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**Multicultural Competence Scale for Prospective Teachers: Development, Validation and Measurement Invariance**

Devrim ERDEM<sup>1</sup>

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**ABSTRACT**

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**Keywords**

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**Purpose:** This study reports on the development, validation and measurement invariance of the Multicultural Competency Scale (MCS) for preservice teachers.

**Research Methods:** Data from 640 pre-service teachers were collected for two studies. After data screening procedures 628 responses were left. The data were divided into two sets for exploratory factor ( $n_1=314$ ) and confirmatory factor analysis ( $n_2=314$ ) using a random split half method in SPSS.

**Findings:** According to the results of the exploratory factor analysis, a 14-item, three-factor solution came out: awareness, skill and knowledge. Awareness

subscale aims to measure the teacher's awareness of his or her own cultural affiliation. Knowledge subscale attempts to measure the teacher's willingness to learn about diverse cultures. Skill subscale intends to measure the teacher's competence to organize and adapt the educational environment and materials according to the multicultural class. Confirmatory factor analysis indicated that the three-factor oblique model was a good fit to the data. The subscales of the MCS demonstrated adequate internal consistency. Measurement invariance tests revealed that full configural, metric, scalar invariance and partial strict invariance were achieved across gender.

**Implications for Research and Practice:** Validity and reliability analysis of the scale suggest that the MCS-14 has satisfactory psychometric features. Thus, the MCS can be utilized to diagnose pre-service teachers' multicultural competency and to investigate changes in their strengths and weaknesses in multicultural competency during the training. The MCS enables preservice teachers to self-assess and to recognize their position of multicultural competence. The MCS also allows researchers to predict teachers' future success in diverse classrooms.

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## Introduction

The new Millennium witnesses an increasing diversity both locally and globally. This is evident in schools and classrooms well. The changing demographics and the increase in migration have led to the growth of a more diverse student body in school than ever before. Thus, identifying student needs based solely on a majority (dominant) group can no longer suffice. The scholars stress that school policies and practices should evolve in response to this diversity of students (Banks, 2010). In such a global world, prospective teachers will be confronted with students from different backgrounds (Nzai & Feng, 2014). Therefore, teachers need to be equipped to effectively serve pupils from culturally and linguistically different groups (Mysore, Lincoln & Wavering, 2006).

Multiculturalism is defined in various ways. Fowers and Richardson (1996) emphasized that "multiculturalism is a social-intellectual movement that promotes the value of diversity as a core principle and insists that all cultural groups be treated with respect as equals" (p. 609). According to American Psychological Association (APA) "Multiculturalism, in an absolute sense, recognizes the broad scope of dimensions of race, ethnicity, language, sexual orientation, gender, age, disability, class status, education, religious/spiritual orientation, and other cultural dimensions" (APA, 2002, p. 10). Multiculturalism also involves a variety of other personal and cultural characteristics (Tiedt & Tiedt, 2005). Rosado (1997) provided an operational definition as multiculturalism as follows:

Multiculturalism is a system of beliefs and behaviors that recognizes and respects the presence of all diverse groups in an organization or society, acknowledges and values their socio-cultural differences, and encourages and enables their continued contribution within an inclusive cultural context which empowers all within the organization or society (p. 2).

Multicultural education is a democratic touch to teaching and learning aimed to nurture cultural pluralism in culturally diverse societies and in a closely linked world (Bennett, Niggle, & Stage, 1990). Singleton (1996) suggests that multicultural education should be considered beyond any social group and be more inclusive generally including gender, culture, age, and class. Nieto (2000, p.305) describes multicultural education as "a process of comprehensive school reform and basic education for all students. It challenges and rejects racism and other forms of discrimination in schools and society and accepts and affirms the pluralism (ethnic, racial, linguistic, religious, economic, and gender among others) that students, their communities, and teachers reflect" (as cited in Iwai, 2013, p. 186). Parekh (2002) views multicultural education as educational activities geared toward promoting intellectual curiosity, self-reflection, ability to arrive at ideas through independent evaluation of evidence, respect for others, sensitivity to a variety of viewpoints and life styles and elimination of ethnocentrism. Banks (2010) noted:

Multicultural education is at least three things: An idea or concept, an educational reform movement and a process. Multicultural education incorporates the idea that all students-regardless of their gender, and social class, and their ethnic, racial, or cultural characteristics - should have an equal opportunity to learn in school. Another

important idea in multicultural education is that some students, because of these characteristics, have a better chance to learn in schools as they are currently structured than do students who belong to other groups or who have different cultural characteristics (p. 3).

As seen above, there are various definitions of multicultural education. The common aspect of the definitions is that multicultural education is a process and requires covering all individuals. Another point, multiculturalism in education is not limited to ethnic origin, race, religion, nationality, language or social class but also include learning manners, past learning, socio-economic condition, sex/gender, geographic region, physical and mental abilities/disabilities (Cushner, McClelland, & Safford, 2003; Keengwe, 2010). Moreover, the main reasons for the need for multicultural education are stated as follows (see in Sherpa, 2019, pp. 37-39): (i) developing ethnic and cultural literacy, (ii) respect for human beings and human dignity, (iii) globalization of education as skill development, and (iv) new skill, knowledge and training for teachers.

The main target of candidate teachers' multicultural education is to train competent educators capable of understanding the characteristics of the student and have the necessary skills to help each student realize their academic potential (Keengwe, 2010; Walker, Shafer, & Iiams, 2004). Rothschild (2003) argued that "a major role of educators is to equip students not only with an understanding of the dominant culture and its history but also with the knowledge and skills to work effectively with individuals from diverse backgrounds" (as cited in Meaney, Bohler, Kopf, Hernandez, & Scott, 2008, p. 191). Many candidate teachers go to teacher education programs with a limited degree of experience (Valentin, 2006) or never have significant experiences with diverse individuals (Milner & Woolfolk Hoy, 2003). Novice teachers themselves reported that they were not sufficiently prepared to teach various students and in multicultural school settings (Cho & DeCastro-Ambrosetti, 2005; Futrell, Gomez, & Bedden, 2003; Ladson-Billings, 2000; Valli & Rennert-Ariev, 2000). Seeberg and Minick (2012) have stated that the majority of students who are in the teacher training program come from middle-class families who often raise themselves as culturally isolated. It would be unrealistic to assume that prospective teachers with such a profile have multicultural experience and skills until they enter a university. Seeberg and Minick (2012) emphasized that there are some barriers to students gaining direct cross-cultural competence experiences in the campus-based teacher training programs; and they listed these barriers as having "little diversity among students in classes, the short semester timeframe, and the inability of students to participate in study-abroad programs, due to work schedules and lack of resources" (p. 2).

Teachers' opinions about students from diverse communities may affect how they manage their instructional practices (Sadker, Sadker, & Zittleman, 2008; Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998). Teachers who have negative attitudes and lower expectations toward their diverse pupils often fail to satisfy the academic achievement of the pupils (Burt, Ortlieb, & Cheek, 2009; DeCastro-Ambrosetti, & Cho, 2011; Dee, 2004; Nieto & Bode 2008; Reiter & Davis, 2011; Tse, 2001). On the other hand, "teachers with a strong interest in and feeling for multiculturalism are often more successful in

promoting the academic success of their learners” (Acquah & Commins, 2013, p. 446). In other words, teachers who are accomplished in the classroom are mostly culturally authoritative teachers (Keengwe, 2010). Consequently, multicultural competence is an essential prerequisite for teachers to enable positive student outcomes.

#### *Multicultural Competence and its Dimensions*

Multicultural competence is described as the ingenuity to take actions or bring conditions into existence that make as large the best favorable development of individuals (Sue & Sue, 2008). As defined by Pope, Reynolds and Mueller (2004), multicultural competence involves “the awareness, knowledge and skills needed to work with others who are culturally different from self in meaning” (p. 13). Diller and Moule (2005) stated for preservice teachers’ cultural competence “refers to dispositions of being aware of cultural differences, being culturally sensitive and able to respond to these” (p. 5, as cited in Liang & Zhang, 2009). Multicultural competence was determined in three dimensions: Cultural knowledge, awareness, and skills (Pope, Reynolds, & Mueller, 2004; Sue & Sue, 2008).

