key Words

Mathematics Anxiety • Mathematics Achievement • Meta Analysis

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Concepts

Anxiety about mathematics can be described as a feeling of tension, anxiety, or fear, and it can significantly impair one's ability to perform mathematical tasks (Ashcraft, 2002). There is also widespread agreement regarding the ways in which math anxiety can affect mathematical performance. Anxiety has a negative impact on performance because it "brings anxiety to bear on performance," which impairs cognitive processing. As early as 1957, Dreger and Aiken had the hunch that some people suffer from a condition known as "numbers anxiety." Since that time, numerous studies have investigated the connection between math anxiety and math performance and found a negative relationship between the two (Parajes & Miller, 1994).

Rationale and Purpose of the Study

The requirement for a "meta analysis" became apparent as more studies revealed the connection between math anxiety and mathematical performance. In his meta-analysis, Hembree (1990) presented a more simplified picture of the relationship between math anxiety and math achievement. Following that, a number of meta-analyses on this topic were carried out. In the 1990s, meta-analyses found a significant, small-to-moderate, and negative relationship between mathematical achievement and mathematical anxiety (Ma, 1999). A number of meta-analyses carried out in the 2000s came to the conclusion that there is a significant, moderate, and inverse relationship between mathematical ability and mathematical anxiety (Namkung et al., 2019; Zhang, et al., 2019; Li et al., 2021; Barroso et al., 2021). Research has continued to investigate this relationship using a greater diversity of samples and measurements ever since these publications were made. In addition, it is believed that there is a requirement for more research to be done on this relationship and for more of the relationship's characteristics to be displayed. In point of fact, carrying on this practice was the primary motivation behind this investigation. But by approaching it from a variety of angles,... Let's explain this in more detail. The material for the meta-analysis became available as the researchers investigated the relationship in question using an increasing variety of samples and measurements. in the years that followed, an increasing number of primary studies were conducted. for example, the range of values for the independent variables that were utilized in these studies. If it is possible to identify the moderators that steer the trajectory of the relationship between math anxiety and success, then this will be one factor that contributes to an increase in success. Remember! The illuminating ways in which the moderators discuss Karl Pearson's work on the typhoid vaccine It is believed that Karl Pearson's synthesis of the results obtained from various studies that were conducted against the typhoid vaccine served as the inspiration for the meta-analysis (Cheung, 2015). Latitudes would not have been regarded as a moderator if this work had not been done. Without testing, we would not have known that the vaccine was successful in chilly environments. And it's possible that a great number of additional people would lose their lives to typhoid. In this sense, each individual meta-analysis study contributes to the advancement of future research. The moderators that were determined in this study may be excluded from future meta-analyses that will be made on the subject of this study or on topics that are similar. This piece of work is also rooted in that tradition. A meta-analysis this study was recently carried out by Bayırlı and colleagues (2021), who found very similar results. However, as I mentioned earlier, primary work has become more demanding in comparison to the previous year. And perhaps most importantly, the moderators came to the conclusion that there were certain people who were

disqualified. Conventional reviews concentrate on aspects of the participant, intervention, and study design, among other things, that have an impact on the variables that were examined. cannot be explained methodically in any way. In meta-analysis, the moderator analysis is used to assess the effects of factors like these on the variation in effect size. If the results of the moderator analyses demonstrate that certain characteristics do not have an effect on the overall impact, then this demonstrates that the results are reliable and can be transferred to situations that are equivalent. If moderator analyses reveal that particular characteristics have an impact on the effect as a whole, then the sources of variation that are responsible for this can be investigated (Glasziou et al., 2001; Lipsey et al., 2001). In addition to this, one of the purposes of meta-analysis is to identify incomplete (unexplored) relationships or relationships that have received a lower amount of research by providing suggestions that may be useful to researchers in the future (Cooper et al., 2019). Analyzing the moderator's role is important in these situations. As a result, the purpose of this particular meta-analysis was to provide an update on the relationship between math anxiety and math achievement as well as the moderators and to draw attention to a number of points with regard to the current moderators. The purpose of this research is to compile a summary of the findings that have been obtained from previous research on the connection between math anxiety and mathematical ability. Hypotheses based on research:

1. There is a correlation between having math anxiety and having a moderately negative level of math achievement. The effect size that was calculated has a significant value.

2. The moderators that have an impact on the calculated effect size are the measurement tool that was used for the region, the type of study, the education level, and the achievement score.

Method

Research Design

The meta-analysis method was used in the study to group the studies on the relationship between mathematics anxiety and mathematics achievement under certain criteria in order to analyze the findings by combining them. This was done in order to reduce the amount of time spent on each individual study.

Research Instruments and Processes

In the meta-analysis process, the keywords "mathematics success" and "mathematics anxiety" were searched in the TR ULAKBIM Index and National Thesis Center of Turkey databases. The Google academic search engine was used. The inclusion criteria of the study are:

1. There are studies being carried out between 2010 and 2022.
2. There are studies carried out in Turkey.
3. The studies included in the research, conducted at home and abroad,
4. include master's theses, doctoral theses, and articles.
5. To be published in scientific, peer-reviewed journals (for articles) or approved by the jury (for theses), correlational studies with statistical findings are conducted.
6. Include moderators who will be reviewed.

During the course of the research, the Comprehensive Meta-Analysis 2.0 (CMA) program was utilized. For the CMA, processing was done on the data from primary studies that fulfilled the criteria. Studies were looked at based on the criteria that were established, and the 21 studies that satisfied the criteria for inclusion were examined.

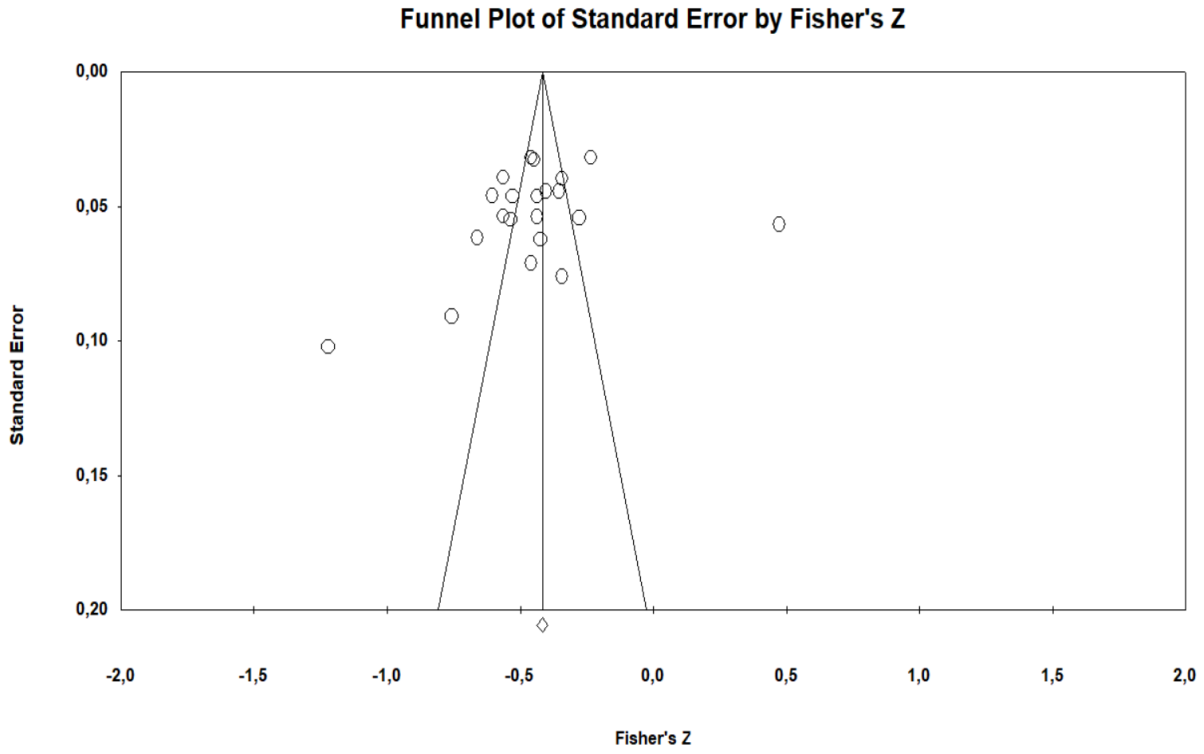
Research Validity and Reliability

The validity of the research was ensured by investigating publication bias and analyzing the validity studies of the studies that were included. The reliability of the research was ensured through the control of two independent coders who coded each of the included studies in accordance with the data coding form that was prepared by the researchers. It was determined that the inter-coder reliability coefficient, also known as AR, was 0.74. This is sufficient.

The most crucial aspect of the reliability analysis of meta-analyses is the examination of publication bias. Both of these approaches were utilized in this investigation in order to test for publication bias. The funnel plot and Egger's regression test are two examples of this. The results of these tests are presented in the following table.

Figure 1

Funnel plot



The funnel plot reveals that the 21 studies that were analyzed were distributed evenly on both sides of the effect size vertical line and very close to the combined effect size. This can be seen by comparing the individual effect sizes of each study to the total effect size. In the absence of any publication bias, it is anticipated that the studies will

spread symmetrically on both sides of the vertical line that represents the overall effect size (Borenstein et al., 2009: 284). As can be seen in this section, the research did not uncover any publication bias.

Table 1

Egger's regression test findings

Lower Limit	Upper Limit	sd	p
-10.94	4.11	3.59	0.35*

p < .05

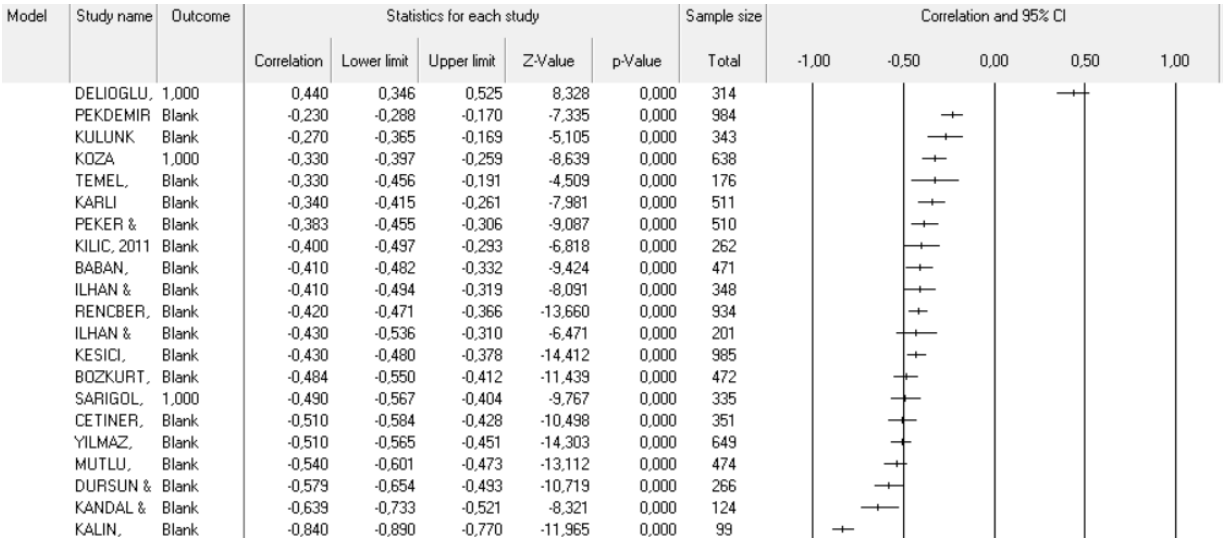
Egger's regression test is an additional test that is used to test for publication bias. On the other hand, this test demonstrates, in accordance with the significance level indicated by "p," whether or not the funnel plot is asymmetrical (Egger et al., 1997). If the Egger test yields a result that does not meet the criteria for significance, this indicates that there is no issue with publication bias (Klassen & Tze, 2014). It can be concluded that there is no publication bias because the value that was obtained in this research did not equal p=0.35 (p>.05).

Data Analysis

In this section, the results and data obtained from the CMA analysis are presented in the form of graphs and tables, as well as their interpretations.

Figure 2

Uncombined Findings of the Meta-Analysis by Random Effects Model (CMA)



When the uncombined effect sizes are looked at, it can be seen that the study by Kalın (2010) has the greatest effect, while the study by Delioglu (2017) has the smallest effect. The highest effect was found in the former.

Table 2

Combined Meta-Analysis Results by Random Effects Model

	Effect Size (r)	Lower Limit	Upper Limit	Z Value	p
Random Effects Model	- 0.422	-0.497	-0.340	-9.184	0.000*

p < .05

Research was conducted using the random effects model. The study under this model revealed that the association between math aptitude and anxiety had a combined effect size of -.42. (ranging from.34 to -.49 for a 95.00 confidence level). According to Cohen et al. (2007), who calculated this number as a negative and medium impact size, there is an inverse relationship between mathematics fear and achievement.

The effect size value is between.00 and.10, which is very weak; between.10 and.30, which is weak; between.30 and.50, which is medium; between.50 and.80, which is strong; and if it is greater than.80, it is interpreted as having a very strong effect, according to Cohen et al. (2007, p. 521).

Table 3

Results of the moderator analysis by research type variable

		Confidence Interval (95%)				Heterogeneity		
Research type	**k**	**ES (r)**	**Low**	**Up**	**z**	**Q**	**df**	**p**
Article	7	-0.473	-0,550	-0.387	-9,600			
Master's thesis	14	-0.394	-0,499	-0.278	-6.239	1.281	1	0,258
Gruplararası Toplam	21	-0.443	-0,506	-0.375	-11.393			

***p < .05**

The relationship between mathematics anxiety and mathematics achievement did not differ statistically significantly according to the study types, according to the random effects model, as a result of the comparison between the groups in terms of the common effect sizes of the studies in two categories, article and master's thesis ($Q_{Intergroup}$ = 1,281, sd = 1, p = 0.258). No matter the sort of labor, there is a reciprocal negative association between math anxiety and math achievement.

Table 4

Results of the moderator analysis by area variable

		Confidence Interval (95%)				Heterogeneity		
Area	**k**	**ES (r)**	**Low**	**Up**	**z**	**Q**	**df**	**p**
Eastern Anatolia	2	-0.495	-0.593	-0.382	-7.592			
Ege	2	0.034	-0.678	0.712	0.077			
South East Anatolia	3	-0.453	-0.511	-0.392	-12.714			
Central Anatolia	7	-0.481	-0.584	-0.363	-7.148			
Black Sea	2	-0.240	-0.290	-0.189	-8.911	73.582	6	0.000
Marmara	4	-0.471	-0.514	-0.427	-17.899			
Uncertain Region	1	-0.639	-0.733	-0.521	-8.321			
Total Between Groups	21	-0.399	-0.426	-0.372	-25.804			

***p < .05**

According to the random effects model, mathematics anxiety and achievement were compared between groups in terms of the common effect sizes of the studies in seven categories: Uncertain Region, Eastern Anatolia Region, Central Anatolia Region, Marmara Region, South East Anatolia Region, Black Sea Region, and Aegean Region. According to the regions, it was found that the association between the groups varied statistically substantially ($Q_{Intergroup}$ = 73.582, sd = 6, p =.000). When the effect sizes calculated for the groups are compared, it can be said that the Uncertain Region, Eastern Anatolia Region, Central Anatolia Region, Marmara Region, South East Anatolia Region, Black Sea Region, and Aegean Region, respectively, have significantly higher levels of the negative relationship between mathematics anxiety and mathematics achievement. In other words, the Uncertain Region, Eastern Anatolia Region, Central Anatolia Region, Marmara Region, South East Anatolia Region, Black Sea Region, and Aegean Region are more affected, correspondingly, by the reciprocal negative association between mathematics anxiety and mathematics achievement.

Table 5

Results of the moderator analysis by area variable teaching level variable

		Confidence Interval (95%)				Heterogeneity		
Teaching level	**k**	**ES (r)**	**Low**	**Up**	**z**	**Q**	**df**	**p**
Primary school	2	-0.415	-0.643	-0.12	-2.700			
High school	2	-0.282	-0.386	-0.171	-4.851			
Secondary school	17	-0.439	-0.527	-0.342	-8.043	4.870	2	0.092
Total Between Groups	21	-0.388	-0.435	0.297	-9.525			

***p < .05**

The relationship between mathematics anxiety and achievement did not differ statistically significantly depending on education levels, as shown by the comparison between the groups in terms of the common effect sizes of the studies in 3 categories (primary school, secondary school, and high school) using the random effects model ($Q_{Intergroups}$ = 4.870, sd = 2, p =.092). Education levels have little effect on the reciprocally negative association between math anxiety and math achievement.

Table 6

Results of the moderator analysis by the success score measurement tool variable

	Confidence Interval (95%)					Heterogeneity		
Success score measurement tool	**k**	**ES (r)**	**Low**	**Up**	**z**	**Q**	**df**	**p**
Report grade	9	-0.45	-0.628	-0.226	-3.732			
Achievement test	3	-0.389	-0.56	-0.187	-3.627			
Course grade	4	-0.4	-0.461	-0.335	-11.01	0.279	3	0.964*
National exam	5	-0.416	-0.506	-0.317	-7.561			
Total Between Groups	21	-0.406	-0.454	-0.356	-14.322			

*p < .05

The relationship between mathematics anxiety and mathematics achievement was statistically significant according to the measurement method used for the achievement score, as shown by the intergroup comparison made in terms of the common effect sizes of the studies in 4 categories: report grade, achievement test, course grade, and national exam. ($Q_{Intergroups}$ = 0.279, standard deviation = 3, p =.964) There was no difference in level. Regardless of the assessment method used to determine the accomplishment score, there is a negative link between mathematics anxiety and achievement.

Results

The studies conducted using the random effects model revealed an opposing correlation (p 0.000) and -.42 between mathematics anxiety and mathematics achievement, which corresponds to a modest effect size. According to Cohen's (2007) classification, this outcome was obtained. This impact size's 95 percent confidence interval has a lower limit of -0.497 and an upper limit of -0.340. The opposing effect can be explained by a decline in mathematical achievement as mathematics anxiety rises, according the meta-findings. analysis's In a similar vein, it may be said that as math achievement declines, math fear rises. For all moderators save the "region" moderator, it was believed that the distribution between the groups was homogeneous for the analysis. In other words, it was found that the average effect size value was unaffected by the grouping formed for the measurement tool utilized for the study type, education level, and accomplishment score.

Discussion, Conclusion & Suggestions

The findings of Şad et al. (2016) and Bayrl et al. (2021) in the Turkish sample are greatly expanded and supported by this investigation. The results of previous meta-analysis research on this topic published in the literature are consistent with the medium impact size in the negative direction found as a consequence of the meta-analysis. Numerous meta-analyses on this topic have really been conducted, as I noted in the beginning to my study. These research yielded comparable findings (Ma, 1999; Şad et al., 2016; Zhang et al., 2019; Namkung et al., 2019; Bayırlı et al., 2021; Li et al., 2021). In terms of moderator analysis, this study is valued, nonetheless. In contrast to other studies, the modifiers of the measurement method for the region and accomplishment score were applied in this one. Similar to the others, the moderators and study style were considered crucial at the teaching level. According to the moderators of the assessment method used to determine the area and achievement score, considerable differences between the effect sizes were anticipated, as indicated in the research hypothesis. because it was believed that the regional cultures were to blame for the children' varying levels of mathematics anxiety and achievement. There may also be differences in how much value is placed on mathematics in certain areas. The negative association between mathematics anxiety and achievement was found to be less pronounced in the Aegean and Black Sea regions, respectively, when the effect sizes determined for the groups were compared. The outcome to be obtained is that it processes the general effects, i.e., that mathematics achievement declines as mathematics anxiety rises, or that mathematics anxiety rises as mathematics achievement declines. Culture, geography, and region-specific elements can be useful in this regard. Following this point, experimental research can be ordered. Additionally, Central Anatolia and the Marmara regions' results were seen to be more similar to the overall outcome. These findings could lead to suggestions that either the Black Sea's weather avoids mathematics anxiety or the Marmara region's urban structure causes it. The measurement method chosen was a different moderator success score, which the hypotheses predicted would vary greatly. This claim's foundation is the lack of a standard for the instruments used to assess math proficiency, which raises questions about their validity and dependability. According to the study's findings, the assessment method utilized to determine the accomplishment score had no effect on the negative link between mathematics anxiety and achievement. These resources included achievement assessments, report cards with grades, and national exams. In Turkey, instructors are expected to have their lecture notes and report cards prepared. They purchase and employ tools that lack accurate and trustworthy internet information. It's possible that an inaccurate measurement of math proficiency will result in an inaccurate correlation with math anxiety. This is the premise of the theory. Other exams (achievement tests, national exams), which were deemed legitimate and reliable and were the subject of a number of analyses, did not differ from one another. The investigation revealed that the negative association between mathematics anxiety and achievement remained constant across educational levels. The effect sizes for the moderator variable of education level did not demonstrate a significant difference in Bayırlı et al. study's from 2021, either. In the study conducted by Şad et al. (2016), it was shown that there was a significant difference between high school and secondary school levels and that secondary school students' mathematics anxiety had a greater impact on their math achievement than did high school students'. The negative connection between math anxiety and math achievement did not vary among research types, according to the other moderator's analysis. The notion that the publications underwent a more thorough peer-reviewing process served as the foundation for this

hypothesis. In this regard, it was anticipated that the impact sizes would be significantly different from those in the master's thesis. Additionally, no other study that used moderator analysis was discovered.

The following suggestions were made in light of the findings of this meta-analysis:

1. Various factors were discussed in this study while taking into account the recommendations from earlier studies. In this situation, it is possible to keep looking into the impacts of various moderators. As a result, a conversational setting centered on comparing effect sizes will be established.

2. The association between mathematical achievement and mathematics anxiety has not been the subject of any university-level research in Turkey. At the primary school level, it is extremely uncommon. The association between mathematics proficiency and anxiety for various educational levels and corresponding age ranges will be uncovered when more studies on this subject are conducted.

3. There are regional differences in the strength of the inverse relationship between math anxiety and achievement. This is a topic for a causal analysis.

Ethic

Since this study is a compilation/meta-analysis study, it is not subject to ethics committee approval.

Author Contributions

All of the authors have contributed equally to this article.

Conflict of Interest

The authors declare there is no conflict of interest in this study.

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Coping Strategies with Boredom in Class: Scale Development and Validation

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Abstract

This study sought to develop a new scale of coping strategies with boredom in class (CBCS) and test its reliability and validity across subsamples of undergraduate and graduate students. The entire sample consisted of 1561 students, with more female (N = 967) than male participants (N = 594). When developing the scale, 367 undergraduate students were asked what they did when they were bored in class and whether they made any effort to focus on the lecture. The exploratory (N = 636) and confirmatory factor analyses (N =355) suggested that the CBCS demonstrated a good internal consistency, dimensionality and latent factor structure. The four factors that emerged from the exploratory factor analysis were named Cognitive Approach, Behavioral Avoidance Based on Simple Stimuli, Cognitive Avoidance and Behavioral Avoidance Based on Activating Stimuli. The CBCS also demonstrated significant convergent validity with related scales used in the literature. The CBCS is shown to be a promising measure of coping strategies with boredom in class.