Multicultural awareness consists of developing a wider and more in-depth grasping of a diverse group (Nzai & Feng, 2014). There are great deals of teacher candidates who have not interacted in diverse populations until the day they entered the multicultural classroom (Clarke & Drudy, 2006). They may suffer from stereotypical conceptions of mainstream culture due to this lack of or limited experience (Acquah & Commins, 2013; Bell, Horn, & Roxas, 2007; Sleeter, 2001). Cultural awareness involves the beliefs, opinions, values and attitudes towards the individual’s own culture; and is concerned with the comprehending of how the cultural experiences of the individual are formed in which habitus (Sue & Sue, 2008). Sue et al. (1982) stated that being aware of one’s own cultural heritage, principles, moral imperatives and prejudices and the extent to which they affect our interactions with different groups is an important factor in developing teachers’ perceptions of multicultural competence (as cited in Vassallo, 2014, p. 2). Vincent, Randall, Cartledge, Tobin, and Swain-Bradway (2011) stated that recognizing one’s own culture could improve one’s comprehension of others’ verbal and nonverbal behaviors (as cited in Nzai & Feng, 2014). According to Garmon (2004), awareness is able to think critically about one’s own beliefs, values and attitudes. Multicultural awareness reveals how we make sense of our experiences and also shapes our perceptions. Cultural awareness is linked to cultural knowledge. Campinha-Bacote (1999) stated cultural awareness implies “know thyself” according to Greek philosophy and “this awareness process must involve examination of one’s own prejudices and biases toward other cultures and in-depth exploration of one’s own cultural background” (p. 204). Campinha-Bacote (1999) posits that given that individuals have a predisposition to ethnocentrism, self-awareness for multicultural growth.

Knowledge on the subject of diversity is a factor that impacts preservice teachers’ competence. Cultural knowledge implies to comprehend the cultural codes, manners, and attitudes (Sue & Sue, 2008) of the diverse students. According to Adams (1995), cultural knowledge includes familiarity with all aspects of cultural features, history,

moral standards, faith frameworks and behavior of members of another ethnic group, as well as the process of collecting information about other cultural groups (as cited in Nzai & Feng, 2014). As defined by Campinha-Bacote (1999), "cultural knowledge is the process of seeking and obtaining a sound educational foundation concerning the various world views of different cultures" (p. 204). Teachers' knowledge about cultural diversity is a robust determinant of learning fortunes and outcomes for diverse students (Gay, 2002). It is important to have information about other cultures that is different from their own culture because it helps to remove people's misconceptions about other cultures (Major & Mangope, 2014).

McGeehan (1982) identified multicultural skill that comprises regulation and implementation of influential multicultural education applications (as cited in Guyton & Wesche, 2005). According to Pope and Reynolds (1997), multicultural skills are defined as the skills individuals use to make effective and meaningful interactions with people with different cultural backgrounds from their own culture. Multicultural skills include the "capability to empathize and genuinely connect with individuals who are culturally different from themselves (...) ability to gain the trust and respect of individuals who are culturally different from themselves" (Pope & Reynolds, 1997, p. 271). Furthermore according to Sherpa (2019), "Teaching and learning materials must be diverse and critically examined for bias. Variety of instructional materials, (...) and learning content must be presented from a variety of perspectives in order to be fit not only that of majority groups but also minority and disadvantaged groups of learners." (p. 37). To improve the quality of education, prospective teachers are expected to have these professional skills. Lack of multicultural skills hinders teachers' performance (Major & Mangope, 2014). Consequently, any measurement of multicultural competence should cover these dimensions.

The most important emphasis of multiculturalism in education is that it is an inclusive process (Rosado, 1997). In the age of cultural pluralism and diversity, the most critical 21<sup>st</sup>-century skill that future generations should have is global awareness (Stewart, 2007). In such an environment where student diversity is increasing, schools also should reflect these dynamic changes. Teachers should not only try to gain their students' multicultural knowledge and awareness but also promote respect for other cultures. When students are able to make an assessment from diverse cultural perspectives, they can develop their critical-thinking skills and their creativity (Stewart, 2007). Teachers' attitudes, prospects, and actions toward diverse cultures are enormously strong in determining the standard of the education they receive (Gay, 2002). Multiculturalism is the basis for more egalitarian and democratic communities. This is especially crucial in light of social justice and human rights. Hence, given that teachers are a crucial component of any educational system and that their competence is a powerful factor in teaching (Guyton & Wesche, 2005), identifying multicultural competencies of the preservice teachers' is important.

Parekh (2002) asserts that a group of individuals involving two or more cultural groups is multicultural. According to this definition as a land, which hosts a rich variety of cultures and civilizations, Turkey is a multicultural society (Polat & Kilic, 2013). Students participating in the Turkish educational system have diversity in

ethnicity, religion, social class, race, sexual orientation and many other characteristics (see in Kotluk & Kocakaya, 2018). Furthermore, Turkey hosts around four million refugees, including 1.7 million children. Thus, students from these families participate in schools in almost every town around the country. As a result of these demographic circumstances, the teachers all over the world, as well as today's teachers in Turkey, should be prepared to enter these increasingly more diverse learners.

In the literature, a limited number of studies was conducted to evaluate the multicultural teacher competencies in Turkey. Basbay and Kagnici (2011) developed perceptions of multicultural competence scale with three-factor 41-item for university instructors. Their study provided some useful information about university instructors' multicultural competencies, but the target population had different attributes. Acar-Cifci (2016) developed four-dimensional the Critical Multicultural Education Competencies for preschool teachers. Ayaz (2016) developed a uni-dimensional Multiculturalism Perception Scale with 194 teacher candidates. Another scale in the Turkish literature was the uni-dimensional Teachers' Multicultural Education Attitude Scale adapted to Turkish by Yazici, Basol, and Toprak (2009). Yavuz and Anil (2010) developed a uni-dimensional attitude scale towards multicultural education for preservice teachers. Since these scales measure attitude or perceptions, the tools do not enable to distinctly evaluate teachers' multicultural competencies in diverse classrooms.

The present study aims to develop a multidimensional scale based on multicultural competence literature. The validity of any conclusions drawn builds on test results great extent depends upon the use of psychometrically sound instruments. In social and behavioral sciences, test scores are often used to make group comparisons. However, such comparisons are meaningful only when the scores at hand are comparable. The widespread perception in the psychometric literature is that measurement invariance should be added when constructing and validating a new scale (Steinmetz, Schmidt, Tina-Booh, Wieczorek, & Schwartz, 2009). If the measurement invariance is not achieved, a direct comparison of the observed means or latent means cannot be possible (Drasgow & Kanfer, 1985). Therefore, when developing a psychological test, the examination of measurement invariance will provide further support for the validity of the tool.

In the current study, measurement invariance for gender was investigated. Some reasons for examining gender-based measurement invariance can be listed as follows. First, in behavioral sciences, it is common to test whether there is a gender difference between scores. Because of such widespread practice, testing measurement invariance across gender is necessary to maintain that the scores obtained from sub-groups have the same meaning. Second, empirical studies on prospective teachers revealed mixed findings of gender differences concerning the teaching profession. For instance, in their meta-analytic studies, Erdamar, Aytac, Turk, and Arseven (2016) and Atalmis and Kose (2018) concluded that the teacher candidates' attitudes towards the teaching profession were significantly higher in favor of females. However, while the self-efficacy of prospective teachers regarding certain teaching competencies was higher for males in some studies, no gender differences were reported in other studies (see in

Yenice, 2012). Therefore, it is crucial to comprehend the existence of gender inequality or bias. In short, this study holds two main aims. The first aim is to develop a scale measuring multicultural competencies of preservice teachers. The second aim is to examine measurement invariance across gender groups.

## Method

### *Research Design*

This is a cross-sectional study. The present study aimed to develop a multicultural competence scale. The following sections describe the research sample, generation of the tool and data analysis.

### *Research Sample*

The participants in this study were the prospective teachers who were studying in the last year of a faculty of education in a university in Turkey. Data from 640 participants were collected from the 2018-2019 academic year. Missing data resulting from partial completion of the survey packet were from the dataset. After this elimination, 628 data were left. Three hundred fifty-eight (57%) of the participants were female and 270 (43%) were male with their age ranging between 21 and 47 years ( $M_{age}=26.12$ ,  $Median=24$ ). Using a random split-half method in SPSS, the data were divided into two sets to conduct exploratory ( $n_1=314$ ) and confirmatory factor analysis ( $n_2=314$ ). One half of the sample was used for exploratory factor analysis (EFA), among them, 192 (61%) were female, and 122 (39%) were male. The other half of the sample was used for confirmatory factor analysis (CFA), among them, 166 (53%) were female, and 148 (47%) were male. Measurement invariance was also examined in the second half of the sample.

### *Item Generation*

This current study was grounded in a multicultural teaching competency model. This model offers three dimensions as follows: (a) awareness, (b) knowledge, and (c) skills. To avoid response contamination while generating the item, it is necessary to prevent the produce redundant or overlapping items (Erkus, 2012). Thus, special care is given to distinguish items that are most likely to capture the trait during the item-writing phase. The author wrote 36 items based on an extensive literature review. Then, three academics reviewed 36 items for clarity, readability, and content appropriateness and concerning representing the dimensions of the items. Changes and arrangements were made on some items in accordance with the feedback from the experts. Twelve voluntary graduate and undergraduate students were requested to complete this first draft of the scale. Eight items were dropped due to ambiguity and 28 items were retained on the preliminary scale. A 5-point Likert-type scale was used for each item to gather responses. The scale is scored by giving a score of 5 for the response "it completely describes me", 4 for the response "it mostly describes me", 3 for the response "it describes me to some degree", 2 for the response "it describes me somewhat" and 1 for the response "it does not describe me at all". The items were written in Turkish. The English version is presented here to clearly illustrate the content of the items in the English language.

### Data Analysis

Firstly, the data set was screened concerning data entry and missing values. Since floor and ceiling effects negatively impact measurement properties (Bruce, Fries, Lingala, Hussain, & Krishnan, 2013, p. 2), to check ceiling and floor effects of the items the lowest and highest scores of the participants were evaluated. Floor or ceiling effects are defined as "achieving the worst and best possible scores, respectively" (McHorney & Tarlov, 1995, p. 294). As McHorney and Tarlov (1995) stated if more than 15% of the participants reach the lowest or highest possible score, this indicates that there are floor or ceiling effects. The reliability of the scale was examined by calculating the internal consistency coefficient of Cronbach's alpha for each sub-dimension. Correlations between subscales were examined using Pearson correlation analysis. SPSS22 and LISREL9.2 programs were used for data analysis.

*Exploratory factor analysis.* Exploratory factor analysis (EFA) was utilized to determine the factor structure of the scale. Although principal component analysis is widely used in exploratory factor analysis, some authors caution that the use of this method in factor extraction may not be suitable for scale development studies (Costello & Osborne, 2005; Fabrigar & Wegener, 2012; Preacher & MacCallum, 2003). Instead, the principal axis factoring (PAF) extraction is recommended (De Winter & Dodou, 2012; Fabrigar & Wegener, 2012; Russell, 2002). Similarly, the factor rotation method is often used with vertical rotation. However, due to the multidimensional structure of the scales used in behavioral sciences and the relationships between the dimensions, it is emphasized that oblique rotation should be used (Costello & Osborne, 2005; Fabrigar & Wegener, 2012; Russell, 2002). Therefore, PAF extraction was performed in the present study. Where rotation is required, the oblique rotation was preferred. In deciding the number of factors, the criterion that the eigenvalue is greater than one was considered. In addition, the scree plot was observed.

*Confirmatory factor analysis.* Model fit was examined by confirmatory factor analysis (CFA). CFA was carried out using the maximum likelihood estimation method and covariance matrix. The following multiple goodnesses of fit indexes were examined for CFA: Ratio of Chi-square to degrees of freedom ( $\chi^2/df$ ), CFI, GFI, NNFI, RMSEA and SRMR. The limit values are accepted as follows to accept the model data fit as sufficient:  $\chi^2/df < 3$ , CFI > .90, GFI > .90, NNFI > .90, RMSEA < .08 and SRMR < .08 (Bryne, 2001; Hu & Bentler, 1999; Kline 2011; Russell, 2002).

*Measurement invariance.* Multiple group confirmatory factor analysis (MGCFAs) was used to test measurement invariance. Many stepwise steps were followed in testing the measurement invariance. This procedure requires a series of sequential constraints to testing measurement invariance across groups (Dimitrov, 2010). After establishing the fit of the model for both male and female datasets, in the next stage, the configural invariance, metric invariance (factor loadings), scalar invariance (intercepts) and strict (error variances) invariance between the groups were conducted (Dimitrov, 2010). Each model was a check against the former model. Chi-square difference test ( $\Delta\chi^2$ ) was used to compare these nested models (Brown, 2006; Dimitrov, 2010; Tabachnick & Fidell, 2001). The presence of a non-significant difference for each model indicates that



the measurement invariance is accepted. Since the chi-square test is sensitive to sample size, it is recommended to use CFI difference values ( $\Delta$ CFI), which is a more robust indicator in nested model comparisons (Cheung & Rensvold, 2002). To ensure that measurement invariance is achieved, the delta CFI value in each model tested must be higher than -.01 (Cheung & Rensvold, 2002).

In cases where measurement invariance cannot be yielded, partial measurement invariance should be examined. There is no specific level or ratio accepted for partial invariance (Dimitrov, 2010). Although the decision is left to the researchers, it is stated that group comparisons can be made on at least two items with invariance (Byrne, Shavelson, & Muthen, 1989). In partial invariance, a sequential process is followed in which the parameters are released based on the examination of the modification indicators (Elousa & Muniz, 2010).

## Findings

### *Data Screening*

Before conducting the analysis data-screening process was performed. Data were examined for correct data entry and missing values. Missing values due to partial completion of the surveys were excluded from this study. The percentage of respondents who achieved the lowest possible score was .3% and the percentage of respondents who achieved the highest possible score was .4%. Thus, values remained well below the standard limits. In short, the ceiling and floor effects were not observed.

### *Exploratory Factor Analysis*

To test the construct validity of the scale, exploratory factor analysis (EFA) was performed on the first sample ( $n_1=314$ ). Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were applied to determine whether the data obtained from the participants were suitable for factor analysis. The KMO value was .87, which indicated that a sufficient sample size. Bartlett's test of sphericity was also significant ( $p<.001$ ), indicating the factorability of the correlation matrices.

To determine the factor structure of the scale, 314 participants' responses to the scale items were analyzed using principal axis factoring extraction without rotation at first. After screening primary loadings, to reach a simple and explicit structure for the factors (Kiers, 1994), factor analysis was repeated with oblique rotation. As a result of the EFA procedure, the scale items were gathered under three factors concerning eigenvalue criteria. The scree plot test also suggested a three-factor solution visually.

A total of 14 item were deleted because of low communalities (less than .30), low factor cross-loadings (less than |.10| difference) (Tabachnick & Fidell, 2001) and/or loadings (less than .40) (Comrey & Lee, 1992; Nunnally, 1978). Apart from the statistical procedures, the interpretability of both factors and items under each factor was taken into account. After removing these items from the scale, the three-factor structure accounted for 54.7% of the total variance. The eigenvalue of the first factor was 4.74 and that accounted for 33.86% of the variance. There were six items under this factor and labeled as awareness (A1-A6). The eigenvalue of the second factor was 1.86 and

that accounted for 13.32% of the variance. There were five items under this factor and labeled as skill (S1-S5). The eigenvalue of the third factor was 1.05 and that accounted for 7.51% of the variance. There were three items under this factor labeled as knowledge (K1-K3). The rotated EFA factor loadings are presented in Table 1.