Key Words

Academic boredom • Coping strategies • Scale development

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Emotions are critical for cognitive development and optimal learning (Linnenbrink-Garcia & Pekrun 2011; Schutz & Pekrun 2007). However, not all emotions are equally associated with academic success. Studies have shown that basic emotions (anger, sadness, fear, happiness, disgust and surprise; Ekman, 1992) are rarely experienced in learning processes and environments (Craig et al., 2008). Researchers emphasized that it was important to distinguish between "basic" and "academic" emotions (Pekrun, 2011). Academic emotions are the emotions experienced during the learning process and its outcomes. Anxiety and boredom can be given as examples of these emotions (Pekrun & Linnenbrink-Garcia, 2012). Despite a considerable amount of work done on academic anxiety (see Trassi et al., 2022), studies on other academic emotions are very limited (Ekornes, 2022; Rowe et al., 2015; Sharp et al., 2016).

The number of studies dealing with boredom in academic environments is very few compared to the prevalence of boredom in learning environments and its negative impact on learning and motivation (Pekrun et al., 2010). In education, boredom has a significant relationship with truancy (Wang, 2021), procrastination, decreased academic success (Malcolm et al., 2003; Mann & Robinson, 2009), dropping out of school (Bearden et al., 1989), deviant behavior (Wasson, 1981) and hostility toward school (Robinson, 1975). Boredom is a specific emotion that is often overlooked in schools due to its relatively inconspicuous and nondisruptive nature, especially compared to emotions such as anger and anxiety (Pekrun et al., 2010). Goetz et al. (2006) reported that boredom is experienced much more than anxiety during a class time. In the study of Larson and Richards (1991), which was conducted with the experience sampling method, they reported that the average middle school student was bored 32% of the random moments during class time and homework. In a study conducted with 5-10th grade students, researchers reported that 44% of the students were bored sometimes, mostly or always (Daschmann, et al., 2011). In studies conducted with undergraduate students, between 19-29% of students found half of a class time boring, and 17-30% found most or all of the class time boring (Demirkasimoglu, 2017; Mann & Robinson, 2009). Pekrun et al. (2010) found that undergraduate students were bored in 42.2% of academic activities. In recent studies conducted with university students, between 37-50% of students reported that they had experienced boredom at most or all a class time (Kökçam, 2019; Şimsek et al., 2019). Researchers have reported that the emotional consequences of boring activities continue even after the activity ends (Daniels et al., 2009; Demirkasimoğlu, 2017; Mann & Robinson, 2009). This shows that boredom affects the frequency of truancy after a boring class. Considering that the classes are related to each other, it is quite possible that students who frequently skip classes during the academic year will fail courses or have low academic averages (Fallis & Opotow, 2003; Mann & Robinson, 2009).

To effectively deal with the negative consequences of boredom, it is necessary to understand the potential causes of this emotion. Fisher (1993) divided the effects that cause boredom at work into three main categories: task main effects, environmental main effects (other people, organizational control practices), person main effects (capacity, personality, mental health, schema complexity). The first and second main effects include situational determinants such as the academic activities, classroom environment in boredom experiences, while the last emphasizes the tendency of the person to interpret the situation as boring (Farmer & Sundberg, 1986; Vodanovich, 2003). In addition to the main effects, Fisher also discussed an interaction effect, which she called person-situation fit. A person experiences boredom when the activity/task is not found meaningful or appropriate to his/her wants and needs

(Fisher, 1993). Csikszentmihalyi (1990) suggested that boredom for a task is experienced when a person's capacity exceeds the difficulty of a task (i.e., under-challenging), while anxiety is experienced when the difficulty of a task exceeds a person's capacity (i.e., over-challenging). Furthermore, if task difficulty is proportional to capacity (optimally challenging), flow and enjoyment occurs. This points that boredom may be induced in under-challenging situations but not in over-challenging situations. However, Pekrun (2002) and Acee et al. (2010) found that students reported feeling boredom both when they perceived task difficulty as too high and as too low.

While task and environmental main effects remind educators of the importance and responsibility of developing tasks and methods aimed at reducing students' boredom and increasing students' learning levels, it is clear that strategies to cope with situational (i.e., environmental main effects) and dispositional (i.e., person main effects) boredom in students' learning environment have a critical role.

According to Holahan et al. (1996), two dimensions underlie various coping strategies: The first deals with the orientation of a person and his/her activity in response to the stressor. Individuals who adopt approach strategies try to address the problem directly, whereas those who adopt avoidance-oriented strategies focus on withdrawal from an aversive situation. In the second dimension, coping strategies are also assumed to contain changes in cognition about altering one's views in response to the situation, or changes in observable behaviors intended at modifying one's environment.

Combining these two dimensions, four types of coping responses were defined: cognitive approach, behavioral approach, cognitive avoidance, and behavioral avoidance. Cognitive approach coping includes strategies for rational analysis and positive reappraisal. These strategies involve directing attention to an aspect of the situation at a given time, reflecting on alternative actions and possible outcomes using past experiences, and accepting the reality of the situation by restructuring it to find something useful in it. Behavioral approach coping includes strategies to seek support and guidance, and to focus on action to directly resolve the situation or its consequences. The behavioral approach strategy is used when the student asks the teacher to add variety to lesson or discuss on more interesting topic with class (Nett et al., 2010, 2011). Cognitive avoidance coping includes strategies to distort or deny the seriousness of a situation or its consequences, or to insulate oneself by engaging in thoughts irrelevant to the situation, such as daydreaming, sleeping, switching off and mind-wandering. Behavioral avoidance coping includes strategies involve distracting oneself from the situation by engaging in behaviors unrelated to the situation (Moos & Halohan, 2003, p.1391). The rhythmic finger/foot tapping, talking to a classmate, doodling or scribbling over a paper, playing a game on the phone, leaving the classroom for a short time can be given as examples of these strategies (D'Mello & Graesser, 2009; Mann & Robinson, 2009; Nett et al., 2010).

Self-regulated learning research shows that students face two critical challenges for optimizing their learning process: (1) to regulate motivation and emotions, (2) to minimize intrinsic and extrinsic distractions (Panadero, 2017). Therefore, successful strategies should not only serve to cope with intrinsic and extrinsic distractions that cause boredom, but also facilitate effective learning by increasing student motivation.

So far, two different scales that measure coping with boredom have been developed. Hamilton et al. (1984) developed the Boredom Coping Scale which, according to Vodanovich (2003), the scale is not based on a

comprehensive theoretical ground, and to Vodanovich and Watt (2016), the scale measures the probability of feeling bored, not the strategies for coping with boredom. A decade ago, Nett et al. (2010) developed a scale (i.e., Boredom Coping Scale) that measured strategies to cope with classroom boredom for 5-10th grade students by adapting as Holahan's classificatory framework for strategies used to cope with stress (Halohan et al., 1996). However, when we examined the items of the BCS, we saw that it was insufficient to explain the strategies of university students to cope with boredom in a class (for a number of different coping strategies undergraduate students use, see Demirkasimoglu, 2017; Mann & Robinson, 2009; Sharp et al.,2017; Şimsek et al., 2019). Therefore, we aimed to develop a scale to comprehensively evaluate students' strategies for coping with boredom in a class. In this way, we thought that it can contribute to the development of successful strategies to cope with boredom in class and will guide similar studies.

Method

Scale Development Process

Before starting to develop the scale, the relevant theoretical literature reviewed and student opinions were taken. Through Google forms, undergraduate students (N=367) were asked what they did when they were bored in class and whether they made any effort to focus on the lecture. Considering Halohan et al.'s (1996) classificatory frameworks for strategies used to cope with stress (cognitive approach, cognitive avoidance, behavioral approach, and behavioral avoidance) the first author developed 81 items. Then, seven experts in the field were asked to evaluate 81 items for content validity. 50 items that reached at least 80% consensus took place in the draft of the scale.

Draft Coping Strategies with Boredom in Class Scale (CBCS) items were initially piloted with undergraduate students (N=24), who were asked to whether there is a problem in the clarity and readability of each item, to suggest revisions. Then, these items revised by the first author. Respondents are asked to answer each of these 50 items on a 5-point Likert-type scale from "1" (never) to "5" (always).

Participants

The entire sample consisted of 1561 students, with more female (N = 967; 61.95%) than male participants (N = 594; 38.05%). The participants' age ranged from 18–36 years (M = 20.49, SD = 2.93). The majority of participants were undergraduate students (1525, 97.7%) from various faculties (dentistry, education, arts and sciences, engineering, theology, medicine, economics, health sciences, etc.), 36 participants (2.3%) were graduate students from various institutes (health science, social sciences, education sciences, and science and technology). Among the undergraduate students, 355 (23%) were 1st year, 394 (27%) 2nd year, 386 (25%) 3rd year, 340 (22%) 4th year, 50 (3%) 5th year. All data were collected in the 2018–2019 spring semester and 2019–2020 fall semester.

Analytical Procedure

In the scale validation literature, there is a consensus to conduct an exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) on the same set of items, but with different samples (e.g., DeVellis, 2016, p.140; Worthington & Whittaker, 2006). From the study's larger data set (N=1005), two independent data sets were

randomly generated, without replacement, to ascertain and then confirm the factor structure of the Coping Strategies with Boredom in Class Scale (CBCS) with independent samples. The first data set (N=636) was used for an EFA, and the second data set (N=355) was used to cross-validate factor structure via a CFA.

Data for EFA and CFA were collected using paper forms. The first author requested permission to administer the forms during the hours of instruction of the faculty members of Marmara University, mainly the Faculty of Education and Theology. During the data collection process, in classrooms/lecture theater, the first author had read the Informed Consent Form, which included simple explanations about the purpose of the research, data analysis method, confidentiality and volunteering statements to participate in this study, and she collected data on students who agreed to participate. Finally, convergent validity was tested on 179 students by using the Boredom Proneness Scale Short-Form and the Coping Response Inventory.

SPSS 21 software was used for item analysis and EFA. Monte Carlo PCA (v.2.3) was used for Horn's parallel analysis. SPSS Amos 20 was used for CFA.

Measures

The following self-report measures were administered to measure the convergent validity of CBCS.

Boredom Proneness Scale Short-Form (BPS-SF). BPS, a 28-item self-report measure, developed by Farmer and Sundberg (1986), was revised by Struk et al. (2016) and was abbreviated as 8 items. The measure utilizes a seven-point Likert scale response format ranging from "1" (strongly disagree) to "7" (strongly agree) with a neutral midpoint (4). Koç et al. (2018) translated and validated BPS-SF in Turkish. The Cronbach alpha internal consistency coefficient of the scale was .77 in this study.

Coping Response Inventory (CRI –Adult). CRI, a 48-item self-report measure, developed by Moos (1993). These responses are measured by eight 6-item subscales using a four point Likert scale format ranging from "1" (not at all) to "4" (fairly often). The Logical Analysis, Positive Reappraisal, Seeking Guidance and Support, and Problem Solving Subscales measure approach coping. The Cognitive Avoidance, Acceptance or Resignation, Seeking Alternative Rewards, and Emotional Discharge Subscales measure avoidance coping. The cognitive method is measured by the first two subscales in each set and the behavioral method by the last two subscales. Ballı and Kılıç (2016) translated and validated the CRI's approach coping subscales in Turkish. The measure utilizes a five-point Likert scale response format ranging from "1" (not at all) to "5" (always). In this study, Cronbach's alpha for the Logical Analysis, Positive Reappraisal, Seeking Guidance and Support, and Problem Solving subscales were good (.76, .79, .74 and .73 respectively). Cronbach's alpha for the overall scale was. 88. To assessment criterion validity of Coping Strategies with Boredom in Class Scale, the Logical Analysis, Positive Reappraisal and Problem Solving Subscales were used in this study.

Results

Firstly, Exploratory Factor Analysis (EFA) and then Confirmatory Factor Analysis (CFA) were performed to test the construct validity of the Coping Strategies with Boredom in Class Scale (CBCS). Kaiser-Meyer-Olkin (KMO) and Bartlett tests were conducted to determine whether the data are suitable in terms of factorability. KMO values

were meritorious (.90 and .88) for both exploratory factor analyses. Barlett test values were $X^2(1225)= 10336.66$ and $X^2(300)= 4853.04$ ($ps<.001$). These values show that the data are good in terms of factorability.

Principal Component Analysis (PCA) is preferred because it has considerable utility in reducing a large number of variables down to a few factors. Eigen cutoff value (1.00), scree plot and Horn's parallel analysis were used to determine the number of factors. Then the next step was the rotation of factors that increase the interpretability of a solution. Since the factors are correlated with each other, Promax was preferred because it is convenient and fast among oblique rotation types (Tabachnick & Fidell, 2014).

The PCA started with 50 items. In the first analysis, the rotation was not performed and the initial solution consisted of 11 components. Therefore, it is also necessary to evaluate the factor loading matrix. The factor loading matrix is a matrix of correlations between factors and variables (Tabachnick & Fidell, 2014). 29 items that were found to be highly correlated with each factor or low correlated with each factor were excluded from the solution. PCA was repeated by adding the excluded items to the final solution one by one. 25 items out of 50 were included in the final solution.

Table 1

Total Amount of Variance Explained

Factors	Initial Eigenvalues			Total Factor Loads		
	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %
1	5.158	20.630	20.630	5.158	20.630	20.630
2	4.090	16.362	36.992	4.090	16.362	36.992
3	1.697	6.787	43.779	1.697	6.787	43.779
4	1.512	6.046	49.825	1.512	6.046	49.825
5	.985	3.940	53.766			
…	…	…	…			
25	.353	1.410	100.000			

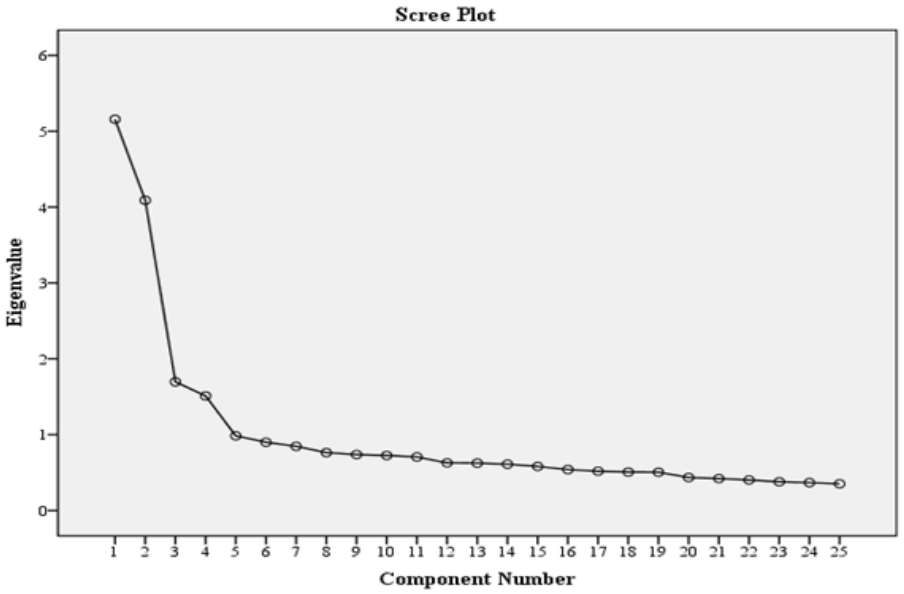

Figure 1. Scree Plot for the EFA

As shown in Table 1, the four-factor solution with 25 items explained 49.83% of the total variance. The scree plot was examined and it was seen that the trend turned horizontal after the fourth factor. The retention criterion in Horn's parallel analysis that "retain those first components with unadjusted eigenvalues greater than the corresponding mean eigenvalue of random data" (Dinno, 2014). Considering these criteria, we decided to the four-factor solution.

Table 2

Factor Correlation Matrix

Factors	1	2	3	4
1		-.21	.02	.04
2			.36	.17
3				.29

According to Tabachnick and Fidell (2014), if the correlations exceed 0.32 in the factor correlation matrix, then there is at least 10% overlap in the variance among the factors. This indicates enough variance for oblique rotation. The first factor was negatively and weakly correlated to the second factor, whereas it was not correlated to the other factors. The second factor was positively and moderately correlated to the third factor and weakly correlated to the fourth factor. The third factor was positively weakly correlated to the fourth factor.

As shown in Table 3, the load values of 25 items varied between .52 and .76. The variance of factor loadings rotated with the Promax made a high loading higher and lower loadings lower for each factor (Tabachnick & Fidell, 2014). Thus, each factor has variables (i.e. items) that are highly correlated with each other and weakly correlated

with the rest. The factors were named Cognitive Approach, Behavioral Avoidance Based on Simple Stimuli, Cognitive Avoidance and Behavioral Avoidance Based on Activating Stimuli, respectively.

After the EFA, the 25-item analysis was conducted to validate our expected four-factor solution using maximum likelihood estimation procedures. The KMO value of the sample consisting of 355 students was examined first and it was found that the distribution was normal (KMO=.90). The CFA model was an adequate fit, $\chi 2/df$ ratio = 2.22, p = .000, Comparative Fit Index (CFI) = .94, goodness-of-fit index (GFI) = .93, Tucker-Lewis Index (TLI) =.90, root mean squared error of approximation (RMSEA) = .05 (see Figure 2 for the measurement model). Tabachnick and Fidell (2014) recommended the value of $\chi 2/df$ in ranges of 1 to 2 or 1 to 3 as an indicator of a good fit. RMSEA value indicated a good fit. CFI, GFI, TLI values were close to the cutoff value (.95) suggested by Hu and Bentler (1999). The results indicated that the model was within the acceptable fit indices.

All standardized factor loadings (.45 –.77) were statistically significant (ps<.001). All variables significantly loaded onto the same factor in the CFA as they had in the EFA, which provides psychometric support for the CBCS and its factor structure (Figure 2), that particularly because the factor structure determined via EFA was replicated with an independent sample via CFA (DeVellis, 2016; Worthington & Whittaker, 2006). The pattern of association among factors in the CFA was similar to the pattern of association in the EFA (see Table 2, Figure 2). Cognitive approach (CAP) was moderately and negatively correlated to behavioral approach based on simple stimuli (BA.SS) and not correlated to cognitive avoidance (CAV). However, the pattern of association between Cognitive Approach and Behavioral Avoidance-AS was slightly different to EFA. When CAP was not correlated to behavioral approach based on activating stimuli (BA.AS) in EFA, weakly and negatively correlated to BA.AS in CFA. Avoidance dimensions (CAV, BA.SS, BA.AS) are highly positively correlated.

Figure 1

The Measurement Model

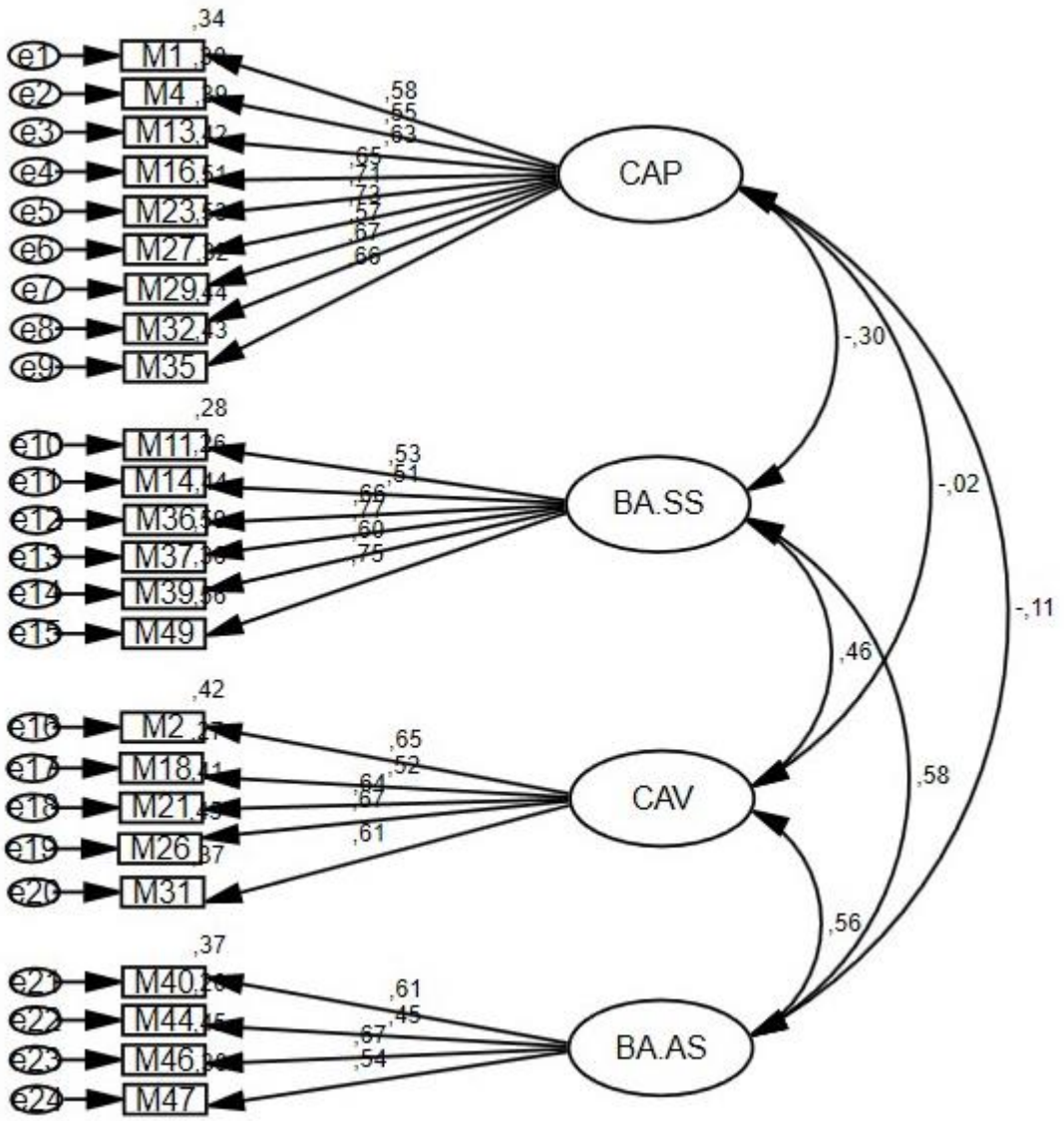

Table 3

Factor Loadings for the Items of the CBCS

Items (When I am bored in class…)	Factors			
	1	2	3	4
I try to focus on the lecture, thinking that the knowledge I will learn in the lecture is important in my professional life.	.56			
I try to focus on the lecture, reminding myself that GPA is important.	.66			
I try to focus on the lecture by thinking about the effort I spent in coming to the class.	.66			
I attempt to pay attention to the lecture by taking notes.	.67			
I concentrate my attention on the lecture, thinking about my future.	.68			
I concentrate my attention on the lecture thinking that listening to the lecturer will make it easier for me to understand the subject.	.66			
I try to focus on the lecture, thinking that I will get a low mark in the exam.	.76			
I focus on the lecture, thinking that the knowledge I will learn in the lecture will improve me.	.64			
I try to focus on the lecture by reminding myself that I may not be able to compensate for it later.	.67			
I try to focus on the lecture, thinking that I will fail the exam.	.68			
I chat with my classmate sitting next to me.		.53		
I sleep.		.52		
I play games on the phone.		.70		
I text on the phone.		.75		
I browse shopping sites.		.67		
I hang out on social networking sites (instagram, facebook etc.).		.75		
I dream.			.76	
I look around (the teacher, my classmates, things, etc.).			.61	
I think about my hobbies and interests.			.70	
I think about my problems.			.75	
I think about the meaning of life.			.68	
I read a book.				.70
I solve puzzles/sudoku.				.68
I read the news.				.58
I write about anything that occupies my mind.				.64

Cronbach's alpha for the Cognitive Approach, Behavioral Avoidance based on Simple Stimuli, Cognitive Avoidance, Behavioral Avoidance based on Activating Stimuli subscales were .88, .81, .81 and .70, respectively. Cronbach's alpha for the overall scale was. 86. Additionally, item total correlations and item discrimination analyses were also performed in the context of reliability. Item-total correlations ranged from .27–.59 and all items significantly correlated with the scale (p<.001). According to results of the t-test for all items, the mean of the top 27% of the participants was also significantly higher than that of the bottom 27% (p<.001). These results showed that CBCS was discriminative for individuals who had high scores and those who had low scores.