**Table 1**

*Factor Loadings of the MCS-14*

	Items	EFA Rotated Factor Loadings	CFA		
			Factor loadings	<i>t</i>	S.E.
Awareness	A1 My cultural belonging can make me distant from students in diverse cultures. <sup>R</sup>	.721	.66	12.18	.041
	A2 I can understand the diverse cultural characteristics of students.	.714	.63	11.48	.042
	A3 I can notice if I discriminate against students from diverse cultures.	.652	.67	12.29	.044
	A4 I can critically examine my prejudices towards diverse cultures.	.584	.55	9.67	.048
	A5 I am aware of my prejudices towards diverse cultures.	.573	.68	12.67	.043
	A6 Because of my cultural belonging, I can behave biasedly toward students with diverse cultures. <sup>R</sup>	.568	.53	9.36	.048
Skill	S1 I can arrange the educational environment for students from diverse cultures.	.809	.77	13.95	.061
	S2 I can prepare exam questions for students from diverse cultures.	.733	.61	10.51	.068
	S3 I can adapt teaching materials to students from diverse cultures.	.666	.62	10.74	.070
	S4 I can handle course subjects in accordance with students from diverse cultures.	.632	.57	9.82	.071
	S5 I can build activities to reduce students' prejudices towards cultural differences.	.584	.58	10.03	.061
Knowledge	K1 I care about students' beliefs, values and traditions from diverse cultures.	.745	.80	14.72	.043
	K2 I know that students with different cultural characteristics should be treated sensitively.	.690	.61	10.70	.057
	K3 I find it necessary to have knowledge about the communication styles of students from different cultures.	.612	.58	10.17	.056

<sup>R</sup>Revised item

### *Confirmatory Factor Analysis*

As a result of exploratory factor analysis, a 14-item three-factor solution was obtained. Then, a confirmatory factor analysis (CFA) was performed to investigate the factor stability of the three-factor solution of the scale on a separate sample ( $n_2=314$ ). The fit indexes for the first-order three-factor structure with 14 items were found as follows:  $\chi^2(74)=145.78$ ,  $\chi^2/df=1.97$ , GFI=.94, CFI=.97, NNFI=.97, RMSEA=.056 (90% lower-upper confidence interval .042-.069), SRMS=.05. In addition, the second-order CFA was evaluated. The fit indexes for the second-order three-factor structure with 14 items were:  $\chi^2(74)=143.72$ ,  $\chi^2/df=1.94$ , GFI=.94, CFI=.94, NNFI=.93, RMSEA=.055 (90% lower-upper confidence interval .041-.068), SRMS=.048. When these values were evaluated, it was concluded that the CFA fit indices for the first-order and the second-order three-factor structure were within acceptable limits. Factor loadings in CFA were found significant at .05 level based on the *t*-test. The modifications indexes were examined but not detected any information about the model misspecification. In the light of these findings, it was concluded that the model data fit for the three-factor solution of the scale was quite well.

### *Inter-correlations among Subscales and Reliability*

Correlation coefficients among the subscales were calculated separately. The correlation coefficients between the awareness and skill subscale scores was found as .37 ( $p<.001$ ). The correlation coefficients between the awareness and knowledge subscale scores was found as .62 ( $p<.001$ ). The correlation coefficients between the skill and knowledge subscale scores was found as .34 ( $p<.001$ ). Internal consistency with Cronbach's alpha coefficients was calculated for each subscale to determine reliability. Internal consistency was .79 for the awareness subscale, .76 for the skill subscale and .68 for the knowledge subscale.

### *Measurement Invariance across Gender*

Measurement invariance was assessed with the data from the second half of the sample. To examine the measurement invariance according to gender, firstly CFA was performed separately in female and male groups. The three-factor oblique model was used as a baseline model. The multiple goodness-of-fit indexes indicated an adequate model fit for the male and female groups (see Table 2). Concerning the findings, it was found that the model fit was yielded sufficiently for the female groups ( $\chi^2/df=2.09<3$ ; CFI=.95; RMSEA=.078) as well as the male groups ( $\chi^2/df=1.44<3$ ; CFI=.96; RMSEA=.058). In this section second-order CFAs for gender groups were also investigated. Concerning the findings, the second-order three-factor oblique models yielded sufficiently for the female groups ( $\chi^2/df=2.15<3$ ; CFI=.92; RMSEA=.079) as well as the male groups ( $\chi^2/df=1.56<3$ ; CFI=.93; RMSEA=.055). It was noticed that both the first-order and the second-order model fits were slightly better in males than in females.

**Table 2***Goodness-of-fit Indexes for the Baseline Model across Gender*

Group	Model	$\chi^2$	df	p	$\chi^2/df$	CFI	NNFI	GFI	RMSEA
									[90% C.I.]
Female	1 <sup>st</sup> order	154.94	74	.000	2.09	.95	.94	.90	.078 [.061-.078]
	2 <sup>nd</sup> order	159.64	74	.000	2.15	.92	.91	.91	.079 [.063-.091]
Male	1 <sup>st</sup> order	106.83	74	.007	1.44	.96	.95	.91	.058 [.031-.081]
	2 <sup>nd</sup> order	115.73	74	.001	1.56	.93	.92	.90	.055 [.041-.068]

After the baseline model was met, the next step was to establish configural invariance. Although conducting individual CFAs in each group (baseline models) can test configural invariance, it is still necessary to run this step in multiple group confirmatory factor analysis (Milfont & Fischer, 2010). As can be seen in Table 3, Model A provided adequate fits to the data, indicating configural invariance was established ( $\chi^2/df=1.85<3$ ; CFI=.95; RMSEA=.070). These findings stated that the factorial structure of the construct is equal across gender. Meeting the configural invariance requirement is a prerequisite for continuing the measurement invariance test. Next, measurement invariance was examined with forward steps. Findings of the fit indexes related to measurement invariance are presented in Table 3. Findings for Model B, Model C and Model D indicated that the chi-square and *df* ratios of all models were below 3, CFI and NNFI values were above .90 and RMSEA values were below .08. These results showed that model data fits were achieved for each model. However, this is not sufficient for examining measurement invariance. A series of nested models with constraints needed to be compared stepwise.

**Table 3***Fit Indexes and Testing Measurement Invariance across Gender*

Model	$\chi^2$	df	$\chi^2/df$	CFI	NNFI	RMSEA	$\Delta\chi^2$	$\Delta df$	p	$\Delta CFI$
A	275.41	149	1.85	.95	.94	.070	-	-	-	-
B	290.82	160	1.87	.95	.94	.069	15.41	11	.164	0.0
C	301.12	165	1.82	.95	.94	.068	10.3	5	.067	0.0
D	369.09	179	2.06	.93	.93	.079	67.97	14	.00*	-.02

The next step was to test the metric invariance model (Model B), which constraints the equality of factor loadings between groups. In the comparison of nested models, chi-square difference test and delta CFI values were examined. The chi-square difference between Model B and Model A was not statistically significant  $\Delta\chi^2(11)=15.41$ ,  $p>.05$  and  $\Delta CFI >-.01$  thus indicating metric invariance was achieved. These findings showed that factor loadings could be accepted as equal across gender groups. In the subsequent step, the chi-square difference between Model C and Model B was not statistically significant [ $\Delta\chi^2(5)=10.3$ ,  $p>.05$ ] and  $\Delta CFI >-.01$ . Thus, scalar invariance was achieved. Scalar invariance means that intercepts, as well as factor loadings, were invariant across the gender groups.

After establishing scalar invariance, strict invariance was investigated. The chi-square difference between Model D and Model C was statistically significant ( $\Delta\chi^2(14)=67.97, p<.05$ ) and  $\Delta CFI<-.01$ , which unfortunately indicated strict invariance could not be achieved. Since full strict invariance was not in place, it could not be assumed that error variances were equal in gender groups. Partial strict invariance was examined to determine which item or item groups had different error variances.

#### *Partial Strict Measurement Invariance*

In the previous section, it was found that MCS demonstrates configural invariance, metric invariance and scalar invariance. However, strict invariance has not been achieved. To determine which item or groups of items spoiled the strict invariance, firstly the error terms in the scalar model were examined. Multiple-group CFA error variances in the scalar model can be seen in Table 4.

**Table 4**

*Standardized Factor Loadings and Error Variances MGCFA*

Items	Standardized factor loadings in the configural model		Error variances in the scalar model	
	Female	Male	Female	Male
A1	.68	.66	.33	.29
A2	.64	.61	.28	.45
A3	.70	.61	.36	.36
A4	.68	.47	.28	.75
A5	.74	.69	.31	.39
A6	.57	.63	.52	.52
S1	.70	.80	.44	.70
S2	.65	.55	.68	1.18
S3	.67	.48	.74	1.09
S4	.54	.66	1.07	.92
S5	.58	.60	.65	.82
K1	.79	.82	.21	.26
K2	.60	.58	.67	.62
K3	.64	.53	.52	.79

Following the recommendation to free one parameter at a time (Dimitrov, 2010), starting with the one with the item having the largest difference between error terms, Model D was modified by freeing the error variance for item S2. This modified Model D was compared with the Model C, but the chi-square difference between modified Model D and Model C was statistically significant ( $\Delta\chi^2(13)=59.06, p<.05$ ) and  $\Delta CFI<-.01$  (Table 5). This finding indicated that there was not enough improvement in the model fit. Then the error variances S2 and A4 were released together. However, there was still no improvement in model fit. Finally, after freeing the error variances of S2, A4 and S3, partial strict measurement invariance was attained (see Table 5). Thus,

equal error variances across gender were found except for these specific three items (S2, A4, S3).

**Table 5**

*Partial Strict Invariance Models after Freeing Error Variances*

Model	$\chi^2$	df	CFI	NNFI	RMSEA	$\Delta\chi^2$	$\Delta df$	p	$\Delta CFI$
Error var. S2 free	360.18	178	.93	.93	.078	59.06	13	.000	-.02
Error var. S2, A4 free	328.72	177	.94	.94	.071	27.6	12	.006	-.01
Error var. S2, A4, S3 free	320.70	176	.95	.94	.069	19.58	11	.052	.00

## Discussion

The first purpose of this study was to develop a scale assessing preservice teachers' multicultural competence. The second purpose of this study was to evaluate measurement invariance of the MCS-14 across gender. In parallel with the initial conceptualization, exploratory factor analysis results were able to support a structure related to multicultural teaching competence. Findings from exploratory factor analysis conducted in the first sample indicated that the MCS scores have three distinct factors that were named awareness, skill and knowledge. Thus, in the light of the literature, the three-factor structure was supported. The awareness subscale consisted of 6 items, accounted for 33.86% of the total variance. The skill subscale consisted of 5 items, accounted for 13.32% of the total variance. The knowledge subscale consisted of 3 items, accounted for 7.51% of the total variance. All items accounted for 54.7% of the total variance. Then, both the first-order and the second-order CFAs were conducted to examine the fit of the three-factor oblique model on a separate sample. Multiple fit statistics showed that model data fit was achieved for both the first-order and the second-order CFAs. Based on the findings obtained in the second-order CFA, it can be concluded that a total score can be obtained and be meaningful for the multicultural competence scale. According to Pearson correlations, inter-correlations of the subscales were positive low to mid and significant. These findings indicated that each subscale was related to the others, but still sufficiently different from each other. In other words, although each subscale belongs to a common core, each represents a separate dimension.

The Cronbach's alpha values were .79 for awareness, .76 for skill and .68 for knowledge. Although .70 is considered an acceptable value for Cronbach's alpha, it "tends to underestimate the internal consistency of scales consisting of fewer than ten items" (Herman, 2015, p. 8). Cronbach's stated that a high alpha value was 'desirable', but he emphasized that the main matter was the interpretability of the scores - and this was usually possible without the necessity for very high alpha values (as cited in Taber, 2018, p. 1288). It was also stated "there is no universal minimally acceptable reliability value. An acceptable reliability value depends on the type of application..." (Bonett & Wright, 2015, p. 4). In the literature, it is also seen that the acceptable lower boundary of the Cronbach's alpha value for exploration research is .60 (e.g., Cohen,

Manion & Morrison, 2007; Hair, Black, Babin & Anderson, 2010). As a result, these reliabilities demonstrated acceptable internal consistency relative to the number of items included in each sub-scale. In the light of these findings, the three-factor MCS-14 has been observed to have appropriate psychometric properties.

Since scores obtained from any scale are often used for group comparisons, measurement invariance across gender was examined in the current study. A single-group CFA was conducted for male and female to establish a baseline model as a prerequisite to test measurement invariance. After achieving the baseline model fit for each group, measurement invariance tests were employed. Multiple group CFA tests suggested that the three-factor MCS-14 scores revealed configural, metric and scalar invariance across gender.

Meeting the configural invariance indicates the same number of factors and the same pattern of a factor in each group. Evidence for configural invariance indicated oblique three-factor model was similar across the gender groups. Metric invariance refers to equal factor loadings across groups, it means that any difference in one unit of latent variable results in the same differences of the observed indicator variables in all groups (Rudnev et al., 2018). The presence of metric invariance implied that the factor loadings of the items were matching across the gender groups. In other words, the construct has the same meaning across gender. Especially, the conceptualization of the multicultural competence construct is alike in male and female, as appraised with the MCS. The presence of scalar invariance indicated the same intercepts across gender. Under scalar measurement invariance, the comparison of factor means between groups is allowed (Dimitrov, 2010). Based on these results, it can be stated that the three-factor model matches among the groups. This indicates that the same structure and also the same measurement model in both male and female. That is, the findings of scalar invariance across gender indicated that meaningful latent mean structures comparisons could be made across gender for the MCS-14 test scores. Briefly, constructs have similar meanings.

Although proof of scalar (strong) measurement invariance is the only thing necessary to make expressive comparisons between latent means between groups (Widaman & Reise, 1997), this current study also investigated strict invariance. Based on the delta CFI test, the full strict invariance was not met. On the other hand, the remaining fit indices, such as  $\chi^2/df$ , CFI, NNFI and RMSEA, pointed out the presence of strict invariance across gender. This case may be related to the issue of practical versus statistical significance that often arises in psychology research (Blankson & McArdle, 2015). When the error (residual) variances in gender groups were assessed, it was thought that the values in difference might not be sufficient to explain meaningful true differences in the construct.

Strict invariance can detect potential obstruction of strong invariance due to the item-specific systematic effect (Wu, Li, & Zumbo, 2007). Thus, partial strict measurement invariance was investigated. Partial strict measurement invariance was obtained by freeing error variances of the three items: S2, A4, and S3. Thus, error variances of these three items were responsible for departure from full strict

measurement invariance. Error variances of S2, S3 and A4 items were higher for male relative to female. Therefore, it is concluded that invariance of item uniquenesses was obtained for all items but the three.

### **Conclusion, Limitations and Recommendations**

The MCS is a self-report instrument that measures perceived multicultural education competence by preservice teachers. The MCS is a tri-factor scale, including 14 items with a 5-point rating scale - "it completely describes me" (5) to "it does not describe me at all" (1). A1 and A6 are reverse-scored items. Based on the findings achieved in the second level CFA, it is possible to express a total score can be obtained regarding the MCS. However, since the tri-factor formation will reflect the multifaceted nature of the scale, the author recommends using the scores from the subscales separately. Considering the total score basis, the range of points that can be obtained from the scale varies between 14 and 70. The high score obtained from the scale shows that the perceived multicultural education competence by preservice teachers is at a high level, and a low score shows that it is at a low level.

The three subscales provided a multi-dimensional assessment of a preservice teacher' multicultural education competence: the awareness subscale aims to measure the teacher's awareness of their own cultural affiliation. The knowledge subscale aims to measure the teacher's willingness to learn about diverse cultures. The skill subscale aims to measure the teacher's competence to organize and adapt to the educational environment and/or materials according to the multicultural class. The validity and reliability of the scale indicated that the MCS-14 has satisfactory psychometric features. This study also supports the use of the MCS-14 in its current configural, metric, scalar and partial strict invariance across gender. Thus the factor loadings, item intercepts and latent means can be compared across gender groups. In addition, it can be stated that due to the achieving item uniquenesses, equivalence of the scale precisions exists except for the three items (S2, A4, S3).

The present study has some limitations. First, the data of this current study were collected by a convenience sample, but random sampling makes it possible to generalize. Second, the data depend on self-report, so the results are limited to the responses of the participants. Data from the MCS and data from interviews and observations can provide more insight to determine a teacher's multicultural competency. Third, although the psychometric properties of the MCS are sufficient, there still remains room for improvement. More psychometric evidence, including test-retest reliability, criterion validity, and predictive validity, is needed to improve the validity of inferences from MCS. Forth, measurement invariance was evaluated according to gender. However, other variables were not examined. Therefore, future studies need to investigate measurement invariance on several variables such as age, department, background experiences, family characteristics, and learning environment.

Despite the limitations, the present study has some implications. The MCS is short and an easily applicable tool. The multidimensional nature of the scale can provide richness and depth to information acquired. Inferences made based upon the MCS-



14's scores are valid, as long as the instrument is used properly. The MCS can be utilized to diagnose pre-service teachers' multicultural competency and determine changes in their strengths and weaknesses in multicultural competency during the training. The MCS enables preservice teachers to self-assess to recognize their position of multicultural competence. Researchers or academics can use the scale to make needs assessments and curriculum planning to identify and monitor the level of educational professional development and performance related to multicultural competence. The MCS also allows researchers to predict teachers' future success in diverse classrooms. Information to be obtained from the MCS may broaden our understanding of multicultural competence of preservice teachers in an increasingly diverse society.