Table 4

Convergent validity of the CBCS

	Cognitive Approach	BA based on SS	Cognitive Avoidance	BA based on AS	Overall Scale (CRI-A)	Positive Reappraisal	Problem Solving	Logical Analysis	BPS-SF
Overall Scale (CBCS)	.56***	.49***	.56***	.67***	.22**	.22**	.11	.20**	.02
Cognitive Approach		-.31***	-.12	.02	.45***	.37***	.47***	.39***	-.11
BA based on SS			.39***	.55***	-.17*	-.13	-.21**	-.13	.10
Cognitive Avoidance				.44***	-.12	-.04	-.27***	-.10	.20**
BA based on AS					.04	.07	-.08	.05	-.04

Note. Coping Response Inventory-A (Only Approach Set), BA: Behavioral Avoidance, SS: Simple Stimuli, AS:Activating Stimuli, BPS-SF: Boredom Proneness Scale Short-Form. *p<0,05; **p<0,01; ***p<0,001

Discussion, Conclusion & Suggestions

The current research involved the development and evaluation of a new measure of Coping Strategies with Boredom in Class Scale (CBCS). We developed the 25-item CBCS and showed via psychometric analyses that this scale consisted of four factors and items with an adequate internal consistency. The results of the CFA indicated that a four-factor model had the acceptable fit indices, so allowing us to conclude that the CBSC had four distinct coping strategies.

We had developed a draft scale, assuming that strategies for coping with boredom consisted of cognitive approach, cognitive avoidance, behavioral approach and behavioral avoidance subscales, as in coping strategies with stress and boredom (Lazarus & Folkman, 1984; Moos, 1993; Moos & Halohan, 2003; Nett et al., 2010). However, the results of the EFA showed that the items in the draft scale to measure the behavioral approach did not emerge a factor. According to studies conducted on high school and undergraduate students, only 6% of students used behavioral approach strategies in classes (Nett et al., 2011; Şimşek et al., 2019). In a study by Tze (2011), in which Canadian and Chinese college students were compared according to their strategies to cope with boredom, Canadian students used behavioral approach strategies primarily, but behavioral approach was not used much among Chinese

students. According to Daniels et al. (2015), this may be due to Canadian students paying for their college education. In such a case, Canadian students may think that they have the right to demand from the instructors to reduce their boredom. According to Nett et al. (2010, 2011), the low use of these strategies may be due to the insensitivity of teachers/instructors to students' wishes. Teachers/instructors need to be aware that students who express their boredom have no intention of offending them and that the student is actively trying to overcome their boredom, and should support the student's efforts to participate in classes.

In addition to cognitive approach and cognitive avoidance factors, there were two other factors. Items in both factors were initially included to measure behavioral avoidance. However, they were separated from each other by EFA. We examined these items and concluded that they consisted of different types of stimuli.

With regard to stimulation and boredom in the behavioral sense, Fromm (1973) mentions two types of stimuli: simple stimulus and activating stimulus. Fromm states that simple stimuli are simple and immediate, arising from neurophysiological organization of a person and a reacting person does not go beyond the minimum-required activity. When responding to these stimuli, a person is almost automatic, reacting without thinking too much. Simple stimuli induce immediate and passive responses. Simple stimuli lose their effect if they are repeated beyond a certain threshold. To become a stimulant again, their intensity must be increased or their content must be changed. According to him, “the person who is in constant need of ever changing, "flat" stimuli is chronically bored”, but s/he is not aware of her/his boredom as long as s/he compensates for it (Fromm, 1973). Behavioral avoidance based on simple stimuli items include playing or texting on the phone, talking to a classmate, browsing shopping and social media sites.

Activating stimuli stimulates a person to be active. “Such an activating stimulus could be a novel, a poem, an idea, a landscape, music, or a loved person.” None of these stimuli produce a simple reaction, but rather encourage the person to respond by actively and sympathetically relating oneself to them. A “live” person encountering the “same” activating stimulus always sees a different side of the stimulus that s/he does not see by becoming more awake and more aware. This stimulus makes her/him active and productive. Unlike the simple one-way relationship between the simple stimulus and the person, there is a mutual relationship between the activating stimulus and the person. According to him, “the person who is capable of responding productively to activating stimuli is virtually never bored. But they are the exception in cybernetic society.” (Fromm, 1973, p.243). Behavioral avoidance based on activating stimuli items include reading books, solving sudoku/puzzles, and writing about any subject that occupies one’s mind.

Kökçam (2019) found that there was a positive correlation between the level of attendance in class and the frequency of using cognitive approach strategies. The use of cognitive approach strategies enables students to focus on lectures. These strategies increase a class' subjective value level for a student (Green-Demers et al., 1998; Pekrun et al., 2010). It can be stated that the subjective value toward a class affects a student's achievement and subjective control over learning positively. As a result, the student experiences less boredom in a class and the level of attendance increases (Pekrun et al., 2010). Nett et al. stated that cognitive approach strategies can also be effective in

preventing boredom. These strategies may make students less bored. As proof of this, they showed use of these strategies by students whether or not they experienced boredom (Nett et al., 2011).

In Nett et al.'s study (2011), students used cognitive avoidance strategies to some degree in 36% of a class time. Cognitive avoidance was negatively correlated to the Problem Solving subscale of the CRI and positively correlated to the boredom proneness. This study's results showed that as students' use of problem solving strategies decreases, the use of cognitive avoidance strategies in coping with boredom increases. As the tendency toward boredom increases, the use of cognitive avoidance strategies increases. Considering that boredom is a negative academic emotion that pacifies an individual (Pekrun & Linnenbrink-Garcia, 2012), it is quite reasonable for people with a high tendency toward boredom to use cognitive avoidance strategies frequently.

Nett et al. (2011) reported that students used behavioral avoidance strategies to some degree in 46% of a class time. Many studies have revealed that behavioral avoidance strategies are frequently used in classes (Mann & Robinson, 2009; Pekrun et al., 2010; Şimşek et al., 2019). Boredom was positively associated with the use of these strategies (Nett et al., 2011). In this study, behavioral avoidance based on simple stimuli (BA-SS) was negatively correlated with problem solving, but not correlated with boredom proneness.

Behavioral and cognitive avoidance strategies were highly correlated. Although it is difficult to separate these strategies from each other, the distinction between the two was made by examining at the dominant aspect (i.e. behavioral or cognitive). According to the researchers, while most cognitive avoidance strategies do not recognize by teacher or not interrupt a class, behavioral avoidance strategies are more behaviorally dominant and more likely to interrupt a class. Avoidance strategies are the least effective in coping with academic boredom (Nett et al., 2010). Kökçam (2019) found that students who had reported higher frequency of truancy used avoidance type strategies more frequently. According to the researchers, there are differences in the source of boredom between those who primarily use cognitive approach coping and those who primarily other coping strategies. While students who primarily use cognitive approach strategies think that they are bored, students who use other strategies primarily think that the teacher, lesson, etc. are boring (i.e., locus of boredom). This can be summarized by a quote by Charles-Joseph Lamoral, 7th Prince de Ligne: "I am not bored, but others bore me." (Fenichel, 1951; Nett et al., 2010). Thus, the former try finding new things in the current situation by changing their perspective, while the latter expect the environment to change, offer something new to them, and give over to the passive nature of boredom. Nett et al. (2010) suggest supporting students to take responsibility by offering psychoeducational programs on their causal attributions, such as attributional retraining (e.g., Haynes et al., 2010).

Behavioral avoidance-AS (BA-AS) are based on activating stimuli, but also include avoidance strategies. While BA-AS were not correlated with cognitive approach strategies, were highly positively correlated with cognitive avoidance and behavioral avoidance-SS (BA-SS). Although cognitive approach strategies (CAP) were negatively and moderately correlated to BA-SS, CAP were not correlated (in EFA and convergent validity study) or to weakly and negatively correlated (in CFA) to BA-AS, indicating that we are dealing with two different constructs. Additionally, Kökçam (2019) found statistically significant a weak positive correlation between the frequency of use of cognitive approach strategies and GPA, and a weak negative correlation with the use of avoidance strategies

including BA-AS and GPA. Further research is needed to develop a better understanding of these constructs, particularly BA-AS, their relationship with constructs measuring motivation and learning strategies in class (e.g., The Motivated Strategies for Learning Questionnaire, Garcia & Pintrich, 1996) can be examined. This may improve our understanding of the nature of the relationship between learning and coping with boredom.

Boredom is affected by a student's subjective perception of value toward the lecture. Students will be reluctant to use cognitive approach strategies when they consider that a class/lecture is not important for them. For this reason, it may be beneficial for a lecturer to clearly state the outcomes of the lecture to students. Students can be encouraged to explore the possible benefits of a lecture/class. But also, student readiness and capacity (i.e., person-situation fit) need to be considered for an optimal learning experience.

Our research is subject to a number of limitations that suggest avenues for further investigation. First, how often the students were bored in classes and the frequency of the strategies they used were as far as the students remembered. The volatile nature of emotions, the co-occurrence of different emotions can make it difficult for a person to remember what emotion s/he was experiencing at the time. To minimize these factors, the experience sampling method can be used in future studies (Larson & Csikszentmihalyi, 2014).

Second, boredom occurs not only in the classroom but also in other academic activities (e.g., while doing homework, studying). Future research could further validate the CBCS by examining coping boredom relates to other academic contexts and situations. Additionally, coping profiles can be determined to identify effective and counterproductive patterns of coping strategies (see Daniels et al., 2015; Eren, 2013; Nett et al., 2010; Tze et al., 2013), examined in terms of their frequency of occurrence of boredom, academic achievement, locus of boredom (e.g., classroom environments, teaching strategies), motivational dispositions (see Atkinson, 1957, 1964; McClelland, 1961/2016) and intrinsic motivation levels (see Vallerand, 2000). Since effective patterns of coping strategies minimize the negative outcomes associated with boredom, researchers' further studies of boredom experience, boredom-coping, and other academic concepts will make it easier for practitioners to design and implement programs aimed at reducing boredom.

Ethic

The present study was conducted in accordance with the Declaration of Helsinki.

Author Contributions

This paper was derived from the first author's master thesis. The second author is the thesis advisor.

Conflict of Interest

The authors declare that this research was conducted in the absence of any commercial or financial relationships that could be interpreted as a potential conflict of interest.

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Appendix

Coping Strategies with Boredom in Class (Turkish Form)

No	Açıklama: Bu formda derste can sıkıntısı yaşadığınız zamanlarda nasıl tepki verdiğinizi belirlemeye yönelik ifadeler bulunmaktadır. İfadeleri okurken ne sıklıkla o ifadeye uygun hareket ettiğinizi "hiçbir zaman (1), nadiren (2), bazen (3), çoğunlukla (4) ve her zaman (5)" seçeneklerinden birini seçerek optik forma kodlayınız. **Derste sıkıldığımda…**	Hiçbir zaman	Nadiren	Bazen	Çoğunlukla	Her zaman
1	Derste öğreneceğim bilgilerin meslek hayatımda önemli olduğunu düşünerek dikkatimi derse yoğunlaştırırım.	1	2	3	4	5
2	Hayal kurarım.	1	2	3	4	5
3	Not ortalamamın önemli olduğu düşüncesiyle derse odaklanmaya çalışırım.	1	2	3	4	5
4	Yanımda oturan sınıf arkadaşımla sohbet ederim.	1	2	3	4	5
5	Derse gelmek için harcadığım çabayı düşünerek dikkatimi derse yöneltirim.	1	2	3	4	5
6	Uyurum.	1	2	3	4	5
7	Not alarak derse yönelik dikkatimi arttırmaya çalışırım.	1	2	3	4	5
8	Etrafı (hocayı, sınıf arkadaşlarımı, eşyaları vs.) incelerim.	1	2	3	4	5
9	Hobilerim ve ilgi alanlarıma dair şeyler düşünürüm.	1	2	3	4	5
10	Geleceğimi düşünerek dikkatimi derse yoğunlaştırırım.	1	2	3	4	5
11	Sorunlarım hakkında düşünürüm.	1	2	3	4	5
12	Dersi dinlemenin konuyu anlamamı kolaylaştıracağını düşünerek dikkatimi derse yöneltirim.	1	2	3	4	5
13	Sınavdan düşük not alabileceğimi düşünerek derse odaklanmaya çalışırım.	1	2	3	4	5
14	Hayatın anlamı hakkında düşünürüm.	1	2	3	4	5
15	Derste öğreneceğim bilgilerin beni geliştireceğini düşünerek dikkatimi derse yoğunlaştırırım.	1	2	3	4	5
16	İşlenen konuyu daha sonra telafi edemeyebileceğimi kendime hatırlatarak derse odaklanmaya çalışırım.	1	2	3	4	5
17	Telefonda oyun oynarım.	1	2	3	4	5
18	Telefonda mesajlaşırım.	1	2	3	4	5
19	Alışveriş sitelerinde gezinirim.	1	2	3	4	5
20	Kitap okurum.	1	2	3	4	5
21	Bulmaca/sudoku çözerim.	1	2	3	4	5
22	Dersten kalabileceğimi düşünerek derse odaklanmaya çalışırım.	1	2	3	4	5
23	Haberleri okurum.	1	2	3	4	5
24	Zihnimi meşgul eden herhangi bir şey hakkında yazı yazarım.	1	2	3	4	5
25	Sosyal paylaşım sitelerinde (instagram, facebook vs.) takılırım.	1	2	3	4	5

Cognitive Approach: 1, 3,5,7,10,12,13,15,16,22

Behavioral Avoidance based on Simple Stimuli: 4,6,17,18,19,25

Cognitive Avoidance: 2,8,9,11,14

Behavioral Avoidance based on Activating Stimuli: 20,21,23,24

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A Review of New Istanbul B1 Level Textbook Writing Activities

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Abstract

Writing skill is seen as a complex and difficult skill compared to other language skills. In order to improve the writing skills of language learners, it is necessary to both diversify the writing activities and work with activities that include different methods. Considering that textbooks are the resources that learners and instructors can easily access in foreign language learning, textbooks should have diversity in terms of writing tasks and methods. The aim of this study is to determine the writing tasks in the textbooks used in teaching Turkish as a foreign language, the compatibility of these tasks with the B1 level skills determined in the Common European Framework of Reference for Languages, and the writing methods used in the activities. In the study, "New Istanbul B1 Level Textbook" is examined. First of all, the compatibility of writing activities in the book with CEFR B1 level writing skills was examined. Then, the writing methods used in the activities (controlled writing, guided writing, critical writing, fill-in-the-blank, etc.) were determined. In this study, document analysis, one of the qualitative research methods, was used. In the study, it was concluded that New Istanbul B1 Level Textbook writing tasks were compatible with CEFR B1 level writing skills and different writing methods were used in writing tasks.

Key Words

Writing task •Writing methods •New Istanbul textbook •B1 level

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Learning a foreign language is an action that takes place for many reasons. In recent years, with the increase in the target group coming to Turkey for academic and economic purposes, teaching Turkish as a foreign language has become a remarkable area. Turkish is taught as a foreign language in Turkish teaching centers within universities, private language courses, and public education centers. In all institutions where Turkish is taught as a foreign language, textbooks serve as the primary source used by the instructor and the learner.

The acquisition of language skills depends on the work done in the areas of listening, reading, speaking and writing. In the prepared textbooks, activities related to related fields are included. For the purpose of learning the language, the number of activities related to the relevant field should be increased. Considering that there are many students who come to our country for academic purposes, the importance of writing skills for these students cannot be denied. Therefore, writing activities should support this skill both in number and quality. The purpose of the writing activities included in the books is to prepare the language learner for an event or situation he will encounter, and to offer the opportunity to cope with the situation. It is not possible to offer this opportunity to individuals who are different from each other by using the same methods. For this reason, different methods should be included while giving language learners the ability to write. The motivation of the student should be supported with explanations and directions.

There are studies in the literature on writing activities in the textbooks used in teaching Turkish to foreigners. Examples of these studies are Tok (2013), Yılmaz (2014), Çekici (2018), Yaylı and Yaylı (2018), Ekinci (2020). In the given studies, they focused on the place and importance of writing activities in the process of teaching Turkish as a foreign language, the number of writing activities in the textbooks they included in the study, the ratio of the number of writing activities to the activities for other skills, the methods used in writing activities, and the evaluation of writing activities in terms of writing approaches.

As a result of the examinations, no study has been found that determines the qualifications and deficiencies of the New Istanbul Turkish B1 Textbook writing activities for International Students, which are frequently used in language teaching, in teaching Turkish as a foreign language.

In this study, the writing activities in the New Istanbul Turkish for International Students B1 Textbook were examined in terms of their compatibility with the B1 level writing skills determined in the Common European Framework of Reference for Languages and writing methods.

In line with the determined purpose, answers were sought to the following questions:

1. What are the activities in the writing sections of the New Istanbul Turkish for Foreigners B1 Textbook and are these writing activities compatible with CEFR writing skills?

2. What are the methods used in writing activities in the New Istanbul Turkish for Foreigners B1 Textbook?

Method

Research Design

This study was conducted in the form of document analysis, one of the qualitative research methods. Document analysis is a research method that includes the analysis of written materials containing information about the phenomenon or phenomena that are aimed to be researched (Yıldırım & Şimşek, 2016). In this study, the writing activities in New Istanbul B1 were examined, the compatibility of the activities with the CEFR writing skill was examined, and the writing methods used in the activities were determined.

Sampling

The sampling of this study consists of the textbooks used in the field of teaching Turkish as a foreign language. Since it is used in many institutions, especially in Turkish teaching centers affiliated with universities, New Istanbul Turkish for Foreigners textbooks are determined as the sample, and B1 level textbooks are determined as the threshold level.

Data Collection and Analysis

Document analysis technique was used to analyze the data. Regarding the first sub-problem of the research, the writing activities in the examined textbook were determined and their compatibility with CEFR writing skills was examined. A table was created showing the activity and the associated writing skill. Skills not covered by the writing activities are also indicated. For the second sub-goal of the research; The writing methods used in the activities in the writing area in the units of the book examined were determined, and a table was created under the headings of "unit, subject, writing activity and method". Classification and digitization of the data was done through the prepared table. In addition, a graph was created showing the frequency of using the methods and their ratio in writing activities.

Findings

Findings were examined in order according to the sub-problems of the research.

Table 1

The Match between New Istanbul B1 Writing Activities with CEFR B1 Writing Skills

New Istanbul B1 Writing Activities	CEFR B1 Writing Skills
1A. Describing our house	Can give straightforward, detailed descriptions on a range of familiar subjects within their field of interest.
1B. Writing a dialog about the division of labor	Can produce straightforward connected texts on a range of familiar subjects within their field of interest, by linking a series of shorter discrete elements into a linear sequence. Can give a description of an event, a recent trip- real or imagined.
1C. Comparing his/her country and current life	Can produce very brief reports in a standard conventionalised format, which pass on routine factual information and state reasons for actions.
2A. Writing an email to apply for a job	Can compose basic e-mails/letters of a factual nature (e.g. to request information or to ask for and give confirmation). Can compose a basic letter of application with limited supporting details.

2B. Writing a success story	Can narrate a story.
2C. Telling our dream job	Can give a description of an event, a recent trip- real or imagined. Can produce a text on a topical subject of personal interest, using simple language to list advantages and disadvantages, and give and justify their opinion.
3A. Healthy diet	Can produce short, simple essays on topics of interest. Can summarise, report and give their opinion about accumulated factual information on familiar routine and non- routine matters within their field with some confidence.
3B. Writing text with numerical data	Can summarise, report and give their opinion about accumulated factual information on familiar routine and non- routine matters within their field with some confidence. Can present a topic in a short report or poster, using photographs and short blocks of text.
3C. Our fears	Can compose letters expressing different opinions and giving detailed accounts of personal feelings and experiences. Can compose personal letters describing experiences, feelings and events in some detail. Can take messages communicating enquiries and explaining problems.
4A. Advantages of studying at university	Can produce a text on a topical subject of personal interest, using simple language to list advantages and disadvantages, and give and justify their opinion.
4B. Writing an e-mail for information	Can compose basic e-mails/letters of a factual nature (e.g. to request information or to ask for and give confirmation).
4C. The importance of school, family and environment in education	Can give straightforward, detailed descriptions on a range of familiar subjects within their field of interest.
5A. Telling our dreams	Can give a description of an event, a recent trip- real or imagined.
5B. Telling our regrets	Can give accounts of experiences, describing feelings and reactions in simple, connected text.
5C. Writing a complaint e-mail	Can compose basic formal e-mails/letters (e.g. to make a complaint and request action).
6A. Cultural differences	Can produce straightforward connected texts on a range of familiar subjects within their field of interest, by linking a series of shorter discrete elements into a linear sequence. Can summarise, report and give their opinion about accumulated factual information on familiar routine and non- routine matters within their field with some confidence.
6B. Village and city life	Can produce a text on a topical subject of personal interest, using simple language to list advantages and disadvantages, and give and justify their opinion. Can summarise, report and give their opinion about accumulated factual information on familiar routine and non- routine matters within their field with some confidence.
6C. Writing an invitation letter	Can compose personal letters giving news and expressing thoughts about abstract or cultural topics such as music or film.

In the activity-skill matching, it was determined that the writing activities in the examined textbook were compatible with the Written Production and Written Interaction Skills determined in the CEFR.