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### Öğretmen Adayları İçin Çok Kültürlü Yeterlilik Ölçeği: Geliştirilmesi, Geçerliliği ve Ölçme Değişmezliği

#### Atıf:

- Erdem, D. (2020). Multicultural competence scale for prospective teachers: Development, validation and measurement invariance. *Eurasian Journal of Educational Research*, 87, 1-28. DOI: 10.14689/ejer.2020.87.1

#### Özet

*Problem Durumu:* Yeni milenyum hem yerel hem de küresel düzeyde artan bir çeşitliliğe tanık olmaktadır. Ülke demografilerindeki değişimler ve göçteki artışlara bağlı olarak okullardaki öğrenci çeşitliliği de artmaktadır. Bu nedenle, araştırmacılar, okul politikalarının ve uygulamalarının bu öğrenci çeşitliliğini karşılayabilecek şekilde gelişmesi gerektiğini vurgulamaktadır (Banks, 2010). Böylesi bir küresel dünyada farklı geçmişlerden ve kültürel alt yapılardan gelen öğrencilerle karşı karşıya kalacak öğretmen adaylarının nitelikli bir eğitime sahip olmaları gerekmektedir (Nzai ve Feng, 2014). Bir diğer ifadeyle, öğretmenlerin kültürel ve dilsel olarak farklı gruplardan gelen öğrencilere etkili bir şekilde hizmet etmeleri için hazırlıklı olmaları gerekir (Mysore, Lincoln ve Wavering, 2016).

Rosado (1997), çok kültürlülüğü bir toplumdaki tüm farklı grupların varlığını tanıyan ve saygı duyan, sosyo-kültürel farklılıklarını kabul edip değer veren, bunun yanı sıra varlıklarını sürdürmelerini teşvik eden ve sağlayan bir inanç ve davranış



sistemi olarak tanımlamaktadır. Parekh (2002) ise daha geniş bir bakış açısıyla çok kültürlü eğitimi, kendini yansıtmaya, kanıtların bağımsız olarak değerlendirilmesiyle fikirlere ulaşma becerisi, başkalarına saygı duymak, çeşitli bakış açılarına ve yaşam tarzlarına duyarlı olmayı içeren ve entelektüel merakı destekleyen eğitim faaliyetleri olarak görmektedir. Eğitimde çok kültürlülüğün temel amacı, öğrencinin özelliklerini anlayabilen ve her öğrencinin akademik potansiyelini gerçekleştirmesine yardımcı olmak için gerekli becerilere sahip yetkin eğitimciler yetiştirmektir (Keengwe, 2010; Walker, Shafer ve Iiams, 2004). Ancak öğretmen adaylarının birçoğu öğretmen eğitimi programlarına çok sınırlı deneyimlerle girdiklerini belirtmişlerdir (Valentin, 2006). Yapılan araştırmalarda aday öğretmenler, farklı kültürlere mensup öğrencilere ve çok kültürlü okul ortamlarında eğitim vermeye yeterince hazır olmadıklarını bildirmişlerdir (Cho ve DeCastro-Ambrosetti, 2005; Futrell, Gomez ve Bedden, 2003; Ladson-Billings, 2000; Valli ve Rennert-Ariev, 2000).

Parekh (2002), iki veya daha fazla kültürel gruba içeren bir grubu çok kültürlü olarak tanımlar. Nitekim zengin kültür ve uygarlıklara ev sahipliği yapan bir ülke olan Türkiye de çok kültürlü bir toplum olarak kabul edilir (Polat ve Kılıç, 2013). Türk eğitim sistemine katılan öğrenciler etnik köken, din, sosyal sınıf, ırk, cinsel yönelim ve birçok özellik bakımından çeşitlilik göstermektedir (Kotluk ve Kocakaya, 2018). Ayrıca, bugün Türkiye, 1.7 milyon çocuğun da dahil olduğu 4 milyon civarında mülteciye ev sahipliği yapmaktadır. Bu mevcut demografik durumun bir sonucu olarak, tüm dünyadaki öğretmenlerin yanı sıra Türkiye'deki öğretmenlerin de farklı kültürel aidiyetleri olan öğrenciler karşısında donanımlı olmaları gerekmektedir.

*Araştırmanın Amacı:* Bu çalışmanın amacı, öğretmen adaylarının çok kültürlü yetkinliklerini ölçen bir ölçek geliştirmektir. Sosyal bilimler ve davranış bilimlerinde test puanları genellikle grup karşılaştırmaları yapmak için kullanılır. Ancak, bu tür karşılaştırmalar yalnızca eldeki puanlar karşılaştırılabilir olduğunda geçerli olur. Bu nedenle, bu çalışmada cinsiyet grupları arasında ölçme değişmezliğinin incelenmesi de gerekli görülmüştür.

*Araştırmanın Yöntemi:* Ölçeğin faktör yapısını belirlemek için açımlayıcı faktör analizi (AFA) uygulanmıştır. Model veri uyumu doğrulayıcı faktör analizi (DFA) ile incelenmiştir. DFA, maksimum olabilirlik kestirim yöntemi ve kovaryans matrisi kullanılarak yürütülmüştür. Ölçme değişmezliği ise çoklu grup doğrulayıcı faktör analiziyle test edilmiştir.

*Araştırmanın Bulguları:* Açımlayıcı faktör analizi işlemi sonucunda ölçek maddelerinin özdeğeri bir'den büyük üç faktör altında toplandığı gözlenmiştir. Faktör yük değerleri .40'ın altında olan ve binişiklik gösteren maddeler ölçekten çıkarılmıştır. Bu koşullardaki 14 madde ölçekten çıkarıldığında ortaya çıkan üç faktörlü yapı, toplam varyansın %54.7'sini açıklamaktadır. Birinci faktörün (Farkındalık) özdeğeri 4.74 ve açıkladığı varyans %33.86'dır. Bu faktör altında altı madde yer almıştır. İkinci faktörün (Beceri) özdeğeri 1.86 ve açıkladığı varyans %13.32 olarak belirlenmiştir. Bu faktör altında beş madde yer almıştır. Üçüncü faktörün (Bilgi) özdeğeri 1.05 ve açıkladığı varyans %7.51'dir. Bu faktör altında üç madde yer almıştır.

Açımlayıcı faktör analizinde ortaya çıkan yapının doğrulanıp doğrulanmadığı farklı bir örneklem üzerinde DFA ile sınanmıştır. Analiz sonucunda 14 maddelik birinci-düzyer üç faktörlü yapı için ortaya çıkan uyum istatistikleri  $\chi^2(74)=143.72$ ,  $\chi^2/sd=1.97$ , GFI=.94, CFI=.97, NFI=.95, NNFI=.97, RMSEA=.056 [%90 güven aralığı .042-.069] ve SRMS=.05; ikinci-düzyer üç faktörlü yapı için ortaya çıkan uyum istatistikleri ise  $\chi^2(74)=143.72$ ,  $\chi^2/sd=1.94$ , GFI=.94, CFI=.94, NNFI=.93, RMSEA=.055 [%90 güven aralığı.041-.068] ve SRMS=.048 olarak bulunmuştur. Bu ölçüler değerlendirildiğinde üç faktörlü yapı için DFA uyum indekslerinin kabul edilebilir sınırlar dahilinde olduğu sonucuna varılmıştır. Bu bulgular doğrultusunda, ölçeğin 14 maddelik üç faktörlü yapısına ilişkin model veri uyumunun oldukça iyi düzeyde olduğu çıkarımı yapılmıştır.

Güvenirliliği belirlemek için her bir alt ölçek için Cronbach alfa katsayıları hesaplanmıştır. Farkındalık alt ölçeğinde altı madde yer almaktadır ve alfa değeri .79'dur. Beceri alt ölçeğinde beş madde bulunmaktadır ve alfa değeri .76'dır. Bilgi alt ölçeğinde üç madde yer almaktadır ve alfa değeri .68'dir. Alt ölçeklerdeki madde sayıları dikkate alındığında iç tutarlılığın yeterli olduğu ifade edilebilir.

Cinsiyete göre ölçme değişmezliğini incelemek için öncelikle kız ve erkek gruplarında ayrı ayrı DFA yapılmıştır. Bulgular incelendiğinde her iki katılımcı grubu için de model uyumunun yeterli düzeyde olduğu ortaya çıkmıştır. Ölçme değişmezliği incelenirken iç içe geçmiş ve kısıtlama içeren bir dizi model aşamalı olarak test edilmiştir. İç içe geçmiş modeller sınanırken ilk aşamada yapısal (configural) değişmezlik modeli test edilir. Uyum değerleri incelendiğinde yapısal değişmezliğin cinsiyet gruplarında sağlandığı görülmektedir ( $\chi^2/sd=1.85 < 3$ ; CFI=.95; RMSEA=.070). Bu sonuç, hem üç faktörlü yapının hem de bu faktörler altındaki maddelerin kız ve de erkek grubunda aynı şekilde geçerli olduğunu ifade etmektedir. Bundan sonraki aşama ise, faktör yüklerinin gruplar arasında eşitliğini sınırlayan metrik değişmezlik modelini test etmektir. İç içe geçmiş modelleri karşılaştırmada ki-kare fark testi ve delta CFI değerleri incelenmiştir. Metrik modelde ki-kare fark testinin manidar olmaması ve  $\Delta CFI$  değerinin -.01'den büyük olması metrik değişmezliğin sağlandığını; diğer bir ifadeyle cinsiyet grupları arasında faktör yüklerinin eşit kabul edilebileceğini göstermiştir. Diğer aşamada, faktör kovaryanslarının gruplar arasındaki eşitliği skalar değişmezlik modeliyle sınanmıştır. Skalar modelde ki-kare fark testinin manidar olmaması ve  $\Delta CFI$  değerinin -.01'den büyük olması skalar değişmezliğin sağlandığını göstermiştir. Skalar değişmezlik, faktör yüklerinin yanı sıra kesim noktalarının gruplarda değişmez olduğunu ifade etmektedir. Son olarak da, katı (strict) değişmezlik modeli incelenmiştir. Katı modelde ki-kare fark testinin manidar olması ve  $\Delta CFI$  (-.02) değerinin ise -.01'den küçük olması katı değişmezliğin sağlanmadığını; bir diğer ifadeyle cinsiyet gruplarında hata varyanslarının eşit olmadığını belirtmektedir. Hangi madde veya madde gruplarının hata varyanslarının farklı olduğunu tespit edebilmek için kısmi değişmezlik incelenmiştir. Katı değişmezliğin hangi madde veya madde gruplarından ötürü sağlanmadığını belirlemek için öncelikle skalar modelde ortaya çıkan hata terimleri incelenmiştir. Cinsiyet gruplarında hata terimleri arasındaki farkın en büyük olduğu maddeler belirlenmiş, sonrasında bu maddelerin hata varyansları tek tek serbest bırakılarak model uyumu incelenmiştir. Nihayetinde sırasıyla Beceri alt

ölçeğinde 2. madde, Farkındalık alt ölçeğinde 4. madde ve yine Beceri alt ölçeğinde 3. maddeye ilişkin hata varyansları serbest bırakıldığında ( $\Delta CFI=0.0$ ) kısmı katı değişmezlik sağlanmıştır.

*Araştırmanın Sonuçları ve Öneriler:* Sonuç olarak, çok kültürlü yeterlilik ölçeği, öğretmen adaylarının çok kültürlü eğitime yönelik yeterliklerini ölçmeyi amaçlayan 5'li Likert tipinde 14 maddelik bir öz değerlendirme aracıdır. Tepki dereceleri "Beni hiç tanımlamıyor (1)", "Beni biraz tanımlıyor (2)", "Beni orta düzeyde tanımlıyor (3)", "Beni oldukça tanımlıyor (4)" ve "Beni tamamen tanımlıyor (5)" şeklinde düzenlenmiştir. Araç üç alt ölçekten oluşmaktadır. Farkındalık alt ölçeği, öğretmenin kendi kültürel bağlantıları hakkındaki farkındalığını ölçmeyi amaçlamaktadır. Bilgi alt ölçeği, öğretmenin farklı kültürler hakkında bilgi edinmeye yönelik isteklilik durumunu belirlemeyi amaçlar. Beceri alt ölçeği ise, öğretmenin eğitim ortamını ve materyalleri çok kültürlü sınıfa göre düzenleme ve uyarlama yetkinliğini ölçmeyi amaçlar. Farkındalık alt ölçeğinde birinci ve altıncı maddelerde ters puanlama yapılması gerekmektedir. Her bir alt ölçekten elde edilen yüksek puan ilgili alandaki yeterliğin yüksek olduğunu göstermektedir. Geçerlik ve güvenilirlik değerleri ölçeğin yeterli psikometrik özelliklere sahip olduğunu göstermiştir. İkinci-düzy DFA sonuçları ölçekten toplam puan alınabileceğine işaret etmektedir. Ancak yazar, ölçeğin çok boyutlu yapısından dolayı her bir alt ölçek puanlarının ayrı ayrı kullanılmasını önermektedir. Bu çalışma aynı zamanda cinsiyete göre yapılacak karşılaştırmalarda yapısal, metrik, skaler ve kısmi katı değişmezliğin sağlandığını desteklemektedir. İleride yapılacak araştırmalarda ölçeğin farklı gruplarda değişmezlik gösterip göstermediği incelenebilir.

*Anahtar Sözcükler:* Çok kültürlülük, ölçek geliştirme, ölçme değişmezliği, kısmı katı değişmezlik.

## EK

**Çok Kültürlü Yeterlilik Ölçeği**

Alt ölçek	Maddeler
Farkındalık	<p>Kültürel aidiyetim, farklı kültürlerdeki öğrencilere mesafeli olmama neden olur. (1)</p> <p>Öğrencilerin sahip olduğu farklı kültürel özellikleri anlayabilirim.</p> <p>Farklı kültürlerden gelen öğrencilere ayrımcılık yapıp yapmadığımı fark edebilirim.</p> <p>Farklı kültürlerle yönelik önyargılarımı eleştirel bir bakış açısıyla irdeleyebilirim.</p> <p>Farklı kültürlerle yönelik önyargılarımın farkındayım.</p> <p>Kültürel aidiyetimden ötürü farklı kültürlerle sahip öğrencilere yanlı davranabilirim. (2)</p>
Beceri	<p>Eğitim ortamını farklı kültürlerden gelen öğrencilere uygun olarak düzenleyebilirim.</p> <p>Sınav sorularını farklı kültürlerden gelen öğrencilere uygun olarak hazırlayabilirim.</p> <p>Öğretim materyallerini farklı kültürlerden gelen öğrencilere uygun olarak uyarlayabilirim.</p> <p>Kazanımları, farklı kültürlerden gelen öğrencilere uygun olarak işleyebilirim.</p> <p>Öğrencilerin kültürel farklılıklara yönelik önyargılarını azaltmak için etkinlikler yapılandırabilirim.</p>
Bilgi	<p>Farklı kültürlerden gelen öğrencilerin düşünce sistemleri, değer ve gelenekleri hakkında bilgi sahibi olmayı önemserim.</p> <p>Farklı kültürel özelliklere sahip öğrencilere duyarlı davranılması gerektiğini bilirim.</p> <p>Farklı kültürlerden gelen öğrencilerin iletişim stilleri hakkında bilgi sahibi olmayı gerekli bulurum.</p>



## The Investigation of the Level of Fulfilment: The Basic Needs of Architecture Students

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### ARTICLE INFO

### ABSTRACT

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**Purpose:** In order to improve the quality of education, it is important to identify the basic needs of first-year students who receive architectural education. The objective of this research was to investigate the level of basic needs satisfaction of first-year students receiving education in the architecture department.

**Research Methods:** In this research, a relational screening model, which is one of the general survey models, was used. Students' perception in terms of satisfaction of basic needs was measured with University Students' Basic Needs Scale. Moreover, information related to socio-demographical characteristics was collected via the Personal Information Questionnaire.

**Findings:** Research findings indicated that the satisfaction levels of basic needs of architecture students participating in the research were generally above 4, which was the neutral score level. The lowest satisfaction level for all five basic needs was determined to be related to the survival need. Furthermore, it was concluded that students' perception in terms of basic need satisfaction significantly differed with respect to their academic grade points, genders, the residential units where they mostly resided and educational status of their parents.

**Implications for Research and Practice:** Depending on the class level, it may be ensured that more comprehensive evaluations are made about the students' perceptions of needs. In new studies, other variables that might have an effect on basic needs satisfaction may also be included.

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## Introduction

It is known that the primitive man needed to feed for continuing his life and to build a shelter for sheltering and protection. These basic requirements have an important place in the emergence of the concept of architecture, which can be expressed as the design process of the built environment. The basis of architecture is human life. Living in a built environment shows that architecture is one of the oldest professions. The individual involved in architecture education, aiming to contribute to both personal and professional development, has to improve his/her professional knowledge and mastery with the experience he/she gains in the process. In architecture education, it is expected that knowledge is not only acquired at the cognitive level but also through mental processes and through effective concepts.