Table 2

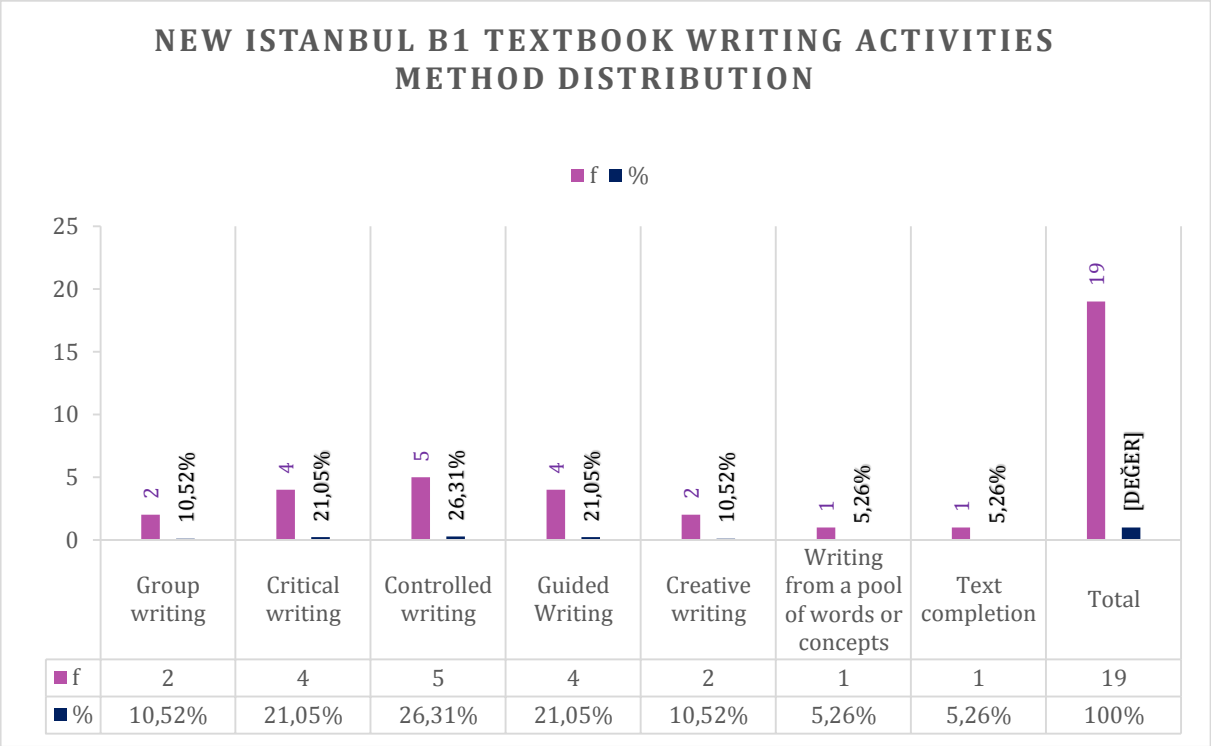
New Istanbul B1 Textbook Writing Activities and Methods

Unit	Subject	Writing Activity	Method
1. A New Life	A. Moving B. Free Air Free Water C. Life in a New City	A. Explaining the features of our house B. Writing a division of labor dialogue C. Comparing your life in your country and now	A. Controlled writing B. Writing as a group C. Guided writing
2. Business Life	A. Business Life B. Success Stories C. Professions	A. Write an email to apply for a job posting B. Writing a success story C. Telling about our dream job	A. Controlled writing B. Controlled writing C. Creative writing
3. Health Comes First	A. Health Comes from the Throat B. Get Healing C. Mental Health	A. Healthy diet B. Writing text with numeric data C. Our fears	A. Critical writing B. Guided writing C. Guided writing
4.Education Life	A. University Life B. Learning Styles C. Education News	A. Advantages of studying at university B. Writing an e-mail for information C. The importance of school, family and environment in education	A. Critical writing B. Writing from a pool of words or concepts C. Critical writing
5. Our Dreams	A. People Live by Their Dreams B. Last Regret Doesn't Help C. Our Complaints	A. Telling our dreams B. Expressing our regrets C. Write a complaint e-mail	A. Controlled writing B. Text completion C. Guided writing/ Creative writing
6. A World Culture	A. Cultural Differences B. Lifestyles C. Festivals	A. Cultural differences B. Village and city life C. Write a letter of invitation	A. Controlled writing B. Critical writing C. Write as a group

The New Istanbul B1 textbook consists of six units. There are three different sections in each unit and a separate writing activity is included in each section. It was determined that different topics were included in the writing activities and seven different writing methods were used.

Figure 1

New Istanbul B1 Textbook Writing Activities Method Distribution



The number and frequency of use of the writing section activities in the New Istanbul B1 textbook are given in Figure 1. In the New Istanbul B1 textbook, group writing method is 10.52 %; 21.05% for critical writing method; 26.31% to the controlled writing method; 21.05% for guided writing method; 10.52% to the creative writing method; 5.26% to the writing method by choosing from the pool of words and concepts; text completion method was used at a rate of 5.26%. It was determined that control writing, guided writing and critical writing activities were used more frequently than other methods.

Conclusion

What are the activities in the writing sections of the New Istanbul Turkish for Foreigners B1 Textbook and are these writing activities compatible with CEFR writing skills? The following conclusions were reached regarding the question:

The New Istanbul B1 level textbook consists of six units and each unit consists of three parts. Writing activities are regularly included in each section. A total of 19 writing activities were included in the writing sections. Among the 19 activities, there are writing a dialogue, writing an e-mail, writing an invitation letter, writing an explanatory text, writing a comparative text, and writing a biography. It was concluded that different types of texts were included in the writing activities. In addition, it was seen that the writing activities examined were compatible with CEFR B1 level writing skills.

The other problem of the research is "Which writing methods are used in the writing activities in the New Istanbul Turkish for Foreigners B1 Textbook?" The following conclusions were reached regarding the question:

In the New Istanbul B1 textbook, the activities of the writing section are not quantitatively high, but it has been determined that many methods such as guided writing, controlled writing, creative writing, text completion, critical writing, writing by choosing from a word or concept pool are used in the activities. As Tiryaki (2013) stated in his study, different writing activities are of great importance in the textbooks used for teaching Turkish as a foreign language. The activities focused on creating paragraphs and writing texts. In writing studies, it is necessary to focus on how to write rather than what to write (Çakır, 2010). Expecting students to write by giving a topic that is compatible with the topic in the relevant unit of the textbook used as a source is not enough to improve writing skills. The student will not be able to determine how to write, what to talk about in which section, and will stay away from writing activities after a while. As a result, applied writing activities will not be productive. However, if the student is informed about how many paragraphs he should write and the topics that should be included in the paragraph, the process will progress in a positive way. In the examined book, the students were given a draft so that they could create paragraphs and texts, and necessary information and directions were given.

It was seen that the activity of “Telling our Dream Profession” in The 2nd Theme and the “Telling Our Dreams” activity in the 5th Theme were similar. It is thought that repetitive activities will not be interesting for students. (Raimes 1983; cited in Tok 2013), studies such as copying and sentence editing at basic levels; he mentions that guided writing and text completion studies can be at more advanced levels. It is thought that the examined textbook was prepared appropriately in this context.

In this study, only the writing tasks in the B1 level textbook from the New Istanbul Teaching Turkish to Foreigners textbooks were examined. The gaps in this study can be filled by examining other levels.

In this study, only the writing part activities were examined. Reading, listening and speaking sections can be studied.

Ethic

This study was conducted in accordance with the ethical standards of the institutional and/or national research

Committee and with the 1964 Helsinki declaration and its later amendments.

Author Contributions

All of the authors contributed equally in the article.

Conflict of Interest

The authors declare no conflict of interest in the research.

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Opinions of Pre-service Elementary School Mathematics Teachers on Misconceptions*

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Abstract

The aim of this study is to determine the opinions of pre-service elementary school mathematics teachers about misconceptions. For this purpose, case study, which is one of the qualitative research methods, was used. The study was conducted with 54 pre-service elementary school mathematics teachers. The data collection tool of the research consists of written response papers that they give to open-ended questions asked to participants. The views of pre-service elementary school mathematics teachers to open-ended questions were analyzed by content analysis. In order to prevent misconceptions that may arise during the lesson, pre-service elementary school mathematics teachers stated that they would; investigate the misconceptions, prepare for the lesson, study the subject, concretize the subject, visualize, determine the pre-learning, give daily life examples, etc. In order to determine whether their students have misconceptions, they stated that they would ask questions, evaluate the answers, solve the test, examine the mistakes and questions, observe the reactions, etc. It is recommended for further research to examine how pre-service elementary school mathematics teachers take precautions to avoid misconceptions by preparing a lesson plan, and to examine the situations of determining and correcting mistakes in students by observing the lessons of the teachers.

Key Words

Mathematics education • Misconception • Pre-service elementary school mathematics teachers.

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Concepts are one of the important elements of mathematics teaching and learning. Despite this importance, students have difficulties in learning mathematical concepts. The reasons for this difficulty are that the concepts being learned are abstract due to the nature of mathematics, that they are related to previous concepts and that they form the basis for new concepts to be learned. As in all disciplines, teaching that is suitable for the structure of mathematics is directly related to students' understanding of mathematical concepts (Baykul, 2003). Since the concepts related to mathematics are abstract in nature, it is very difficult to perceive these concepts directly when the developmental levels of children are taken into account and require a number of development processes (Ersoy, 2006).

In addition to the abstract nature of mathematics, the fact that concepts are related is one of the issues that challenge students. Defining a concept in a math class can be difficult. In order to define a concept, it is sometimes necessary to explain related concepts (Gökkurt Özdemir et al., 2017). Since each concept is related to the previous, next and other concepts, it is necessary to establish a relationship between the concepts for mathematics, which is a cumulative science. This cumulative structure reveals the importance of associating new concepts to be learned with previous learnings and concepts (Adıgüzel et al., 2018). Individuals build on their previous prior knowledge while learning concepts, and this prior knowledge they have sometimes causes difficulties in learning new concepts (Baki & Bell, 1997) and even makes it impossible (Baykul, 2003). It has been stated that misconceptions create great obstacles to the perception of mathematical facts and models, and that misconceptions cause the disconnection between related subjects (Kaynak et al., 2000). Considering this relationship of mathematical concepts, it is not possible for students who learn the preconceptions incorrectly on related subjects to learn new information. The reason for this can be shown as the fact that mathematics is cumulative, as well as the spiral structure of the curriculum (Ersoy, 2006).

Skemp divides mathematical knowledge into transactional and conceptual knowledge (Baki, 1998). Transactional information is defined as the information about knowing which steps should be taken in order without questioning the reason for the realization of a transaction (Baki, 2008). Conceptual knowledge is not only knowing the definition and name of the concept, but also being able to see the transitions and relationships between concepts (Soylu & Aydın, 2006). As long as the meaning of the concept is understood, concept knowledge is realized (Baki & Kartal, 2004). Similarly, Ersoy (2002) stated that both transactional and conceptual knowledge is needed in learning mathematics, and that transactional knowledge can be learned by memorizing, while conceptual knowledge requires understanding. Therefore, he emphasizes that the acquisition of conceptual knowledge takes longer and involves more complex processes. Operations teaching devoid of conceptual understanding causes mistakes and dislike for mathematics (Van de Walle et al., 2014). For this reason, it is emphasized that conceptual and transactional knowledge should take place in mathematics teaching in a balanced way (Baki, 1998; Baki & Kartal, 2004; Soylu & Aydın, 2006). By balancing conceptual and transactional knowledge, it becomes easier for students to reveal high-level thinking skills necessary for understanding mathematics, to make assumptions, generalize and make connections between subjects (Birgin & Gürbüz, 2009). Realization of conceptual learning has an important place in mathematics education in terms of both more permanent knowledge and the formation of a more meaningful learning situation. Difficulties experienced while learning concepts and incorrect information about the concept may cause

difficulties in learning many subsequent concepts and misconception of concepts (Duatepe-Paksu, 2013). Students may have misconceptions because they interpret the concepts, they have difficulty in understanding in accordance with their own understanding (Mayer, 1987).

Misconception is defined as the thought that contradicts the accepted meaning in science Nesher (1987), the understanding of students that produce systematic mistakes (Smith et al., 1993), the behaviors that emerge as a result of students' wrong beliefs and experiences (Baki, 1999), a concept that fits in the mind but is different from the definition of that concept scientifically (Yenilmez & Yaşa, 2008), a perception or understanding that is far from the view on which experts agree on a subject in the literature (Zembat, 2013), perceiving the concept differently from the scientifically accepted concept definition; maintain these perceptions in a systematic and persistent way (Okur, & Gürel, 2016). Definitions of misconceptions provide guidance on what to do to prevent misconceptions before they occur, or to remove them when misconceptions occur. Identifying and eliminating misconceptions is important and necessary for the quality of education (Ayyıldız & Altun, 2013; Özdemir Fincan, 2021). The first way to deal with the misconceptions that may exist in students is to be aware of the misconceptions. If students have misconceptions in their prior knowledge, they can prevent correct learning and lead to new misconceptions (Yenilmez & Yaşa, 2008). For this reason, first of all, students' misconceptions should be determined and then teaching methods should be applied to eliminate them (Alkan, 2009). Mistakes or lack of information detected at every stage of education should be corrected without losing time (Çetin, 2009).

Cornu (1991) classified the reasons that may lead to learning difficulties and misconceptions as epistemological, psychological and pedagogical. Epistemological reasons stem from the nature of the concept itself. Psychological reasons, on the other hand, are expressed as reasons arising from the student himself, such as the student's personal development, readiness, and mathematical comprehension ability. The reasons arising from teachers and teaching are called pedagogical reasons. In each field, pedagogical content knowledge gains importance (İpekoğlu, 2017). Shulman (1986) states that the types of knowledge about what kind of misconceptions students may have about the concepts taught and how these misconceptions can be eliminated are among the most important types of pedagogical knowledge that a teacher should have. However, concepts that are not learned correctly by teachers can be transferred to students (Ayyıldız, 2010). If teachers have misconceptions, they can negatively affect students' learning and transfer their misconceptions to their students (Adıgüzel et al., 2018). Similarly, Ryan and Williams (2007) stated that teachers have misconceptions among the causes of misconceptions in students.

While teaching mathematical concepts, teachers must have the right knowledge about the concept to be learned and prepare learning environments by using appropriate methods or techniques in a way that will not mislead students (Aktepe et al., 2015). Grouws and Schultz (1996) stated that teachers would be able to arrange their instructions if they knew possible misconceptions that students might have. This situation depends on how students can understand a certain mathematics subject, predicting the points that may seem complicated to students, and being aware of the misconceptions that may be found in students (Yavuz Mumcu, 2017). In order to recognize the misconceptions in students, teachers must first be aware of the misconceptions (Gökkurt Özdemir et al., 2017) and be able to analyze these misconceptions well (Zembat, 2013). Teachers who know the misconceptions and their

causes will be able to prevent possible mistakes or misconceptions of students (Gökkurt Özdemir et al., 2017). In case teachers realize that there is a misconception, they should first be provided to confront the misconceptions in the minds of the students. In this process, teachers should (a) identify students' misconceptions, (b) create a discussion environment among students so that they face their misconceptions, and (c) help students restructure and assimilate information with scientific approaches and models (Güneş, 2007). In addition, since misconceptions are based on the complex personal experience of each student in the past, they may have different misconceptions from other students (Yenilmez & Yaşa, 2008). Therefore, it can be stated that teachers have an important role in eliminating misconceptions. It is thought that it is important for pre-service elementary school mathematics teachers who are still in the training phase to know both possible misconceptions and how to correct them when they occur. In this direction, the aim of the study is to determine the views of pre-service elementary school mathematics teachers on misconceptions.

Method

Research Design

This study, which aims to determine the views of pre-service elementary school mathematics teachers on misconceptions, was conducted with the case study design, which is one of the qualitative research methods. The case study design serves the purpose of the study in revealing the current state of pre-service teachers' views on misconceptions, as it allows the researcher to analyze a situation, program, event, action, process or one or more individuals in depth (Creswell, 2003). Since the views of the participants were wanted to be presented in detail, it was thought that the most appropriate design among the qualitative research designs was the case study.

Participants

This study was carried out with 54 (41 female and 13 male) pre-service elementary school mathematics teachers studying at a state university in their third year. Participants were selected by criterion sampling, one of the purposeful sampling methods, and volunteers were included in the study. While determining the participants, attention was paid to the fact that they had taken the course on Special Teaching Methods and Misconceptions and the Nature of Learning. Thus, it was thought that the participants, who were knowledgeable about both teaching methods and misconceptions, would give a more detailed opinion on possible misconceptions. The names of the pre-service teachers, who were informed about the data collection process before the study, were kept confidential and the findings were presented with the coding of PT_1, PT_2, …, PT_{54}.

Research Instruments and Processes

The data collection tool of the research consists of the written response papers given to the two open-ended questions asked to the pre-service teachers. The following questions were asked to pre-service teachers in order to determine their views on misconceptions:

1. What kind of preparations do you make before the lesson in order to prevent misconceptions that may arise during the lesson? Please explain.

2. How do you know if your students have a misconception? Please explain.

Data Analysis

The answers of the pre-service elementary school mathematics teachers to open-ended questions were analyzed by content analysis. Content analysis enables the reduction of participants views into defined categories to better analyze and interpret them (Harwood & Garry, 2003). Before starting the analysis process, data collection tools were read several times to gain familiarity with the data. The opinions of the pre-service teachers were analyzed separately by the researchers and the categories were determined. It is considered important that different coders perform the data analysis rather than a single person (Patton, 2014). In addition, Miles and Huberman (1994) suggested using the intercoder reliability formula to determine the agreement between the analyzes performed by the two researchers separately. Accordingly, the inter-coder reliability coefficient was calculated as 86%. Then, the content analysis was concluded by reaching a consensus on different categories. Since repeated analyzes provide a more saturated and deep analysis from the data set (Miles & Huberman, 1994), all data were analyzed and reviewed once more, and the codings were checked and the categories were finalized. The categories in question and the related pre-service elementary school mathematics teachers who expressed their views on these categories were reflected in the tables and discussed in the findings section. The findings are presented with direct quotations from the views of pre-service elementary school mathematics teachers. While quoting the statements of the pre-service elementary school mathematics teachers, their opinions outside the relevant category were removed and replaced with "…".

Trustworthiness of the Study

It is stated that one or more of the trustworthiness criteria should be considered in evaluating qualitative research and checking the accuracy of the findings (Creswell, 2003; Guba & Lincoln, 1982; Merriam, 2009). Guba and Lincoln (1982) expressed trustworthiness criteria as (a) credibility, (b) dependability, (c) confirmability and (d) transferability (cited in Patton, 2014). For credibility, about one month after the study, the general research results were shared with the participants orally and participant confirmation was obtained. For Dependability, the analyzes were carried out by both researchers, paying attention to the consistency of the data with the results. A consensus was reached on the data analyzed by both researchers for confirmation and the codes were finalized. For transferability, the method of the study, participants, data collection tool and data analysis process are explained in detail.

Results

In this study, which aims to determine the views of pre-service elementary school mathematics teachers on misconceptions, the findings are presented in the context of the participants' preparations to prevent misconceptions and how they will determine whether their students have misconceptions. While presenting the findings, the pre-service teachers who expressed their opinions on the emergence of the codes are included in the tables. Thus, it was desired to provide transparency in data analysis and to allow comparison of direct quotations with the pre-service teachers who expressed the codes. Table 1 shows the preparations that pre-service elementary school mathematics teachers think to make in order to identify possible misconceptions that students may have before the lesson.

Table 1

Opinions of Pre-service Elementary School Mathematics Teachers on the Preparations They Will Make in order to Prevent the Formation of Misconceptions in Their Students

Opinions	*Pre-service Teachers*	*f*
Searching for misconceptions	PT_1-PT_2-PT_3-PT_4-PT_5-PT_6-PT_7-PT_8-PT_9-PT_{11}-PT_{12}-PT_{15}-PT_{16}-PT_{17}-PT_{18}-PT_{20}-PT_{21}-PT_{22}-PT_{24}-PT_{25}-PT_{27}-PT_{31}-PT_{34}-PT_{35}-PT_{36}-PT_{37}-PT_{38}-PT_{39}-PT_{41}-PT_{43}-PT_{45}-PT_{46}-PT_{48}-PT_{50}-PT_{51}-PT_{52}-PT_{54}	37
Material preparation	PT_2-PT_5-PT_7-PT_{11}-PT_{12}-PT_{14}-PT_{15}-PT_{17}-PT_{21}-PT_{22}-PT_{23}-PT_{24}-PT_{25}-PT_{28}-PT_{30}-PT_{33}-PT_{34}-PT_{35}-PT_{42}-PT_{44}-PT_{45}-PT_{53}-PT_{54}	23
Lesson preparation	PT_3-PT_4-PT_{12}-PT_{13}-PT_{14}-PT_{22}-PT_{23}-PT_{24}-PT_{26}-PT_{30}-PT_{33}-PT_{35}-PT_{39}-PT_{40}-PT_{42}-PT_{44}-PT_{45}-PT_{46}-PT_{47}-PT_{48}-PT_{49}	21
Activity preparation	PT_5-PT_6-PT_7-PT_{10}-PT_{12}-PT_{14}-PT_{17}-PT_{21}-PT_{29}-$ÖA_{34}$-PT_{36}-PT_{41}-PT_{42}-PT_{43}-PT_{45}-PT_{47}-PT_{48}	17
Question preparation	PT_5-PT_{10}-PT_{13}-PT_{17}-PT_{20}-PT_{21}-PT_{23}-PT_{26}-PT_{40}-PT_{41}-PT_{45}-PT_{46}-PT_{47}-PT_{50}-PT_{52}	15
Studying the subject	PT_6-PT_{13}-PT_{17}-PT_{20}-PT_{25}-PT_{26}-PT_{27}-PT_{30}-PT_{35}-PT_{39}-PT_{42}-PT_{47}-PT_{48}-PT_{50}	14
Worksheet preparation	PT_{21}-PT_{26}-PT_{29}-PT_{31}-PT_{36}-PT_{42}-PT_{49}	7
Lesson plan preparation	PT_2-PT_7-PT_{11}-PT_{24}-PT_{39}-PT_{40}-PT_{52}	7
Concretizing the subject	PT_2-PT_7-PT_{27}-PT_{28}-PT_{34}-PT_{44}	6
Visualization	PT_{15}-PT_{41}-PT_{43}-PT_{45}-PT_{54}	5
Identifying prior learning	PT_{10}-PT_{18}-PT_{19}-PT_{53}	4
Giving examples of daily life	PT_2-PT_9-PT_{20}-PT_{45}	4
Game narration	PT_7-PT_{11}-PT_{40}	3
Conceptual test development	PT_1-PT_{22}	2
Motivating for the lesson	PT_{32}-PT_{33}	2
Concept map preparation	PT_4	1
Concept cartoon preparation	PT_4	1

When Table 1 is examined, it is observed that the majority of the participants stated that they would investigate the possible misconceptions of the students. The pre-service teachers stated that they could have information about the misconceptions and shape their preparations in the context of these misconceptions. For example, PT_{25} stated that with the help of the theses she will examine, she will have information about the misconceptions and will use this information while processing the subject as follows:

> *In order to know the misconceptions beforehand of the students about that subject and to have knowledge about it, I would examine the thesis on this subject and do research. I identify possible misconceptions and pay attention to these issues while explaining the subject. (PT_{25})*

23 of the pre-service teachers stated that they would prepare materials to prevent misconceptions. In order to prevent the occurrence of misconceptions, PT_{54} expressed his opinion that materials should be used if appropriate as follows:

Misconceptions about the course that the student may fall into should be investigated in advance. In order to avoid these misconceptions, materials should be used if necessary and appropriate. (PT_{54})

21 pre-service teachers stated that they will prepare for the lesson in order to prevent misconceptions that may occur in their students. On the other hand, 17 pre-service teachers stated that they would prepare activities to use in the lesson so that they could prevent possible misconceptions that students might have. PT_{42}'s view on the preparation to avoid misconceptions is as follows:

The teacher should come to the lesson prepared and well-informed. At the beginning of the lesson, the teacher should make a preparation that can attract the attention of the students. He can bring materials that he can use while teaching the lesson and prepare an activity or worksheet. (PT_{42})

There are 15 pre-service teachers who think that they can prevent the possible mistakes of the students with the questions they prepare. In addition, it is seen that 7 pre-service teachers have the opinion that misconceptions can be prevented with worksheets. PT_{13} stated that with the questions he prepared, PT_{49} could identify the types of misconceptions that students might fall into through the worksheets, as follows.

In order to prevent misconceptions that may arise during the lesson, I study and prepare for the subject of the lesson in advance. In order to prevent misconceptions, I prepare questions in a way that corresponds to the tricks so that I can see which student falls into which misconception. (PT_{13})

We can prevent misconceptions and take precautions with the worksheets we prepare ourselves before the lesson. (PT_{49})

Some of the pre-service teachers think that they can prevent their students from making mistakes by working on the subject. The opinion of PT_{26}, one of these candidates, is as follows.

In order to prevent misconceptions that may arise during the lesson, I study the subject I am going to teach in that lesson well before coming to the lesson, and I pay attention teaching my lesson without hesitation. (PT_{26})

While 7 of the pre-service teachers emphasized the importance of preparing a lesson plan, 6 pre-service teachers stated concretizing the subject and 4 pre-service teachers stated using real-life examples among the preparations they would make to prevent students' misconceptions. In this context, the statements of PT_2 are as follows:

Before the lesson, the teacher can determine the misconceptions that the students can make about the subject to be covered and make an appropriate lesson plan to prevent them. In order to understand the subject in this plan, examples of daily life and our environment should be given. We need to make the subject concrete. Appropriate mathematics material related to the subject to be covered in the lesson can be prepared and taken to the class. (PT_2)

There are 5 pre-service teachers who stated that they would use visual elements in their lessons with the thought that visualization can prevent possible mistakes of students. PT_{43} expressed his opinion that he could avoid misconceptions by visualizing the concept with the help of tables and figures he would prepare, as follows.

Before the lesson, I would try to identify the misconceptions that students might fall into. Then, in order to prevent these misconceptions, I would prepare activities that would attract students' attention and facilitate their learning, and I would apply them in the lesson. I would make a figure or table to visualize the concept. (PT_{43}*)*

6 of the pre-service teachers stated that they would try to determine the pre-learning of their students. Thus, the opinion of PT_{10}, who stated that he aimed to prevent the formation of misconceptions due to the deficiencies in the pre-learning of the students, is as follows:

For students not to fall into misconceptions at the level of readiness, I would be related to that subject and make sure that the subjects they learned were understood. I would provide this through a readiness test or question and answer in class… (PT_{10}*)*

Pre-service teachers stated that they would look for ways to motivate students before the lesson, develop a conceptual test, and prepare a game, concept map or concept cartoon in order to prevent the misconceptions that may occur in their students. In this context, the views of PT_{33}, PT_{22}, PT_{40} and PT_4 are as follows.

The course preparation process is very important in this sense. In order to increase the motivation in the lesson, students should be chatted with… (PT_{33}*)*

… Considering the misconceptions that may occur in educators beforehand, a conceptual test can be prepared according to the misconceptions that may occur. If the subject is difficult to understand and the use of materials is appropriate, the material should be prepared and brought to the class before the lesson. (*PT_{22}*)

First of all, I prepare a lesson plan so that I do not experience confusion while teaching in the classroom. I research which game is easier for my students to learn and bring it to class. (PT_{40}*)*

Students may have misconceptions on some issues. Many techniques and methods can be used to prevent them. Many methods such as concept maps and concept cartoons should be used to find out where and how children will go wrong. And in this way, by making a good preparation, it will prevent misconceptions. (PT_4*)*

In addition to taking precautions to prevent the formation of misconceptions, it is also very important to be able to determine the formation of misconceptions. In this direction, middle school mathematics pre-service teachers were asked for their opinions on how to determine whether their students had misconceptions. Findings related to these views are given in Table 2.

Table 2

Opinions of pre-service teachers *on determining their students' misconceptions*

Opinions	Pre-service teachers	f
Asking questions	PT_1-PT_1-PT_{14}-PT_{17}-PT_{18}-PT_{19}-PT_{11}-PT_{12}-PT_{13}-PT_{14}-PT_{16}-PT_{17}-PT_{18}-PT_{19}-PT_{20}-PT_{21}-PT_{22}-PT_{23}-PT_{24}-PT_{25}-PT_{26}-PT_{27}-PT_{33}-PT_{34}-PT_{37}-PT_{38}-PT_{40}-PT_{41}-PT_{42}-PT_{45}-PT_{46}-PT_{50}-PT_{52}-PT_{53}-PT_{54}	35
Evaluating answers	PT_1-PT_3-PT_4-PT_6-PT_7-PT_8-PT_{12}-PT_{13}-PT_{14}-PT_{15}-PT_{17}-PT_{18}-PT_{21}-PT_{22}-PT_{25}-PT_{27}-PT_{29}-PT_{31}-PT_{32}-PT_{33}-PT_{36}-PT_{38}-PT_{39}-PT_{40}-PT_{41}-PT_{44}-PT_{45}-PT_{51}-PT_{52}-PT_{53}	30
Giving test	PT_2-PT_5-PT_6-PT_7-PT_{10}-PT_{12}-PT_{13}-PT_{15}-PT_{19}-PT_{20}-PT_{21}-PT_{23}- PT_{28}-PT_{31}-PT_{35}-PT_{39}-PT_{43}-PT_{47}-PT_{49}-PT_{52}-PT_{53}	21
Examining errors	PT_6-PT_9-PT_{19}-PT_{26}-PT_{27}-PT_{32}-PT_{36}-P_{45}-PT_{49}-PT_{50}	10
Examining errors	PT_8-PT_{11}-PT_{17}-PT_{21}-PT_{32}-PT_{42}-PT_{44}-PT_{45}	8
Observing reactions	PT_{29}-PT_{30}-PT_{31}-PT_{36}-PT_{47}-PT_{48}	6
Getting the students involve in activities	PT_1-PT_5-PT_{10}-PT_{14}-PT_{24}-PT_{35}	6
Getting feedback	PT_{21}-PT_{33}-PT_{42}-PT_{54}	4
Creating a suitable classroom environment	PT_{24}	1

When Table 2 is examined, it is seen that 35 of the secondary school mathematics pre-service teachers stated that they would ask questions to their students in order to determine whether there was a mistake in their students. For example, PT_{40} stated that he would prepare questions about his possible misconceptions, and after examining the answers to these questions, he could reveal whether his students had any misconceptions and, if any, the reasons for their misconceptions. Similarly, PT_{52} stated that he would understand whether his students had any misconceptions by the answers they gave to the questions he asked, and that he would try to be a better teacher by improving his teaching methods. PT_{33}, on the other hand, stated that the student's giving correct answers does not mean that he does not have a misconception, therefore, the students' solutions should be examined and questioned as follows:

> *I prepare questions that they can experience misconceptions. Then I check their solutions one by one to try to understand how they solved it, what they thought. Or I write questions on the board and check how they solve them. In this way, if they made a mistake, I would understand at that moment what mistakes they made and why. (PT_{40})*

> *I understand whether my students have misconceptions by the answers they give to the questions I ask. Thus, I try to develop solutions and my way of explaining according to their answers in order to become a better teacher. (PT_{52})*

> *Just finding the right answer does not mean that the student does not fall into misconceptions. Therefore, distinctive questions should be asked to the student and feedback should be obtained. A lot of attention should be paid to the points where the student can make mistakes. In addition, the way of going should be looked at, not the result of the answers. The student should be constantly asked questions. How did you think about this question? Why did you follow such a path? such questions should be asked. (PT_{33})*

Teacher candidate drew attention to the importance of evaluating student responses in determining whether students have misconceptions. PT_{54}, one of the 30 pre-service teachers who expressed an opinion in this direction, stated that what kind of misconceptions the students (if any) had could be revealed through an evaluation to be made at the end of the subject teaching. PT_{21} emphasized the necessity of making assessments throughout teaching as follows:

> *After teaching the subject, an evaluation is made and it is determined whether the students have misconceptions and what kind of misconceptions, if any, have occurred. These misconceptions do not have to be determined by evaluation, questions are asked to the students during the lesson and the misconceptions are determined according to the feedback received. (PT_{54})*

> *… We also need to make frequent assessments while teaching. We can have students solve some examples and find out if there are any misconceptions in the same way. (PT_{21})*

21 of the pre-service teachers stated that they could identify their mistakes, if any, by having their students solve the test. For example, PT_{21} emphasized that after the lesson was taught, she would use the test questions to get feedback from the students and that she could reveal possible misconceptions by examining student responses. PT_6, on the other hand, stated that with the test he will prepare at the end of the subject, he will examine the solutions of the students and determine the reasons for making mistakes, and that he can support the students in eliminating the mistakes by solving the questions in the classroom environment.

> *After the lesson is done, we have to get feedback from the student. We can do this with a little test we prepared. We can examine these answers and find out on which subjects he has misconceptions...* (PT_{21})

> *At the end of the subject, I prepare a test to cover the misconceptions about the subject and have them solve it. Afterwards, I collect the solved tests from the students and identify the questions that the students got wrong. By examining their solutions, I try to understand whether the reasons for making mistakes are due to misconceptions. I provide the solutions on the board so that all students can see the questions of the test, and I help the students to correct and understand the mistakes they make. (PT_6)*

Ten of the pre-service teachers think that they can reveal whether they have misconceptions by examining the mistakes made by their students, and 8 of them by examining the questions asked by the students. There were 6 pre-service teachers who expressed the opinion that they could have an idea about whether they had a mistake or not by observing the reactions of the students. In this context, the opinions of PT_{36}, PT_{45} and PT_{48} are as follows:

> *...Then I collect the solved tests from the students and identify the questions the students got wrong. By examining their solutions, I try to understand whether the reasons for making mistakes are due to misconceptions. I solve the questions of the test on the board in a way that all students can see, and I help the students to correct and understand the mistakes they make*. (PT_{36})

> *We can understand whether students have misconceptions from the question solutions and the questions they ask during the lesson. (PT_{45})*

... I could understand whether the students had misconceptions from the reactions of the students while I was explaining them during the lesson. (PT_{48})

Pre-service teachers stated that they can determine whether their students have misconceptions by performing activities in the classroom (6 participants), making evaluations with the feedback they receive (4 participants), and creating a suitable learning environment. In this context, the opinions of PT_{24} and PT_{42} are as follows:

... I also prepare the activities that I will have my students do in order to eliminate these misconceptions. I provide them with a suitable classroom environment where they can freely express their thoughts. (PT_{24})

Feedback from students shows whether they have misconceptions or not. (PT_{42})

Discussion, Conclusion & Suggestions

The results obtained in this study, which aimed to determine the opinions of pre-service elementary school mathematics teachers about misconceptions, will be discussed in two groups: (a) what kind of preparations they will make before the lesson in order to prevent misconceptions that may arise during the lesson, and (b) how they will understand whether their students have misconceptions. In order to prevent misconceptions that may arise during the lesson, pre-service elementary school mathematics teachers expressed their opinions about searching for mistakes, preparing for the lesson, studying the subject, concretizing the subject, visualizing, determining the pre-learnings, giving examples of daily life, explaining with games, developing a conceptual test, motivating the lesson and using materials, activities, questions, worksheet, lesson plan, concept map, concept, preparing the cartoon.

The pre-service elementary school mathematics teachers stated that they would try to improve both their field and field teaching knowledge by studying the subject before the lesson, preparing for the lesson, and investigating the misconceptions. In different studies, it is also emphasized that misconceptions should be known by teachers (Alkan, 2009; Berg & Brouwer, 1991; Güneş, 2007; Yavuz Mumcu, 2017; Gökkurt Özdemir, Bayraktar & Yılmaz, 2017). Because having the knowledge of misconceptions helps teachers to interpret the behaviors and ideas of their students and to prepare effective teaching plans (Geddis, 1993; Magnusson et al., 1998 as cited in Halim & Meerah, 2002). Thus, teachers who have knowledge about possible misconceptions will be able to determine effective teaching strategies (Jordaan, 2005) to prevent them and organize their teaching (Grouws & Schultz, 1996, cited in Williams, 2001). In order to prevent the formation of misconceptions, pre-service elementary school mathematics teachers also drew attention to the importance of being prepared for the teaching process by preparing a lesson plan, as well as investigating misconceptions.

In order to prevent the formation of misconceptions, pre-service elementary school mathematics teachers stated that they will visualize, determine preliminary learning, give an example of daily life, explain with a game, develop conceptual tests, motivate the lesson and prepare materials, activities, questions, a working paper, a concept map, a concept cartoon. Based on this, it can be stated that pre-service elementary school mathematics teachers who are aware of the possible misconceptions that students may have, plan to design a learning environment that will support students' conceptual understanding. While teachers' knowledge of misconceptions ensures that the concepts are

permanent and meaningful learning (Özdemir Fincan, 2021), it will also prevent possible misconceptions of students (Gökkurt Özdemir et al., 2017). In this respect, it is thought that it is important to consider misconceptions during the planning of teaching and thus to create opportunities that support learning (Kula & Bukova Güzel, 2014).

Pre-service elementary school mathematics teachers stated that they can understand whether their students have misconceptions during the lesson by asking questions, evaluating the answers, solving the test, examining the mistakes and questions, observing the reactions, doing activities, getting feedback, and creating a suitable classroom environment. In this context, Şandır and Aztekin (2013) also stated that knowing misconceptions is not enough, that these misconceptions should be understood in detail and strategies to reveal them should be used. Because it is important to identify the misconceptions of the students and to carry out the elimination studies (Jonnes, & Tanner, 2000 cited by Ayyıldız & Altun, 2013). In this context, besides knowing the effective strategies to prevent misconceptions (Graeber, 1999), teachers who identify misconceptions should also have knowledge of teaching methods to eliminate them (Alkan, 2009).

In line with the opinions of the pre-service elementary school mathematics teachers, it can be stated that they do not have enough information to detect the misconceptions. In fact, Duru (2011) focused on counterexamples and suggested presenting contradictory examples in the classroom in order to eliminate students' misconceptions. This will help students come face to face with their misconceptions by creating a suitable learning environment. Jonnes and Tanner (2000) also emphasized that by creating environments where learners can express their thoughts comfortably, practices that will enable them to confront existing misconceptions should be implemented (cited by Ayyıldız & Altun, 2013).

Since misconceptions are based on the complex personal experience of each student in the past, they may have different misconceptions than other students (Yenilmez & Yaşa, 2008). In this respect, it is thought that teachers' knowledge and experiences about learners are also very important in overcoming misconceptions. Therefore, it is thought that it is important to have both subject matter and pedagogical content knowledge in knowing misconceptions and overcoming them. Teachers who do not have sufficient content knowledge have difficulty in recognizing students' misconceptions (Halim & Meerah, 2002). Therefore, teachers are expected both to carry out their teaching to prevent the formation of misconceptions and to know how to overcome misconceptions when they arise in addition to knowing students' possible misconceptions (Kula, Bukova Güzel, 2014). For this reason, the teachers must be informed of students' misconceptions (Grouws & Schultz, 1996). Knowledgeable teachers, on the other hand, can reveal students' misconceptions to a large extent (Gess-Newsome, 1999). For this reason, pre-service elementary school mathematics teachers' development of their subject matter knowledge will contribute to preventing the formation of misconceptions, identifying and eliminating the misconceptions. It was determined that pre-service elementary school mathematics teachers had some views on preventing, identifying and eliminating misconceptions. However, it is thought that it is important for pre-service elementary school mathematics teachers to be informed in detail about how to prevent possible student misconceptions, to identify the misconception and to correct it when faced with it. In this direction, it can be stated that besides having field knowledge, it is also important to have knowledge of field teaching in order to know and overcome misconceptions. This study was

carried out in order to determine the opinions of pre-service elementary school mathematics teachers about misconceptions in general. In particular, it will be possible to investigate the opinions of the pre-service elementary school mathematics teachers regarding the possible misconceptions that may be held in certain concepts. For further research, it is recommended to examine how pre-service elementary school mathematics teachers take precautions to avoid misconceptions by preparing a lesson plan, and to examine the situations of identifying and correcting students in case of misconceptions by observing their lessons.

Ethic

This study was conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. Informed consent was obtainted from all students.

Author Contributions

The authors made equal contribution to this study. Therefore, each author is equally responsible.

Conflict of Interest

The authors declare that they have no conflict of interest

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A Psychological Perspective on Infidelity in the Context of a Literary Work: Anna Karenina-Lev Tolstoy

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Abstract

Literature and psychology, which have different characteristics from each other, often try to study common issues. Both fields benefit from each other in terms of subject analysis. Just like in this regard, studies on the subject of deception, which are studied in both areas, are not considered sufficient in the literature. Studies in the field on the subject of infidelity are not considered sufficient and more factors that may be effective in infidelity are discoursed. The main purpose of this study is to examine the infidelity behaviors in the novel Anna Karenina written by Lev Tolstoy within the framework of psychoanalytic, attachment, schema theories, and risk factors. As a result, it was seen that risk factors such as attachment, psychoanalytic perspective, schema concepts, and gender corresponded to the examples of infidelity in the book. A similar result could not be reached with the duration of the marriage and the number of children, which are among the risk factors.

Key Words

Anna Karenina • Infidelity • Tolstoy

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The concept of infidelity or cheating on, which has become a part of human life from past to present, is defined as having a close relationship with another person other than one's present partner in romantic relationships (Hendrick, 2016). In order for the definition of infidelity to be valid, it is not necessary for the couples to be bound to each other by marriage. Infidelity, which can be experienced in any bilateral relationship (Drigotas & Barta, 2001), is defined as a breach of the agreed trust (Blow & Harnett, 2005). Infidelity (Kelly & Conley, 1987), which is the biggest factor in the dissolution of marriages, is not welcomed in couple relationships such as dating and cohabitation (Hendrick, 2016). As infidelity, which causes great destruction in the relationship (Aliabadi & Shareh, 2021), has a multidimensional and complex structure (Thomson, 1982), environmental events, some sensitivities that individuals experience in their relationships, and their upbringing (Weeks, et al., 2003) will be taken into account to be examined in this study.

Although there are studies on infidelity when the literature is reviewed, they are not sufficient. The concept of infidelity, which is thought to have not been studied enough, attracts the attention of not only the field of psychology but also of literature, and the subject is frequently mentioned in the works. For example, in the novel "Anna Karenina" written by the Russian writer Lev Tolstoy between the years of 1873-1879, the theme of infidelity was worked on. This theme has remained up to date due to its subject and many factors. Although the subject of infidelity is included in research within psychology, which explains human emotions, behaviors, and mental processes by taking it into a scientific framework, it is observed that the place of literature is undeniable even in the birth of psychology, especially in Freud's thoughts and theories (Korkut-Naykı, 2012). For this reason, the novel "Anna Karenina", which is a literary work, has been examined based on the perspective of infidelity.

When the subject of infidelity is examined, the individual is advised that sex is bad, negative, or a thing not to be talked about at a young age, while the opposite is remarked to the individual when he/she becomes an adult, and it is thought that this situation causes people to call their sexual partners bad (Weil, 1975). The perception of the sanctity of the family, which hinders sexual pleasure due to the Oedipus and Electra complex, can be an obstacle for the individual to center their desires around a single object (Freud, 1938). In other words, it has been revealed that while individuals are less satisfied with their married partners, their satisfaction from extramarital affairs is higher (Weil, 1975). Horney in her explanation, which supports Freud, stated that the man's relationship with the woman he admires may be sexually deprived and that in this deprivation, he may be drawn to another woman with a lower socioeconomic level (Horney, 1937). Situations similar to the definition are encountered in the novel as well. Anna Karenina and her husband Aleksey Karenin define the marriage which lasted for eight or nine years as the sanctity of the marriage bond, the sanctity of being a mother, and obeying the monotonous social rules. Even when Anna Karenina was in the process of breakup, she stated that she was not a good woman, but that she was a mother, and for this, she had to take her son. While Anna Karenina states this, her husband Aleksey Karenin thinks that a child cannot be entrusted to such a woman because the situation may bring a disgrace to the sanctity of the family and states that his child should stay with him. On the other hand, Anna Karenina's older brother Oblonski, after cheating on his wife, whom he has been married to for nine years, thinks that his wife is a pure and clean housewife and that she will not leave the house because of their five children, even if it is not for himself. As the reason for cheating on his wife, he states that he has not lost his ability to love, but now he prefers younger and more loving women. It is

mentioned that Oblonski, who is observed to have no regrets about his cheating behavior for a long time, found another lover for himself in the future, and this new lover is described as young and beautiful. In a study conducted by Glass & Wright in 1985, it was determined that men were more motivated to repeat their cheating behavior., Anna, who was called by Oblonski to save his marriage after being caught cheating, talks about the sanctity of the family and the woman while trying to console her brother's wife. We can observe a similar situation when Kity, who will marry Levin in the future, dreams of marrying Vronski during the dating process and Vronski states that he likes that Kity is attached to him. Vronski described his behavior as a harmless method of seduction, not pursuing marriage.

Babies show some reactions to the disappearance of attachment objects according to their attachment style (Bowbly, 1980). It is stated that the attachment styles developed during infancy and the reactions exhibited directly affect romantic relationships and friendship relationships in the future (Hazan & Shaver, 1987). Attachment styles developed in adulthood have been shown to be a factor in determining the motivation for cheating (Allen & Baucom, 2004). The relationship between individuals' attachment styles and cheating is frequently investigated. In studies conducted to determine the relationships between individuals' attachment attitudes and their cheating behavior, it was revealed that anxious or avoidant attachment style has a positive and significant effect on exhibiting cheating behavior (Bogaert & Sadava 2002; Gentzler & Kerns, 2004; Hatamy, et al, 2011;Treas & Giesan, 2000). It is also among the findings of the study that individuals with different attachment styles have difficulties in meeting each other's needs (Colin & Read, 1990). Although it is not possible to obtain complete information about the attachment styles of the characters in the book, some clues can be detected. For example, the fact that the aunt is the most influential family member in the marriage process of Anna Karenina raises questions about who is the caregiver and has a close relationship with her. No positive information was given about the attachment status of the husband and wife to one another before marriage. Similarly, Aleksey Karenin, who stayed with his uncle from the age of ten with his brother, grew up mostly with academic goals. It was not mentioned that there was a special bond between him and his uncle during the process of growing up and getting a job. In addition, his brother, whom he saw as the closest to him and said that he could open his heart to, died of disease while he was on duty abroad. Vronski, another novel character, stated that after his parents separated, his mother met with other people in high society, and because of this attitude, he did not trust his mother, he never respected her sincerely, and he only acted respectfully because of the society's expectations. This allows us to make some comments about the attachment styles of the novel characters.

Based on early maladaptive schemas conceptualized on the basis of attachment (Young et al., 2003; Young & Klosko, 1994), research findings in the literature often assume that there may be a positive and significant relationship between cheating and attachment, as well as a relationship between schemas and cheating on (Çavuşoğlu, 2011; Güler, 2022). Among the schemas that predict the tendency to cheat in women rejection, disconnection, and inability to establish close relationships include the belief that stability, trust, care, empathy, and feelings of love will not be met (Martin & Young, 2010). The emotional bonding needs of these individuals are not adequately met, and as a result, they believe that they will never be understood and will be alone forever (Young, et al., 2003; Young & Klosko, 1994). Among the partners whose needs are not met emotionally, Aleksey Karenin, who lost a parent at a young age, and Anna Karenina, where her aunt is more active even in the marriage process, can be

given as examples. It is also noticed that Vronski could not develop enough emotional bonds with his caregiver. These situations were effective in the formation of the schemas of the characters.

It is observed that individuals who have abandonment and instability in their schemas and try to cope with it with over-compensation method tend to see infidelity as more reasonable because of the fear of being abandoned as a result of being cheated on and being alone (Young & Klosko, 1994). Both Alexi Karenin and Dolly, who are cheated on in the novel, have agreed to forgive their cheating partners and get back to their lives after many internal arguments. From this point of view, it can be thought that there is abandonment/instability in the schemas of individuals. There are findings that there is a direct correlation between the increase in sacrifice and the increase in investment in the relationship (Drigotas & Barta, 2001). In addition, individuals with the abandonment/ instability schema always try to keep a partner in reserve in case the key person in their lives leaves them (Young & Klosko, 1994) and they constantly believe that they will be manipulated, cheated on, and lied to (Young et al., 2003). Similarly, Anna Karenine did not separate from her husband while she had a lover, as long as she did not have to. While she was separated from her husband and lived with her lover for a certain period of time, she tried to attract her husband again after the difficulties she experienced during the birth process. Toward the end of her relationship, she made everything more complicated by thinking that her lover Vronski would lie to her all the time and that he would no longer love her as before, and that he would leave her. In the following processes, with the support of the idea that "I am different and no one understands me" (Loose, et al., 2018), the social isolation scheme may have started to be triggered in Anna Karenina, who is not wanted by the society and is openly excluded from meetings because she cheated on her husband.

According to evolutionary psychology, men consciously or unconsciously aim to get as many women pregnant as possible and reach the best partner (Schmitt & Buss, 2001). Women, on the other hand, prefer people who they believe can offer better quality of life by providing the best care for themselves and their children (Hendrick, 2016; Sargın, 2008). Although the French governess did not become pregnant as a result of Oblonski's cheating behavior, Oblonski continued to befriend other women and cheat on his wife. Anna Karenina also often tried to replace her husband, whom she thought was not taking care of herself and her son enough, with Vronski. Together with Vronski, Anna took care of his son and tried to offer him the life that she believed was the best.

As a result of the reward cost analysis, it is stated that individuals show stability in the case of cheating or not cheating, based on the evaluation of their relationships, the investment they make in their relationships, and the satisfaction they get from the relationship (Hall & Fincham, 2006; Rusbult et al., 1998; Seal et al., 1994; Weil, et al., 1975). If the individual's gain is more than his loss, it is accepted that he has not achieved satisfaction from his current relationship. This criterion is effective in whether or not individuals continue their relationships (Terzi İlhan & Işık, 2017). Although Oblonski was sad after his wife learned that she had been cheated on and asked for help from his sister, after the situation improved, he pointed out the old assistant while talking to his friend Levin and stated that the human eye would want to see a young beautiful person and he continued to cheat on his wife with a new lover in the process. This enables us to conclude that when Oblonski evaluates his relationship, he thinks that he is insufficient in reaching the desired satisfaction and exhibits these behaviors. In the novel "Dolly" the wife of

Oblonski, who claims that as a result of her husband cheating on her, does not love him as much as before, decides to continue the relationship for reasons such as her children being able to prepare for life in a healthy way, having order at home, and thinking about how her life will be in the future. Here, the effective factor in Dolly's continuation of the relationship is observed as the investment made in the relationship. Anna Karenina, on the other hand, initially wanted to both live with her son in her husband's house and be with Vronski, but she had to leave her house as a result of her pregnancy and the disturbing behavior of her husband and society towards her, although she could not completely end her relationship with her husband. The factor that is effective in Anna Karenina's not wanting to leave the house at all and having to leave the house can be interpreted as the higher prices she pays as a result of the award-cost analysis. According to the investment theory, for novel characters the satisfaction that provides the continuation of the relationship is valid for Oblonski's wife, but not for Anna Karenina, who decided to end the relationship.

In the study conducted by (Boon, et al., 2014), they found that individuals do not exhibit cheating behavior due to social support. Another finding is that the dating of rich married men and young women in Nigeria is accepted even if it is not tolerated by society (Smith, 2010). In the novel, this situation emerges as two different social reactions for two different genders. For Anna, the situation is a deterrent attitude with reactions such as the exclusion from society and even the absence of any woman in her side, while in Russian culture, it is accepted that men who make married women cheat on their spouses are more successful in society, and it is considered more normal and a sign of success for men to do this behavior. Dolly, who was cheated on by her husband, was given advice for her family and children to ignore this and forgive her husband, that is, to accept the situation as normal. While Vronski states that he does not respect his mother, who cheated on his father and took other people into her life after separation, he still accepts this situation as normal for himself. As a result of cheating in the novel, both Anna Karenina's husband and Oblonski's wife have chosen to forgive their partners. Studies on interventions in cases of infidelity in marriage have often concluded that partners forgive each other (Askari & Bajlan, 2014).

Gender, which is considered as a risk factor in studies on cheating, is often the subject of research. In studies conducted in different cultures, it has been determined that the number of men who state that they have cheated on their female partners at least once while in an emotional or physical relationship is higher than women in every society, although their rates are different. (Buunk & Dijkstra, 2000; Hatipoğlu, 1993; Marin, et al., 2014; Weil, 1975; Wiederman & Hurd, 1999). As a result of the analysis of the novel characters, basically, Anna Karenina cheats on her partner, as well as Oblonski cheats on her partner. It is also stated that there is a similar situation between Count Vronski's mother and her partners, although it is less mentioned in the book. The fact that Levin, who married Oblonski's sister-in-law, had siblings from the same mother and different father, gives information about the fact that there were more male partners who were cheated on in the past. According to a study conducted by Friker, which supports the novel, the number of cheating by women was found to be higher than that of men (Çıkıt, 2017). Although different findings are obtained in different studies, the numerical difference between men and women regarding cheating also differs in exhibiting cheating behavior and questioning the causes of cheating behavior. According to this, men tend to cheat on their partners more sexually (Blow & Hernet, 2005; Atkins et al., 2001) because their relationships do not go as in their dreams, they seek instant pleasure, seek novelty, and take revenge on

their partner (Norment, 1998). While Anna Karenina's older brother Oblonski was trying to express his sincerity about his remorse and ask for forgiveness, he excused himself by stating that cheating was a momentary whim. When women's cheating is examined, it is seen that the reasons are the effort to increase self-confidence, the desire to compensate for emotional neglect, the desire to find unmet romance from the partner, the search for new excitements, the desire to be with someone who is in a better position financially, insufficient sexual satisfaction and excess household responsibility. As a result of these, it was found that women primarily cheat emotionally and hurt their partners. (Norment, 1998) (Atkins et al., 2001; Blow & Hernet, 2005;

Glass & Wright, 1992). In the novel, Anna Karenina, who cheated on her husband, blames her husband for emotionally neglecting her, always being involved with his work, and on top of that by bringing work to the house. Anna Karenina, who cheated on her husband with Vronski, started to cheat on her husband emotionally at the outset, just as in the findings. In cheating, sexual satisfaction is also one of the effective risk factors, especially for male partners (Dollahite and Lambert, 2007; Liu, 2000).

According to the research conducted between the number of children in marriage and cheating, no significant finding was found (Blow & Harnett, 2005). When the heroes in the novel are examined, it is stated that Anna Karenina and Aleksey Karenin have one child, Oblonski and Dolly have five children, Vronski has two siblings and Levin has three siblings. Although there are different numbers of children, it was observed that the partners cheated on each other in the families of the given characters. Based on the finding, no connection could be found between the number of children and cheating in the novel. Regarding the effect of having a child on marriage, there is a finding that it positively increases the intimacy in marriage (Callan, 1983; Sprecher, et al., 1998), as well a finding that not having a child negatively affects the intimacy and the absence of a child affects the intimacy positively (Fışıloğlu, 1992; Pletchaty et al., 1996). In addition to the findings related to the increase in infidelity as the duration of marriage increases (Seal, et al., 1994), there are also findings related to the decrease in infidelity and increase in marital satisfaction as the duration of marriage increases (Aktürk, 2006; Dökmen & Tokgöz, 2002; Grandon et al., 2004). Another finding is that there is no significant relationship between the time spent in marriage and cheating (Acar, 1998; Patrick, 2002). In the novel, Anna Karenina has been married to her husband for about eight years, and Oblonski to his wife for nine years. According to the research findings, both marriages are not included in the long marriage period.

In many religions, cheating is a religiously forbidden phenomenon. This phenomenon aims to keep partners away from cheating and prevent individuals from hurting each other (Zink, 2008). In the religion of Christianity, which is professed by the majority of Russians, regarding the infidelity it is stated that individuals should be content with the woman the creator gave them and forget about other women (Bible, 2012). While the Qur'an states that there is a heavy penalty for cheating on one's spouse (Kuran, 2010), the penalty for cheating in Judaism varies depending on whether the individual is married or not, as in Islam, but there are sanctions for both partners (Güngören & Turan, 2018). Although there are prohibitions on cheating in religions, the fact that it is given to the individual under the pressure of society is a risk factor in cheating (Yenicer and Kökdemir, 2004). In the book, it is often talked about the wrongness of this in religion and the punishment of the individual in the face of cheating. When Anna Karenina first

told her husband her that she cheated on him, he stated that they were bonded by God and that she needed to find the right way. When divorce is required, it is accepted as a social rule that it can only be accepted as a result of physical inadequacy and infidelity. In addition, it is known that the remarriage of a woman who divorced her husband, in terms of religion and society, is not accepted in Russian laws. Although Anna Karenina's husband often pays attention to behaving in accordance with religion and society, he thinks that she does not behave in accordance with religion and society, and he often expresses this.

Of the evaluated risk factors, the age status of individuals does not differ significantly according to studies (Acar, 1998; Günay, 2007; Güven, 2005). In the book, there is more of an age gap between Anna Karenina and her husband, who cheated on her partner, while the age gap between Oblonski and Dolly is one.

Whether or not the partners separate as a result of cheating, the process is completed with difficulty (Blow, 2005). As a result of their sexual cheating, it is seen that male partners often exhibit behaviors such as sexual coercion and violence against their partner (Goetz & Shackelford, 2009; Levine, 2005), and this situation also triggers uncomfortable sensations such as emotional hurt, shame, sadness, anxiety, anger, jealousy, and revenge and causes permanent wounds in individuals (Blow, 2005; Levine, 2005). It is observed that men are more influenced than women in this process and blame themselves (Boukheut, et al., 2003). After learning that Anna Karenina was cheating on her, her husband did not show great reactions, thinking that the situation would be temporary, but acted by considering possible social behaviors. But in the process, when he saw that Anna Karenina was serious and did not follow the rules he set, he started to exhibit more aggressive attitudes. While going to file a divorce case to take revenge on his wife, she assaulted Anna Karenina in order to get the letters from her lover. Although the revenge reaction against cheating is cheating from time to time (Kesici, et al., 2019), none of the injured novel heroes preferred this method for revenge. The way in which cheating is learned determines how much the individual will be affected by cheating (Afifi et al., 2001). It was concluded that in cheating situations, the least destructive way is learning by the individual himself, and the most destructive way is learning from someone else that he/ has been cheated on (Blow, 2005). In the book, Anna Karenina told her husband that she was cheating on him. In another instance, his wife caught Oblonski's letter for the governess. In both cheatings, the injured individual learns the situation himself. For this reason, it may be that as a result, both individuals could not decide to leave their partner. As a result of cheating, it is normal for children to feel a lot of tension, even if they do not fully comprehend what is happening at home (Levine, 2005). In the novel, the children of both families are negatively affected by the tension between the partners. While the little children of Dolly and Oblonski were getting sick, Anna and Aleksey Karenin's son tried to show his reaction by saying that he wanted his mother by crying and keeping to himself more. To be told that his mother is dead in order to affect the child less, and later to learn that his mother is not dead, may cause bigger problems for the child. It has been determined that individuals who are not happy in their marriages exhibit cheating behavior twenty-five percent more than those who are happy (Atkins et al., 2001). For Aleksey Karenin, the family seems to be more important and supportive for issues such as professional advancement, while Anna Karenina is unhappy, bored, and depressed in this marriage. Since women's infidelity has higher costs than men's (Daly & Wilson, 1988), the price to pay as a result of infidelity is different. While paying different prices, Anna Karenina's state of unhappiness and depression will ultimately claim her life.

Discussion

In this study, Anna Karenina novel written by Lev Tolstoy was analyzed according to theories, risk factors, and results. The results are that they match in terms of the research findings made about the heroes in the book. In general, Anna Karenina's character and some side characters cheat on their partners. The basis of the behavior of individuals who cheat on their partners is examined within the framework of theories such as psychoanalysis, evolution, schema, and attachment. It has been determined that there are similarities between the findings and the cheating behaviors of the heroes. When cheating is considered in terms of risk factors, although it has been determined that the cheating behavior of individuals is affected by environmental factors such as gender, and duration of marriage, there are similarities in cheating behaviors according to studies, but similar results have not been reached regarding the effects of the number of children on cheating.

It is thought that the use of books and movies with the psychology literature can contribute more positively to the understanding of the subjects by using them in the education process. Especially when the incidence of infidelity is high in societies (Atkins et al., 2001; Kantarcı, 2009), studies conducted in places where studies on this subject are scarce are important in terms of providing the opportunity to examine multiple theories and environmental factors in a single study. The study may provide a stimulating opportunity for examining different books in the future.

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Examination of the Contribution of Data Learning Field to the General Objectives of the Mathematics Teaching Program

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Abstract

The aim of this study is to examine the contribution of the data learning area to the general objectives of the mathematics curriculum. The study was designed with case study, which is one of the qualitative research designs. A total of 160 students from 2nd, 3rd, 4th and 5th grades were asked the open-ended question in order to determine which of the general purposes of mathematics teaching in the data learning area in the mathematics curriculum. After the answers given by the students to this open-ended question were read and analyzed one by one, the contribution of the data learning field to the general aims of mathematics education was tried to be supported by student words. The relationships between the general objectives of the mathematics curriculum and the target behaviors of the data learning area were determined. As a result of the research, it was determined that there is a data learning area in each of the general objectives of primary school mathematics teaching. Although data learning area is an important basic learning area, it is seen that this learning area is not given enough importance in our country. The view that the objectives in the field of data learning leads students to (a) data collection: sourcing habit and knowledge generation, (b) data organization: identifying critical aspects and forming concepts, (c) presenting data: synthesizing and generalizing, (d) data analysis: comparing and problem solving emerges.

Key Words

Chart • Data learning area • Education • Elementary education • Math education

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A successful person in the information age is not an individual who takes the existing information and repeats or reflects it when desired, but is an individual with developed creativity skills, who can search for information, access different sources, interpret the information he finds, and produce new solutions in line with old information and experiences in the face of new experiences. A wide variety of studies in the developing world focus on education today as it was in the past, aiming at realizing more effective and efficient education and training. Education systems that require a dynamic structuring gain value not as they get old, but as they renew themselves (Alkan, 1999). For raised individuals to be qualified individuals; It is desired that they have the rising values that today's need such as exploring, predicting, producing information from information, thinking logically, solving problems.

Mathematics has many benefits and is one of the essential elements of the education system. Mathematical literacy involves reasoning mathematically, using mathematical concepts, procedures, facts and tools, describing and predicting events. Mathematical literacy is knowing the role of mathematics in understanding the world constructively, relationally, and reasonably (PISA, 2012). New approaches and techniques-methods are on the agenda and applied in order to raise individuals with the desired qualifications in mathematics teaching (NCTM; 1989, 2000). In this context, instead of the approach in which "the teacher explains, the student takes notes and listens", which is far from daily life and other sciences, where stagnant knowledge and skills and memorization come to the fore, an approach that "offers students superior functions such as research, questioning, reasoning, establishing relationships, solving problems, and communicating" was developed.

Learning mathematics is an important process that begins at an early age and affects life. Since children are in a period in which they develop rapidly physically and mentally in primary school, the programs to be prepared for them vary according to the years and therefore the preparation of the programs requires meticulousness (Altun, 2005). The Ministry of National Education (MoNE) aimed to make the education process efficient with its teaching programs and to increase success at the same time (İlhan & Aslaner, 2018). With the effect of developments and new approaches in mathematics teaching, the need to update mathematics teaching programs arises. In our country, the mathematics curriculum has been changed or revised many times in the last two decades (Dinç, 2021). The general objectives and achievements of the mathematics curriculum, which was revised in 2018, restructured the learning-teaching process. (Aktan, 2020).

According to Baykul (2012), the main purpose of primary education is to prepare individuals for life and higher education. Mathematics plays an important role in the primary school curriculum. It is essential that mathematics teaching in basic education is carried out effectively but without intimidating students. Teaching mathematics in primary education has an important place in the future lives of individuals. Every day, information and scientific information is spreading rapidly. Individuals who are suitable for the type of people that societies need in this process should be qualified and conscious individuals who know how to obtain information, how to analyze it, how to use it, how to interpret it, and how to integrate this information with their daily life besides getting information ready (Dinç, 2021). It has become an important skill for individuals in today's societies to use them in data collection and evaluation, graph creation, data analysis, graph interpretation, decision making and estimation processes, which are encountered both in daily life and in basic sciences.

We often encounter numerical data in our daily life. These numerical data surrounding our lives have an important place in drawing conclusions, making critical evaluations and making decisions. Creating meaningful results from the data is directly related to how the data is interpreted. Although the need to interpret the data and draw conclusions from the data is evident in many areas, studies are carried out for a more widespread and effective use of data (Guven et al., 2015).

The foundations of students' mathematical development are formed in the first years. Students' ability to communicate with language, drawing and other symbolic tools develops rapidly in these years (Seymour, 1996). Children learn by exploring, their interests and daily activities are natural tools for developing their mathematical thinking. Mathematics learning depends on students' curiosity and interest. And it naturally develops in line with their experiences. It is essential that every child develops a solid mathematical foundation, especially in the early years. It is in these years that ideas about what mathematics is and what it means to know and learn mathematics as a student. In the following years, these views affect the student's thinking, performance, behavior and decisions about learning mathematics (NCTM, 2000).

According to the New Jersey Core Curriculum Content Standard (2001) children are actually natural researchers. They are as concerned with the world around them as they are with the habits and thoughts of their classmates, teachers, neighbors, and family. As they are naturally curious, they often ask questions like “How many?”, "How much?", "What kind?", "Which of these?" Such questions often contribute to the initiation of studies on data collection and analysis. The necessary infrastructure for data collection and analysis in children already exists.

As stated in the Madisan Metropolitan School District Standards (2001) from the earliest years, children have the ability to draw, use their manual dexterity and cut paper or physically show what they want to present visually. In data collection and analysis, graphs of real bodies, shape graphs, column graphs, line graphs, and circle graphs are all ways of presenting data. The presentations prepared by the students from the data they collected should be shared and discussed in their environment. Because they reflect the understanding of the students.

Children, who are the assurance of our future, must have the ability to interpret and analyze data in order to make sound decisions. Since data is used to describe events in the past or to predict future events, dramatic developments in technology have brought the world into the information age. All people need experience in the data analysis process and general concepts in order to make the right decisions. Learning some basic information about data and statistics is also important in order to better understand, interpret and evaluate information in daily life. For several centuries, it has been seen that one of the most important needs in many fields such as engineering, medicine, economics, physics, chemistry and biology is statistical information (Tosun, 2021). Knowing what happens when new data is added or removed from different statistics is one of the important issues in data analysis. The main purpose of data collection is to find answers to questions that cannot be answered immediately (Forsythe, 1997).

One of the most important subjects of primary school mathematics teaching is data collection and analysis. The general principles, contents, curricula and standards of school mathematics, which occupies an important place in mathematics education, are explained in documents published at certain times by the National Council of Teachers of Mathematics (NCTM) at the international level. According to the document “Principles and Standards for School

Mathematics [PSSM]" published in 2000, the field of data and statistics education should be included at all levels of mathematics education (NCTM, 2000). Altun (2008), interpreted data and statistics as the ability to systematically collect and organize information; express and analyze the results obtained with graphs; interpret and evaluate information as a result of the analysis, and finally use it at the decision-making stage.

Tosun and Ünal (2019) stated that the need for data learning area in mathematics education programs is increasing gradually. According to Baki (2015), the purpose of data processing and statistics learning area is to create research questions, collecting data, processing data, organizing data, expressing and interpreting data with different forms of representation as well as being able to calculate the probabilities of an event by examining the states of its occurrence. Tosun (2021) stated that students have problems in high-level thinking about the subjects and graphics within the scope of data processing learning area. Given the evolving society, the data-driven activities required include a broader, more process-oriented perspective that encompasses important skills such as describing, inferring, interpreting and analyzing data beyond graphing data (NCTM, 2000).

Mathematics Curriculum developed by MoNE (2018) consists of four learning areas: (a) numbers and operations, (b) geometry, (c) measurement and, (d) data processing. Data collection and analysis is also specified within the data processing learning area. The basic concepts in these four learning areas were discussed in each class and the concepts were expanded and presented to the students as they passed to the upper grades. Accordingly, it can be argued that examining primary school students' views on data learning is important in terms of understanding their perspectives and experiences on this topic. As can be seen in the literature mentioned above, it is noteworthy that there is not enough research in this area at the national level. The aim of the study is to examine the students' views on the field of data learning and to examine the contribution and role of this field to the general aims of mathematics education.

Method

Research Model

This study, which examines the contribution of the data learning area to the general objectives of the mathematics curriculum throug student views, was designed as a case study from qualitative research designs. According to Yıldırım and Şimşek (2013), qualitative research is defined as "research in which qualitative data collection techniques such as observation, interview and document analysis are used, and a qualitative process is followed to reveal perceptions and events in a natural environment in a realistic and holistic manner". An important feature of the case study is the in-depth investigation of one or more cases (Merriam, 1998). The aim here is to reveal the results related to a certain situation (Yıldırım & Şimşek, 2013). This method differs from other research methods because it is preferred especially when asking what, how and why questions to understand different subjects of education (Çepni, 2012; Yin, 2003). A case study is a research method that examines situations in their real-life context, is used in situations where there are more than one data source, and provides a holistic interpretation of the study (Merriam, 1998).

Study Group

The study group of the research consists of primary school students. The study group consists of 160 students randomly selected from the 2nd, 3rd, 4th and 5th grade students. Students are shown as Student 1, Student 2, … Student 160 in the quotations in the presentation of the findings.

Data Collection Tool

Taking expert opinions from the lecturers working in the mathematics education graduate programs of the Faculty of Education, 160 students consisting of 2nd, 3rd, 4th and 5th grade primary school students were asked an open-ended question "Why do you like the data learning field?". After the answers given by the students to this open-ended question were read and analyzed one by one, it was tried to determine the students' views on the data learning area and the general purposes of primary school mathematics teaching. The relationships between the general aims of primary school mathematics teaching and the target behaviors of the data learning area were determined.

Data Analysis

The interview results obtained from the students were evaluated by using the descriptive analysis method, without making any changes in the student expressions. The concordance between the analyzes of the two researchers was calculated by Miles and Huberman (1994) as 82% of the inter-rater reliability formula.

Findings

In this study, in which the contribution of the data learning area to the general objectives of the mathematics curriculum was examined, the participants asked the question “Why do you like the data learning area?” their answers to the open-ended question are presented in the context of General Objectives of Primary Education Mathematics Teaching.

Students’ ability to develop a self-confident approach to mathematical problems by developing a positive attitude towards mathematics with their experience in learning mathematics.

According to the data obtained from the participants, it is seen that the data learning area covers the aim of developing a self-confident approach to mathematical problems by developing a positive attitude towards mathematics, which is one of the general aims of mathematics teaching. In this context, Student 1, a 2nd year student, stated that she wanted graphics to be discussed in every mathematics lesson because she enjoyed that graphics were fun and beautiful. Similarly, Student 2 and Student 3 expressed that they liked the graphic subject. 3rd grade students, Student 29, Student 42, and Student 56, also stated that when they think of graphics, they think of shapes and tables, and it gives them pleasure to take care of them. It can be seen from the statements below that 4th and 5th grade students also stated that they enjoyed drawing graphics.

> “Graphics are fun and beautiful. It was so enjoyable that at first I wondered what it was like. Then I saw that it was so enjoyable that I would like to do it in every math class, it is very enjoyable.” (S:1- 2nd grade)
>
> “Drawing shapes is fun, I enjoy painting, I love drawing.” (S:2-2nd grade)
>
> “I love dealing with graphics. Maybe I like it because we draw shapes, I don't know, but maybe I love listening to it and writing about it, not just drawing its shape. I love that subject a lot, I like it very much.” (S:3-2nd grade)
>
> “Graphing is like measuring our knowledge. I like to make graphics.” (S:2-3rd grade)

"When I think of graphics, I think of shapes, pictures, lectures and mathematical tables, and I love graphics" (S:29-3.Grade)

"Graphics have been like a game to me since 1st grade, I always say we should process them. But I think we probably won't work because we've grown." (S:42-3rd grade)

"I like the graphic unit because I like shapes. Shapes appeal to me. It improves our dexterity." (S:56-3rd grade) "I like graphics because they are easy to understand, I don't like math, but graphics made me love math. (S:85-4.class)

"I learn with pleasure in the graphics class. In short, I am both learning and having fun. I love it because I learn by seeing." (S:100-4.class)

"I never get bored while drawing graphics. Because graphics are for both learning and drawing fun." (S:150-5th grade)

"I like to show an ensemble or a fraction on a graph. My favorite charts are the column and circle chart. Because these graphs seem complicated at first glance. That's how I feel like I've grown. Great people also deal with complex and big things." (S:130-5.class)

"I can do graph questions without distinguishing between hard or easy. Because these questions seem very enjoyable to me." (S: 140-5th grade)

"It is very nice to work with shapes and lines. It's fun to draw with pictures like this. We can understand those subjects better from these graphics" (S: 160-5. grade)

Students' ability to make sense of the relationships between people and objects and the relationships between objects by using the meaning and language of mathematics,

The students' opinions reveal the purpose of appreciating the power of mathematics and its structure that includes a network of relations by using the meaning and language of mathematics, which is one of the general purposes of mathematics teaching. Student 92, a 4th grade student, understood the importance of mathematics thanks to graphics and stated that it is frequently used in other daily life. Again, Student 143, Student 146 and Student 81 stated that the graphs were used to find the number of trees in the forest, the number of a community, and that it was used by people from all professions.

"Using graphics in every field shows that it is important for people, each graphic has its own benefit, knowledge and taste. I believe these will benefit me a lot when I grow up." (S: 155-5th grade)

"Graphics come in handy in everyday life. It is useful in forecasting weather conditions, measuring fever of patients.(S: 92-4th grade)

"Not only us students, but also people from various professions use graphics such as lines and shapes." (S: 143-5th grade)

"With the graph, we can immediately find the number of a very large community without the need for long processes.(S: 146-5th grade)

"In graphics, we save both time and paper. For example, instead of using a large piece of paper to count trees in a large forest, we can quickly find the number of trees using graphs." (S: 81-4th grade)

Students' ability to understand mathematical concepts and use these concepts in daily life

According to the data obtained from the participants, it has been seen that the data learning area serves to understand mathematical concepts and systems, to establish relationships between them, and to use them in daily life and other learning areas, which is one of the general purposes of mathematics teaching. 4. Student 85, who is a 6th grade student, stated that graphics can be used in presidential elections and meteorology, while Student 158 stated that graphics are a very enjoyable unit and that they learned what can be grown in some regions.

"I love graphics. Graphics describe shapes, animals, plants, that is, pictorial mathematics for me" (S:42-3.class)

"It is very enjoyable to draw pictures of different sizes"(S:89-4.class)

"Graphs can be used in mathematics, in meteorology in presidential elections"(S:85-4.class)

"The graphics are a very enjoyable unit. Because with graphics, I understand what is grown in some of our regions"(S:158-5th grade)

"I see these graphics mostly in the heat and cold section of the social lesson and the graphics section of the mathematics lesson"(S:117-4.grade)

"Hot and cold are explained to us with graphics in the social studies lesson" (S: 83-4. Grade)

"We can learn crowded things quickly. We can immediately learn how many things in nature are."

(S:12-3rd grade)

Students' ability to use their estimation and mental processing skills effectively

As a result of the opinions of the participants stated below, it clearly reveals that the purpose of the data learning field is to use the estimation and mental processing skills, which are among the general purposes of mathematics teaching. Student 82, Student 95 and Student 100 stated that they could do the operations in their minds thanks to the graphics.

"I love to draw graphs. This makes it easy for me to process. Besides, I open my mind by doing the things I will do with the process in my mind"(S: 82-4.class)

"I love drawing graphics. Because I do the operations from the mind"(S: 95-4.class)

"I like the graphics unit because I can solve it mentally and without processing" S:100-4.class)

Students' ability to develop their mathematical literacy skills and use them effectively.

As a result of the students' opinions, it is seen that the data learning area covers the general purpose of mathematics education, the aim of developing and effectively using the mathematical literacy skills necessary to receive an advanced education in mathematics or other fields. Student 20, Student 96, and Student 53 understood the importance of mathematical literacy and wrote statements stating that a graph is a short-cut representation.

"I think the graphics are a beautiful thing, we draw a picture of how many people are in our class, for example, five people. we write how many people you show under it"(S:53-3rd grade)

"It is a short way to make a graphic representation."(S:96-4.class)

"For example, we can show my class size in a short way. For example, while a worker counts the trees in the forest, the graph shows it in abbreviations."(S:20-3rd grade)

Students' ability to develop their mathematical literacy skills and use them effectively.

As a result of the data obtained from the participants, it is clearly seen that the "data" learning area fulfills the general purpose of mathematics teaching, to express their own mathematical thinking and reasoning in the process of solving mathematical problems. Student 45 and Student 88 stated that they could solve many problems immediately thanks to graphics.

"We solve a lot of problems in the column chart. So much has been produced this year, so much this year. The column chart is also very nice."(S: 45-3rd grade)

"Graphic questions are very easy, can be done immediately. We can immediately answer the questions by looking at the line graph. The air temperature may be like this on average this month and this next month"(S: 88-4th grade)

"We can also make a graphic with the objects around us"(S:12-2.class)

That students value mathematics by being aware of the fact that mathematics is a common value of humanity

The following views of the students coincide with the purpose of giving value to mathematics, being aware of the fact that mathematics is a common value of humanity, which is one of the general aims of mathematics teaching in the field of data learning. Student 52, who is a 3rd year student, stated that the shapes drawn gave him different emotions and that he cared for himself in this way.

> "That round shape I drew; it makes me think like a love, communication, commitment, that is, a society." (S:52-3rd grade)
>
> "I understand the questions better in graphs. I solve problems better. Tomato production in this season is this much, in other seasons it is like this. Thanks to the graphics, I can understand the operations more easily. It makes problems easier."(S:145-5.class)

Students' ability to use mathematical terminology and language correctly to logically explain and share their mathematical ideas

According to the data obtained from the participants, it is seen that the data learning area covers one of the general purposes of mathematics teaching, to use mathematical terminology and language correctly in order to explain and share their mathematical thoughts in a logical way. Student 72, Student 149, Student 110 and Student 97 stated that they understood how important the use of rulers was when drawing graphics.

> "I like graphics. If there were no graphics, I would not know the ruler very well in mathematics" (S: 72-3rd grade)
>
> "It's hard to draw graphs. It is more difficult especially when you have cm." (S:149-5th grade)
>
> "One of the reasons I like graphics is that we use rulers while drawing graphics" (S:110-4.class)
>
> "What I like about graphics is because we draw more and find dimensions. Finding a measure is good for me because it is found while drawing" (S: 97-4th grade)

Students' ability to develop their metacognitive knowledge and skills and consciously manage their own learning processes

According to the data obtained from the students' opinions, the data learning field contributes to the development of cognitive knowledge and skills, which is one of the general aims of mathematics teaching, and to the conscious management of their own learning processes. Student 147 and Student 109 stated that they can consciously manage their own learning processes by making forward-looking predictions thanks to the graphics..

> "Thanks to the graphics, I took a temperature measurement for a week and was able to predict what the temperature would be like the next week. (S: 147-5th grade)
>
> "I can learn from this month's water consumption chart in Izmir whether I will have water in the future".(S: 109-4. Grade)

Students' ability to develop the characteristics of being systematic, careful, patient and responsible

As a result of the data obtained from the participants, it shows that the data learning area realizes its purpose of developing the characteristics of being systematic, careful, patient and responsible, which is one of the general aims of mathematics teaching. Student 155, Student 101 and Student 72 stated that drawing graphics requires attention, care, time and effort, and they get angry when they cannot draw.

> " Sometimes I get angry when I can't make the drawings in the column chart. (S: 72-3rd grade)
>
> "We need to take care of the graphic drawing. If we don't care, the graphic won't be pretty and we won't be able to understand much." (S:101-4.class)
>
> "It's very nice to draw graphics. It is also difficult to draw. We strive to make it. But it is entertaining. In my opinion, the most laborious and beautiful of graphics is the figure graphic. Graphics keep people busy because they create effort."(S:155-5.class)

Students' ability to develop the power to research, produce and use knowledge

According to the following opinions of the students, the data learning field contributes to the development of the power of doing research, producing and using information, which is one of the general aims of mathematics teaching. Student147, a 5th grade student, stated that he did not feel himself in the lesson while drawing graphs and that his attention was focused on something else. Student 100 stated that graphics improved their imagination.

> "I don't feel myself in class while drawing the column chart, it feels like I'm trying to focus my attention on something."(S: 147-5. Grade)
>
> "When we draw these on our notebook, we should draw them carefully. While we are drawing, our notebook is filled with information. It can also help future generations."(S:155-5th grade)
>
> "We can show something without writing, develop our imagination, we can show it to someone who is illiterate, we can show something in a short way."(S:100-4.class)

Students' ability to express concepts with different forms of representation

The following views of the students clearly reveal the general purpose of mathematics teaching in the field of data learning, to enable students to express concepts with different forms of representation. Student 118, a 4th grade student, stated that he liked this learning area very much because he could show his feelings with shapes and pictures. Student 142 and Student 73 also stated that they liked the painting lesson very much and that graphics also developed their imaginations.

> "I love graphics because they are easy to paint, draw and process. The collars of the students, the hats of the boys, and the hair of the girls are very beautiful."(S:75-3rd grade)
>
> "Sometimes, when my graphic is not beautiful, my other friends say it is beautiful."(S:72-4.grade)
>
> "I love the graphics unit because you can show my feelings in every way with pictures. When I think of a fruit, I can show it immediately with a shape graphic."(S:118-4.class)
>
> "I like graphics because they are so easy and enjoyable. Drawing is my favorite subject. Graphics improve my imagination."(S: 142-5th grade)

Students' ability to establish the relationship between mathematics and art and develop aesthetic feelings

As a result of the data obtained from the participants, it is seen that the data learning area overlaps with the general aims of mathematics teaching, to establish the relationship between mathematics and art, and to develop aesthetic feelings. 5th grade student Student 157 states that graphics require effort, but that he also develops his drawing and that he experiences a different phenomenon while drawing, which shows that the data can develop aesthetic feelings.

> "Graphics are the subjects that develop our drawing and require effort in drawing. While we are drawing these, a different phenomenon can cover us."(S:157-5th grade)
>
> "Graphics is a fun subject. This issue is like a cluster issue. The pictures of the graphic are beautiful." (S:42-3rd grade)
>
> "When I draw shapes and lines, it looks beautiful to my eyes." (S:92-4.class)

Discussion and Conclusion

In this study, it was tried to examine the contribution of data learning area to the general objectives of the mathematics curriculum in order to reveal how important the data learning area is. When students exhibited an acquisition of the data learning area, it was desired to determine which goals of the mathematics lesson contributed

to this behavior. As a result of the literature review and the analysis of qualitative researches, it was seen that the data learning field serves many purposes of mathematics. These are listed as follows.

- That the students feel as if they are in the painting lesson and enjoy it in the data learning area in the mathematics lesson, that they draw original shapes using colored crayons, that the lesson feels like a game to them, that they do not understand how time passes when drawing graphs, and that they draw different graphs according to the data is effective in gaining self-confidence, developing positive attitudes towards mathematics and self-confidence
- It contributes positively to students' appreciation of the power of mathematics and its structure that includes a network of relationships, seeing graphic pictures in newspapers and media, using line graphics when specifying air temperatures in meteorology, making use of pie charts while teaching fractions in mathematics lessons, and using different geometric shapes in drawing shape graphics. Similarly, comparing graphs with each other (geometrically similar and different aspects between shapes, column and circle graphs), making use of pie charts (dividing the pie into four, cutting a piece) while teaching fractions and percentages in mathematics class also makes the student's attitude towards mathematics positive.
- It shows that students benefit from shape, column and circle graphics while drawing "precipitation by regions, temperatures by years, products by months" in life studies, social studies and science lessons, and use the concepts of horizontal and vertical axes while solving puzzles in individual and collective activities lesson and students can use it in other learning areas. In addition, while interpreting the figure graph, students understood the concepts of size and smallness, fewness and abundance by using their expressions, they learned the concepts of length and shortness by using their expressions while interpreting the column graph, they understood the concepts of low-height, closeness-distance when interpreting the line graph, and using the terms few-many when comparing percentages in the circle graph they show that they comprehend the expressions of size-smallness. This is a positive factor in students' ability to understand mathematical concepts and systems, to establish relationships between them, and to use them in daily life and other learning areas.
- Students can concretize on graphic examples and perform mental operations, in figure graphics, for example, if each figure shows 2 students, they can do these operations in their mind when it is asked how many students will 5 figures show, in a circle chart, for example, they can divide the cake into 8 and say that half of the cake is taken when 4 is taken, when the temperature drops in temperature graphics knowing that the temperature is dropping and you are starting to feel cold and visa versa means that these factors contributes positively to students' ability to use their estimation and mental processing skills effectively.
- Students' use of addition and multiplication while interpreting the graphs while telling how many entities the shapes represent; Benefiting from the four operations while calculating the proportions of the slices in the circle graph contributes positively to gaining the necessary mathematical knowledge and skills in order to receive an advanced education in mathematics or other fields.

- In the process of solving mathematical problems, there are factors that positively affect students' ability to develop their mathematical literacy skills and express their reasoning. Among these factors are students' ability to solve simple problems (which one is big, which one is small, etc.), while they interpret their graphs, to reach new information from the information given in the given figure, column, line graphs, and to pose a new problem from the given ones. Gaining ideas about time while reading graphs and making predictions for the future (when looking at wheat production by years, how much this year, how much this year), being able to read the line graph (the graph has that number when this point of the graph is at this position), interpreting the circle graph (that percentile slice covers this much area) are among the factors that have a positive effect.

- Students can transform the given graphics into problems, turn them back into graphs and shapes, make predictions about the future while interpreting column and line graphs and set up problems (such as what the temperature will be in July), create different problems when comparing the information in the circle graph, develop their problem solving strategies and develop their own thoughts in the problem solving process and be able to easily express their reasoning contributes positively to their ability to use these in solving problems in daily life.

- Students use a ruler while drawing graphs, create a chart of the given data, count the shapes in the graph, measure the area covered by the shapes on the graph, use the measurements when reading the heights of the bars in the column graph, the numbers on the axes of the line graph, and the amount of slices in the circle graph (large value, small value) and use compass while drawing the circle graph and these allows students to use mathematical terminology and language correctly to explain and share their mathematical thoughts in a logical way.

- Although the graphs they draw form a small part of the whole, they have general information about the whole and if they have a good command of the graphs, they can comment on a whole from the small piece of data they have. For example, while making comments about the temperatures in the Aegean Region, students also have information about the meteorological positions of Turkey. These, in turn, contribute to students' ability to develop their metacognitive knowledge and skills and to consciously manage their own learning processes.

- Students should be able to draw graphs and figures patiently, carefully and in a regular way, examine the graphs carefully and make comparisons such as more or less, small and large, use their skills while drawing graphs, and should be orderly, careful and meticulous while creating the tables of data, contributes positively to the development of their personality traits such as being patient, orderly and systemic.

- The factors that contribute positively to students having a personality that makes research, produces information and develops their power of use are that they can express their ideas clearly while commenting on the graph, decide for themselves what to show when drawing the figure graphs, and obtain information by looking at the graphs. In addition, this idea is supported by the fact that they get information by looking

at the graphics, try to explain and spread the graphical knowledge they have gained to their environment, and decide on their own which data should be displayed with which graphics.

- When comparing the graphs drawn by the students with each other, the criticism that yours is beautiful but mine is ugly, the different perspectives on shapes in a given shape graph, the use of different colored pencils while drawing column, shape and circle graphs, and the use of different shapes in the shape graph arouse their intellectual curiosity and helps them move forward. In addition to these activities, interpreting the graphics and making predictions about the future, the formation of opposing thoughts with their friends and the ability of the students to self-criticize (I wish I didn't draw like this, my friends wouldn't like it), ability to express concepts with different representations helps students develop their intellectual interests.
- The use of colored crayons by the students, the beauty of the drawn figures and graphics, the harmony of colors in the colors and the uniformity of the drawings, the different colors of the pie slices in the circle graph, the use of different line options in the line graph, the symmetry feature in some graphs enable students to establish a relationship between mathematics and art and they enables them to develop aesthetic feelings.

In this regard, data collection and analysis in MMSD K Dec 5 Mathematics Content Standards for Data Analysis and Probability, (2001) related standard gives students and teachers the opportunity to establish a connection between a large number of thoughts and operations related to numbers, algebra, measurement and geometric concepts. Student working on data analysis and probability, mathematics and sciences with the issues of contemporary life and a natural method that can establish a relationship between the similarity is determined with this study constitutes. It emphasizes that students should be able to use and interpret data correctly, make predictions based on data, and develop their decision-making skills in order to become conscious citizens and consumers (MoNE, 2009).

According to their research, Özel Kadılar et al. (2021) emphasized that statistical information is always encountered in daily life, therefore, data processing and statistical skills should be given more place in curricula, and statistical thinking and statistical literacy are very important today and they stated that data-related acquisitions should be given more space at all levels of education from pre-school to university. Tosun (2021) said that it is important to learn some basic information about data and statistics in order to better understand, interpret and evaluate information in daily life and he also emphasized that for several centuries, one of the most important needs in many fields such as engineering, medicine, economics, physics, chemistry and biology has been statistical information based on data.

As stated in the New Jersey Core Curriculum Content Standard (2001) reasoning in areas related to data collection and analysis helps students succeed in business life. What is learned at school may seem to the student as something predetermined and bound by rules. Students working on data and statistics can learn that the solutions to some problems depend on assumptions and that there is a certain level of uncertainty in them. Their explanations are consistent with the findings of this study.

From all the above information, it is understood that the "Data" learning area is an important basic learning area. On the other hand, it is seen that this learning area is not given enough importance in the first stage of primary education in our country.

In short, "Achievements in the field of data learning, students;

Data collection	→	Sourcing habit	→	Producing information
Data editing	→	Identifying critical aspects		→Creating concept
Data presentability	→	Synthesis	→	Generalizing
Data analysis	→	Comparison	→	Problem solving

appears to be leading the way.

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Pre-service Mathematics Teachers' Conceptual Knowledge Related To Basic Concepts And Operations

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Abstract

The aim of this study is to discuss the conceptual dimensions of pre-service mathematics teachers' approaches to the basic concepts and operations of mathematics. 25 pre-service mathematics teachers in the first semester of the 2022-2023 academic year, who were educated at a state university, participated in the research. Four open-ended questions about the basic concepts of mathematics were asked to pre-service mathematics teachers and their written opinions were received. Content and descriptive analysis were applied to the responses. As a result of the analyzes, pre-service teachers did not approach these questions in the context of conceptual knowledge, but generally gave the answers in the context of procedural knowledge. Pre-service mathematics teachers used reflective thinking, which they used to compare the procedural knowledge processes they gained in the formal education process with the previous solutions, in these question solutions as well.

Key Words

Conceptual knowledge • Procedural knowledge • Pre-service teacher

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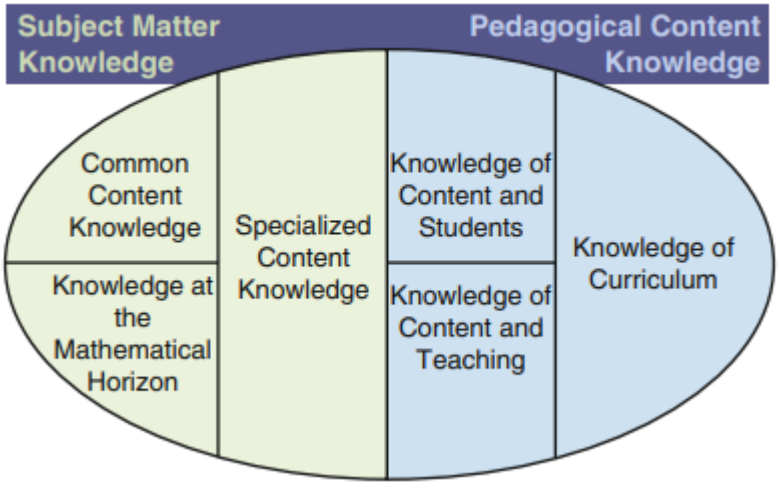
One of the researchers who formed the basis of research on teacher and teacher knowledge is Shulman. Shulman (1986), teacher knowledge; analyzed by establishing a theoretical framework on the categories of content knowledge (this refers to the amount and organization of knowledge per se in the mind of the teacher), pedagogical content knowledge (a type of content knowledge that is more related to the teachability of the subject), and curriculum knowledge (contains the sequence of materials and topics to be used in teaching). The effect of content knowledge on the formation of mathematics teaching knowledge of teachers or pre-service teachers is undoubtedly very important. Various studies have also revealed that there is a close relationship between content knowledge and pedagogical content knowledge (Boz, 2004; Capraro et al ., 2005; Even , 1993; Türnüklü , 2005).

Shulman (1987) defined content knowledge as a type of knowledge that includes teachers' concepts, operations, proofs, and problem-solving skills related to the subject they will teach. It is related to the basic concepts and content of the field (mathematics, biology, chemistry, etc.) to be taught by the teacher. The teacher should create appropriate learning environments that allow students to understand the part of the content in the curriculum. They should know and use the teaching methods and techniques used in their field. Shulman mentions two basic structures while describing content knowledge. The first of these structures is a set of ways to determine the truth or falsity, validity or invalidity of (mathematics) concepts and facts in the field, and the second is the different ways of producing and structuring knowledge in the field.

Ball et al. (2008), as a result of their study on what mathematics teachers should know, revealed a classification as in Figure 1 under the title of *"Content Knowledge for Teaching Mathematics"*.

Figure 1

Ball et al. (2008) model of Content Knowledge for Teaching Mathematics (CKTM)



Common Content Knowledge; It is kept related to the knowledge of mathematics that not only teachers but also others can have. Specifically, it includes teachers or pre-service teachers to be able to do the activities they will present to their students and to use mathematical terms for related concepts correctly.

Horizontal content knowledge; on the other hand, includes teachers having a general knowledge of the curriculum by knowing how the mathematics topics in the curriculum are related to each other.

Specialized content knowledge; is the mathematical knowledge and skills required for teaching used by mathematics teachers and pre-service teachers. What is expected from teachers and pre-service teachers is to know mathematical concepts, explanations and ideas in a conceptual way and to be able to transfer them to their students with appropriate representations and methods.

Both the *subject content knowledge* expressed by Shulman and the *customized content knowledge revealed by* Ball et al. are examined, mathematics teachers are expected to have in-depth procedural and conceptual content knowledge about mathematics subjects. According to Ball (1990), the concept and process knowledge of mathematics teachers should be correct; They also need to understand the principles underlying this information. Chick et al. (2006) stated the expectations from mathematics teachers regarding content knowledge in the pedagogical context as follows:

Profound Understanding of Fundamental Mathematics; Exhibits deep and thorough conceptual understanding of identified aspects of mathematics.

Deconstructing Content to Key Components; Identifies critical mathematical components within a concept that are fundamental for understanding and applying that concept

Mathematical Structure and Connections; Makes connections between concepts and topics, including interdependence of concepts

Procedural Knowledge; Displays skills for solving mathematical problems (conceptual understanding need not be evident).

Methods of Solution; Demonstrates a method for solving a mathematical problem.

Purpose of the Study

It is undoubtedly very important that mathematics teachers and pre-service teachers should have a deep conceptual knowledge of the subjects they will teach. It is undoubtedly very important that mathematics teachers and pre-service teachers should have a deep conceptual knowledge of the subjects they will teach. Skemp (1971), who investigated mathematics knowledge for the first time in terms of learning psychology , conceptual knowledge; "as the ability to know what to do and understand why", also procedural knowledge; He defined it as "the ability to use the rules without understanding the reasons". In other words, while in procedural knowledge there is only the state of knowing how to use a concept or process without knowing the reason for it, in conceptual knowledge the state of comprehension comes to the fore (Baki 1997). Permanent and functional learning in mathematics can only be possible by balancing procedural and conceptual knowledge (Baki, 1998).

The aim of this study is to evaluate the content knowledge of pre-service mathematics teachers about natural numbers in line with the explanations given in the introduction.

Method

In this section, the design of the research, the research group, the data collection tool, data analysis of the study are mentioned.

Research Design

This study, it was tried to determine the approaches of pre-service teachers to the basic concepts and operations of mathematics. For this purpose, the case study method was adopted from qualitative research approaches. The case study method focuses on a specific situation, describes this situation and enables the reader to better understand the existing situation (Merriam, 2013). This method seeks to answer the question of how while explaining the existing situation. But apart from that, it provides a deeper understanding of a phenomenon. Data are described and classified using themes (Creswell, 2020; Yıldırm & Şimşek, 2013). Similarly, in this study, the pre-service teachers' phenomenon about basic mathematical concepts and operations were described and described in depth.

Research Group

The research group of the study consists of 25 pre-service teachers attending a mathematics teacher education programme in a university in Turkey. Qualitative research generally involves a small sample recruited using purposive sampling (Patton, 2014). It was placed the names of the pre-service teachers within the ethical rules. Their names were not given, coded as PT1, PT2…, PT25.

Research Instruments and Processes

Data were collected with a concept test consisting of four questions. While preparing the concept test, the students were asked to interpret whether the statements in the question were always correct so that they could think from multiple perspectives. The questions that were included in the data collection tool are listed in the table below.

Table 1

Questions in the data collection tool

Question numbers	Questions
1	Does $\frac{a}{b}$ always make sense? Please comment.
2	Does $a - b$ always make sense? Please comment.
3	Is it correct to replace the parentheses in the $(x - y) + z = x - (y - z)$ equation? Please comment.
4	"Addition, subtraction, multiplication, and division are operations, and these are called four operations." Is the statement always true? Please comment.

Data Analysis

When the selected questions are examined, these four questions determine what kind of approach the pre-service teachers put forward regarding elementary concepts and operations at the basic level. The questions are at the basic level, as it is aimed to reveal the understanding of the concepts rather than revealing the knowledge levels of the pre-service teachers. It was applied to 10 primary school pre-service mathematics teachers in order to control the concept test questions prepared by one of the researchers and to provide preliminary information about the research. As a result of the pilot study, questions involving the search for significance in natural numbers were used throughout the test. In the study, it was concluded that the final version of the data collection tool, which was examined by two mathematics educators who are experts in their fields, is suitable for the research problem.

The researchers applied the concept test to the pre-service teachers during a class hour. It was said that it was left to them how to interpret the questions in the data collection tool and the data collection tool was presented to the pre-service teachers. They were asked to evaluate and interpret each question.

First of all, it was determined how many of the pre-service teachers who participated in the research answered the questions. Twenty-five pre-service teachers answered the first and second questions each, and twenty pre-service teachers answered each of the third and fourth questions. The answers of the pre-service teachers who did not answer, that is, left the question blank, were not taken into consideration. The obtained data were subjected to content and descriptive analysis. Categorization was made according to the common features in the answers given and direct quotations from the answers were given.

Results

In this section, content and descriptive analysis of the answers to the data collection tool consisting of four questions were made. The answers given by the pre-service teachers to the questions were examined and the codes were created. Interpretations were made by giving examples selected from the answers.

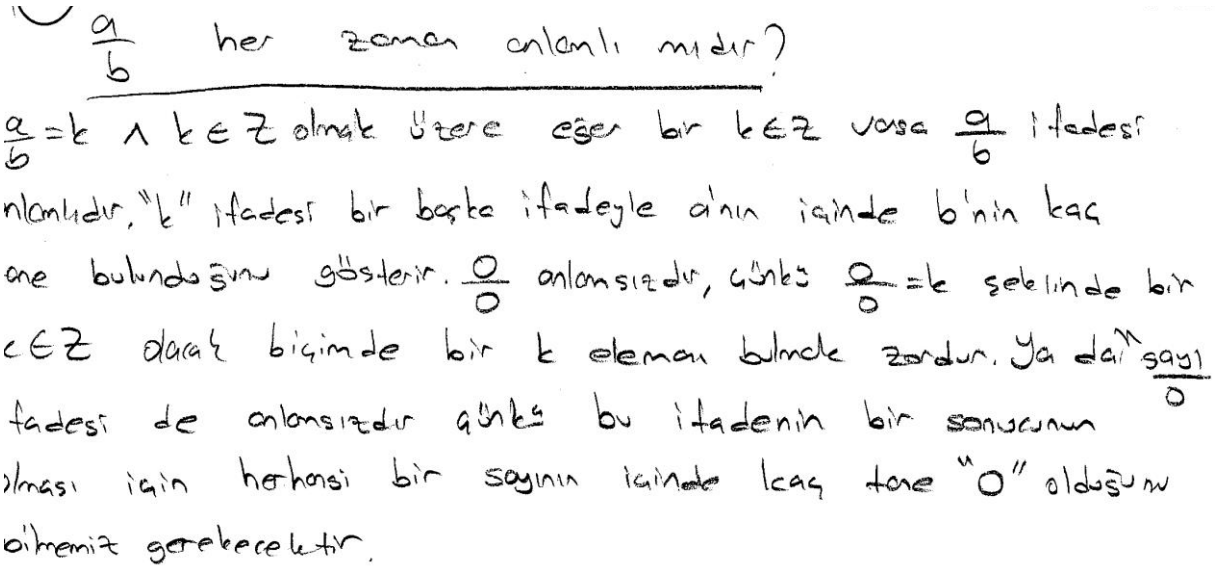
"Question 1 *:* Does $\frac{a}{b}$ always make sense? Please comment.*"* The findings of the answers to the question are presented in Table 2.

Table 2

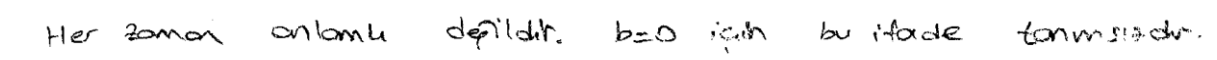
Responses to Question 1

Responses	Respondents	Percent
if b=0 the expression is undefined so it doesn't always make sense.	12	48
If b=0, it is undefined. The set we work with is important	9	36
Depends on the set being studied	3	12
a/b=k and makes sense if k elements are Z.	1	4
Total	25	100

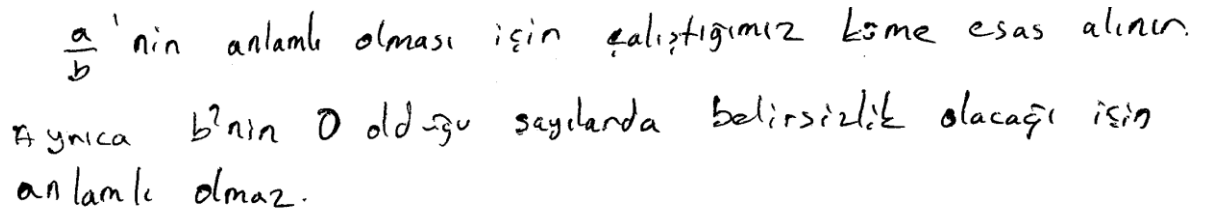
When Table 2 is examined, it is seen that pre-service teachers mostly focus on the situation where the denominator is not zero. While 12 people argued that the expression b should be different from 0, 9 people also emphasized the importance of the cluster being studied. 84% of the respondents stated that b should be nonzero. Examples of answers are given below.



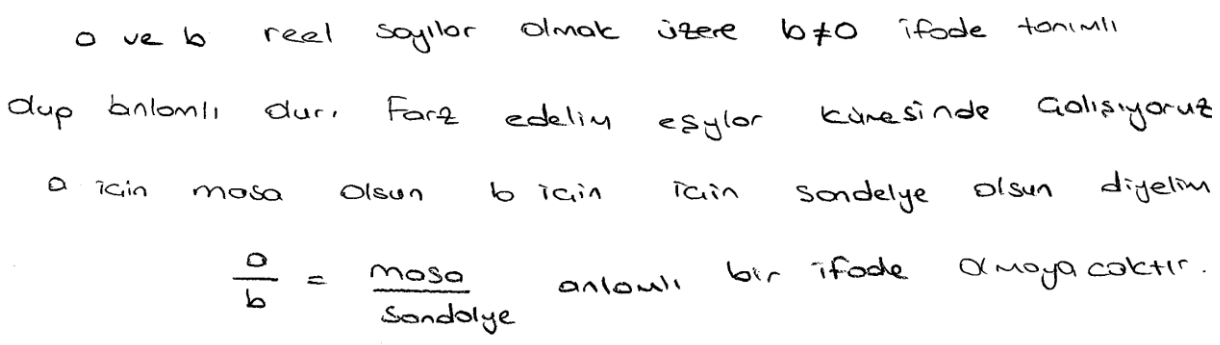
It said: Makes sense if a/b=k and k elements are Z. The expression k shows how many b are in the moment. 0/0 is meaningless. Because it is difficult to find a k element such that 0/0=k. Again number/0 is undefined.



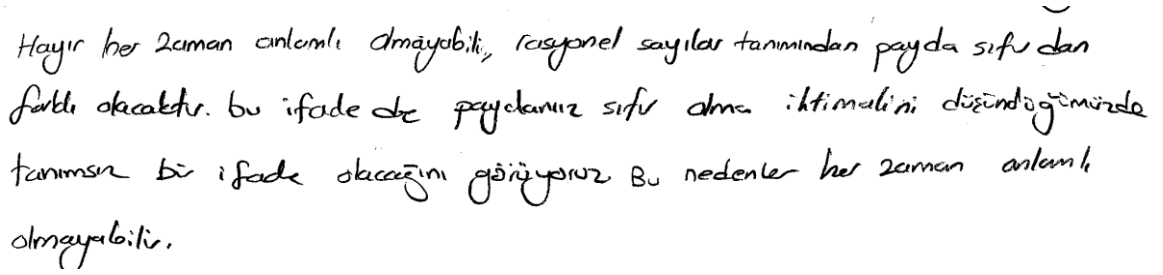
It said: It doesn't always make sense. For b=0 this expression is undefined.



It said: In order for it to be meaningful, it is based on the cluster we are working with. When b=0, it is not significant because there will be uncertainty.



It said: Significant if a and b are real numbers and b is nonzero. Suppose we are working on a set of items. If a is a table and b is a chair, a/b= table/chair is not significant.



It said: It may not always make sense. If the denominator is zero, it is undefined.

Although the respondents emphasized the importance of the studied cluster, they also linked the condition of being defined to different variables. Although it is one of the common ideas that the denominator should not be zero, it is also written that the expression can be made defined with limit approaches.

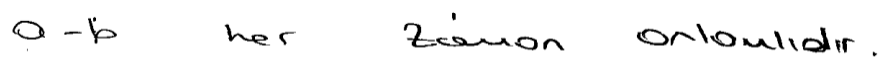
"Question 2: Does $a - b$ always make sense? Please comment." The findings of the students' answers to the question are presented in Table 3.

Table 3

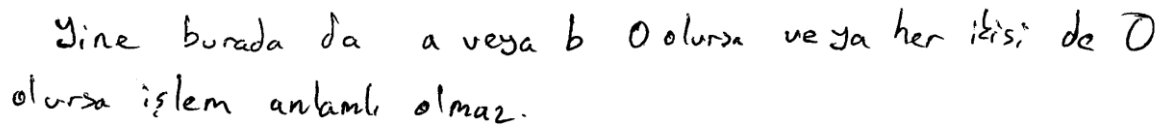
Responses to Question 2

Responses	Respondents	Percent
Always makes sense	10	40
∞-∞ becomes meaningless. That's why it doesn't always make sense.	5	20
Depends on the cluster being studied	4	16
Not meaningful if the result is zero	2	8
The expression is meaningful only if a is positive and b is negative (a+b).	1	4
It doesn't make sense mathematically. It is physically meaningful.	1	4
In physical life it is sometimes meaningless.	1	4
0-0 makes no sense	1	4
Total	25	100

As seen in Table 3, 10 of the respondents stated that the expression was significant. 5 people argued that the expression is meaningless in the ∞-∞ ambiguity. 4 people stated the importance of the studied cluster. Examples of answers are given below.

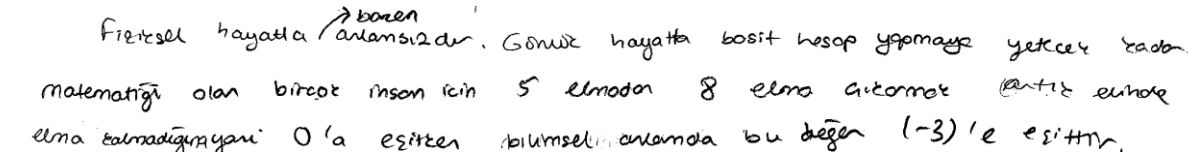


It said: Always ıt makes sense

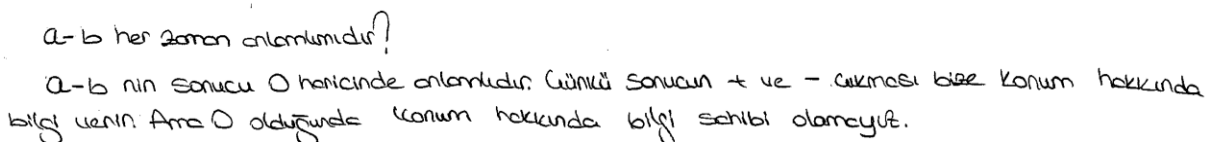


It said: Doesn't make sense if a or b are 0 or both are zero.

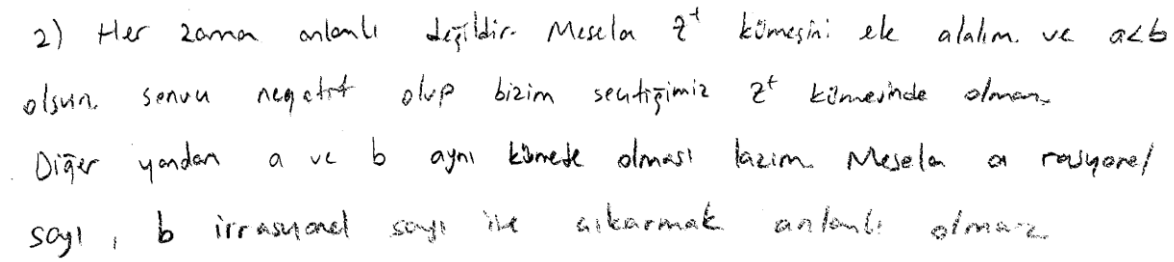
It said: It is meaningless in 0-0=0 operation.



It said: In physical life it is sometimes meaningless.



It said: It is significant except that the result is 0.



It said: It's not always meaningful. Let's take the set of positive integers for example. If a<b, the result will be negative and not in the set we selected. a and b must be in the same set.

When the answers were examined, it was seen that those who defended the correctness of the statement could not prove their answers mathematically. The cases ∞-∞ and 0-0 create uncertainty and therefore the expressions will not be meaningful are some of the answers given.

"Question 3: Is it correct to replace the parentheses in the $(x-y)+z=x-(y-z)$ equation? Please comment." The answers to the question are given in Table 4 below.

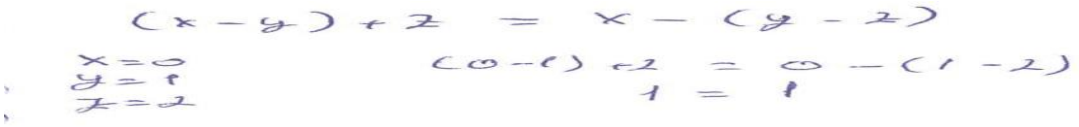
Table 4

Responses to Question 3

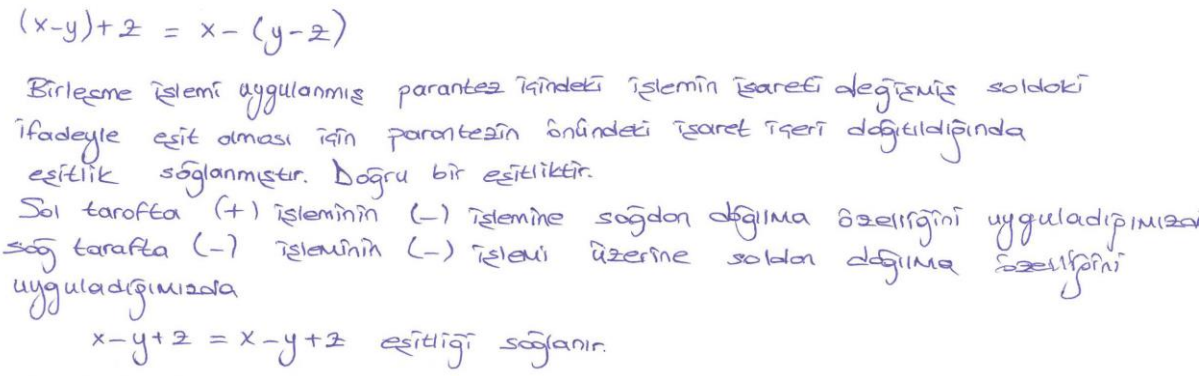
Responses	Respondents	Percent
Correct	7	28
Dispersion and merging properties are used and correctly said	10	40
The accuracy of the expression is shown by giving numerical values.	1	4
Depends on the cluster being studied	2	8
No responses	5	20
Total	25	100

When Table 4 is examined, 90% of those who answered the question stated that the statement was correct. While those who emphasized the importance of the studied cluster remained at 5%, 55% of those who defended the correctness of the expression tried to prove the correctness of the expression by distributing the parenthesis or giving numerical values. Examples of answers are given below.

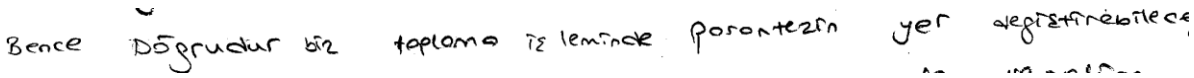
It said: It may change location due to addition process. It relates to the given cluster.



It said: The accuracy of the expression is shown by giving numerical values.



It said: Dispersion and merging properties are used and correctly said



It said: I think it's true, the parentheses can be swapped.

In the answers, it was tried to show the correctness of the expression by using the distribution and associativite properties in general. However, there were also those who tried to prove the correctness of the expression by giving it a numerical value. There have been some who have argued that it is correct to replace the parentheses without resorting to any proof method. Those who emphasized the importance of the studied cluster did not write in which clusters and conditions the operation was valid.

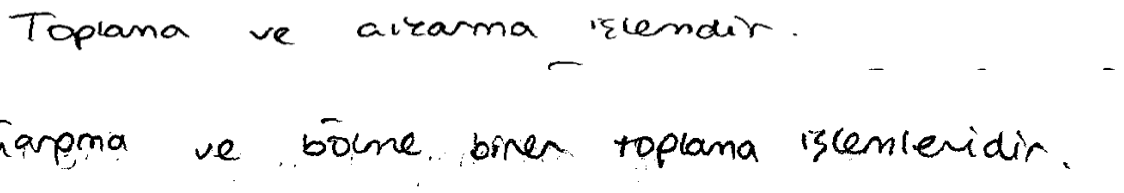
“Question 4: "Addition, subtraction, multiplication, and division are operations, and these are called four operations." Is the statement always true? Please comment.” The answers to the question are given in Table 5 below.

Table 5

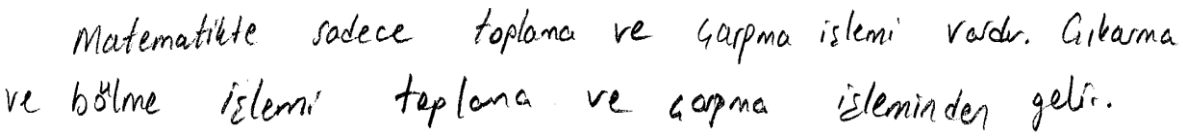
Responses to Question 4

Responses	Respondents	Percent
Statement is correct	15	60
Only addition and multiplication are operations, the others are inverse operations.	4	16
Addition and subtraction are operations. Multiplication and division are addition operations.	1	4
No responses	5	20
Total	25	100

When the Table 5 is examined, those who stated that the statement is correct constitute 75% of the respondents. Although 5 people stated that addition is an operation, 4 of them added multiplication and 1 added subtraction. Below are examples of answers to the question.



It said: Addition and subtraction are operations. Multiplication and division are addition operations.



It said: In mathematics, there are only addition and multiplication operations. Subtraction and division operations come from them.

It said: Yes these are operations and called four operations.

None of the respondents explained the feature of being a transaction. Those who claimed that the statements were true did not give reasons. While there are some who state that subtraction and division are not operations other than addition and multiplication, there are also some who state that only addition and subtraction are operations.

Discussion, Conclusion & Suggestions

Considering the general structure of mathematics, it can be said that mathematics is roughly based on the concepts of sets and functions. Here, the set shows the place and its properties, and the function shows how to act on this work place (Konyalıoğlu, 2008). In this context, these concepts are the concepts that should be taken into consideration in mathematical question and problem solutions. At the same time, it can be accepted as a separator of operational and conceptual knowledge that cannot be fully differentiated.

According to the literature, mathematics lessons are beginning to emphasize procedural learning rather than conceptual learning (Baki, 1998), and mathematics courses are taught with a significant emphasis on conceptual learning and operations are remembered rather than conceptually understood (Aksu et al., 2018).

In this study, the conceptual learning levels of pre-service mathematics teachers about some basic concepts and operations were examined by taking written opinions; showed that the explanations of the pre-service teachers were generally at the operational level, while the conceptual learning remained at the superficial level. This is consistent with some studies that found that there is procedural learning rather than conceptual learning in mathematics education (Aksu et al., 2018; Baki, 1998; Hiebert, 2013; Schoenfeld , 1985).

The findings roughly show that; pre-service teachers did not approach these questions in the context of conceptual knowledge, and they generally gave answers in the context of procedural knowledge. They tried to answer operationally without mentioning whether a relation satisfies the necessary conditions for it to be processed . Procedural knowledge and conceptual knowledge are not independent of each other. Conceptual knowledge and procedural knowledge interact with each other cyclically and with the problem according to the situation of the problem, without specifying priority in the solution of the problem (Rittle-Johnson et al., 2001).

Conceptual knowledge includes the skills to symbolize mathematical concepts, to establish relationships between concepts and between concepts and symbols, and to perform the necessary operations (Hogg & Vaughan, 2014). The currunt study, pre-service teachers were insufficient in answering the questions by paying attention to important issues such as being defined or meaningful, and the characteristics of the studied cluster, which they should deal with in the context of conceptual knowledge. In fact, this study shows that the basis of procedural knowledge is conceptual knowledge oriented and this is ignored by the pre-service mathematics teachers.

This situation can be a constant indication of both the prior knowledge and the way of thinking of the pre-service mathematics teachers. It is noted that the pre-service mathematics teachers used the process prototype they gained in the formal education process and the reflective thinking, which they compared to the previous solutions, in these question solutions.

Ethic

This study was conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments.

Author Contributions

All stages of the study were organized and conducted by the authors.

Conflict of Interest

In the research, the authors declare no conflict of interest.

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