In respect to such aspects, discipline of architecture differs from many other disciplines and provides an interactive learning environment in which students are mentally, sensorially, and intuitively centralized. Discipline of architecture in which interaction and sharing are effective sustains its dynamism not only inside but also outside of schools. This situation includes independent activities with no limited time rather than learning processes that are restricted to course hours. In these processes, learners play effective roles by means of individual and group studies. It is so important both physically and psychologically to improve concentration that is particularly required during individual studies progressing based on design problem. Meanwhile, individual differences have to be paid sufficient attention.

The first year of the university is of particular importance for the education process in terms of the first step towards a new social environment and profession. From this point of view, in order to improve the quality of education, it is important to identify the basic needs perceptions of first-year students who receive architectural education. Ozdel, Bostancı, Ozdel and Oguzhanoglu (2002) state that students who get a chance to study at the university have concerns about leaving the family, acquiring a new environment, being alone and having economic difficulties.

Ensuring compliance with new situations is directly related to students' perception of basic needs satisfaction. Copeland (1992) stresses the importance of fulfilling basic needs for people to feel under control and to get closer to success. Freud explained human behavior mostly on the basis of biological needs and motives. Maslow (1943) developed a broad theory that combined various views. According to the five hierarchical classification of importance and priority, we can list; physiological requirements (nutrition, sleep, etc.), the need for security (physical, economic and social security), the need for belonging and love (belonging to the group, love-loving), the need to respect (respect, reputation, fame) and the need for success (success, self-reproducing, performing) (Inceoglu, 2011). Glasser (2005) states that the basis of human movements is constituted of five genetic needs. According to the choice theory approach, the assumption is put forth that happiness can only be achieved if the basic needs of the people are met sufficiently. In relation to this, according to Glasser, needs based on physiological needs (survival) and psychological needs (love and belonging,

power, freedom, entertainment) constitute the basic needs of people. The five basic requirements identified by Glasser can be summarized as follows.

The need for survival is the most basic need of humans. It is the source of behavior in which vital functions are controlled by the brain and conscious behaviors are mobilized. It includes basic physical needs such as food, water, air, housing, heating, security and reproduction (Frey & Wilhite, 2005; Kaner, 1993). The need for power can be expressed by being successful, having status, being recognized and valued. In achieving success, it is a need providing a sense of motivation and self-esteem in obtaining approval. It is based on the need to have the ability and capacity to do something. We have the ability to use our creativity as much as we can use our freedom in a way that does not conflict with other people (Frey & Wilhite, 2005; Glasser, 1998). The need for entertainment is manifested as a need in people's genetic structures. It is expressed as the desire to participate in the activities which provide pleasant feelings and whose purpose is giving pleasure. Taking pleasure while producing and learning something is associated with the need for hearing, playing and experiencing humor (Corey, Corey, & Corey, 2013; Glasser, 1998). The need for love and belonging depends on people's seek for love and devotion. The need to be with others is the foundation for the forming of human relations. It is related to the bonds established in family, friends and business relations. It is important to develop good relations in order to meet the needs of love and other social needs. The level of interaction with other people and the level of fulfilment of the needs explain to what extent satisfaction and love needs can be satisfied (Frey & Wilhite, 2005; Glasser, 1998). The need for freedom means that a person has his/her own choices and he/she wants to walk in line with these choices. People want to live their lives as they wish, to express themselves freely and to act independently in many other ways. However, socially being free is associated with being open to alternative ideas rather than selfishness (Erwin, 2003; Frey & Wilhite, 2005).

Although the five basic needs mentioned are genetically present in humans, fulfilment of these needs is specific to the individual. The information obtained from the outside consists of knowledge and the choice of how to behave towards this information is shaped by intrinsic motivations. When literature was examined, it was seen that the level of basic needs being met in architectural students was not studied in any of the studies. In this context, this research aimed to reveal the level of fulfilment of the basic needs of first-year students studying architecture. Hypotheses developed as part of the research are as follows;

H<sub>1</sub>: a significant relation exists between fulfillment level of students' basic needs and their academic achievement status.

H<sub>2</sub>: fulfillment level of students' basic needs varies depending on gender.

H<sub>3</sub>: fulfillment level of students' basic needs varies depending on locations where they live most of their life.

H<sub>4</sub>: fulfillment level of students' basic needs varies depending on their mothers' educational status.

H<sub>5</sub>: fulfillment level of students' basic needs varies depending on their fathers' educational status.

In accordance with the aforementioned hypotheses, an answer is sought for the following questions:

1. What is the fulfillment level of first grade architecture student's basic needs?
2. Does point average related to the fulfillment level of students' basic needs vary significantly depending on their academic standing?
3. Does point average related to the fulfillment level of students' basic needs vary significantly depending on the following factors?
  - a) Gender
  - b) Location where they live most of their life
  - c) Parents' educational status

## Method

### *Research Design*

In this research, a relational screening model, which is one of the general survey models, was used. Screening models are appropriate approaches for studies that aim to describe a past or currently existing situation in the way it exists. In general, screening models are screening applications applied to the entire population or a group of sample or sampling in order to have a general judgment of a population that consists of a large number of elements. The relational screening models in this group are research models aiming to determine the existence of covariance or the level of variance between two or more variables (Karasar, 2016).

### *Research Sample*

The research was conducted with first-year students studying at Architecture Department of Karadeniz Technical University Faculty of Architecture in the fall semester of the 2018-2019 academic year. A total of 82 students, 46 female and 36 male, participated in the research. Distribution of the participants' socio-demographic characteristics is presented in Table 1.

**Table 1**

*Socio-Demographic Characteristics of the Participants of the Research*

Variable	Groups	Number	Percentage
Gender	Female	46	56.1
	Male	36	43.9
Academic GPA	2.01-2.50	25	30.5
	2.51-3.00	34	41.5
	3.01-3.50	13	15.9
	3.51-4.00	10	12.2



Table 1 Continue

Variable	Groups	Number	Percentage
Mothers' Level of Education	Primary-Secondary School	52	63.4
	High school	21	25.6
	University	9	11
Father's Level of Education	Primary-Secondary School	28	34.1
	High school	21	25.6
	University	33	40.2

When the distribution of socio-demographic characteristics in Table 1 was examined, it was determined that 56.1% of the students were female and 43.9% were male. It is seen that 30.5% of students had academic grade point average of 2.01-2.50, 41.5% of 2.51-3.00, 15.9% of 3.01-3.50, and 12.2% of 3.51-4.00.

#### Research Instruments and Procedures

*The University Students Basic Needs Scale:* In order to determine the level of fulfilment of the basic needs of the students, the University Students Basic Needs Scale (USBNS) developed by Turkdogan (2010) was used. The USBNS is used to evaluate the level of fulfilment of university students' survival, power, entertainment, love and belonging, and freedom needs. As a result of validity and reliability studies, the scale consists of 5 sub-dimensions and 19 items. In the 7-point Likert-type measurement tool USBNS, there are four items of survival, power, freedom, entertainment, and in the sub-dimension of love and belonging there are three items. Each statement is answered by choosing among the options of: "(1) I don't disagree at all", "(2) I mostly disagree", "(3) I don't agree much", "(4) I'm indecisive", "(5) I partially agree", "(6) I mostly agree" and "(7) I completely agree". As the average score obtained from the scale increases, it is accepted that the needs are met smoothly and the students' satisfaction level is high. As a result of the exploratory factor analysis of the scale form, a five-factor structure with self-value between 1.31 and 5.47, which explained 67.40% of the variance, was reached. In addition, confirmatory factor analysis results showed that the scale had good fit values for construct validity without any modification ( $\chi^2/df=3.36$ ;  $GFI=.96$ ,  $AGFI=.94$ ,  $CFI=.96$ ,  $RMSEA=.045$ ,  $SRMR=.034$ ) (Turkdogan & Duru, 2017).

*The personal information form:* It was developed for the purpose of determining gender, socio-demographic characteristics such as residential area where much of life is spent, mother's education status, father's education status, and academic grade point average of the students participating in the research. The data related to the academic grade point average of students was obtained from the Department of Architecture of Karadeniz Technical University within the scope of ethical procedures. Fraenkel, Wallen and Hyun (2012) emphasize the importance of including socio-demographic data and states that all data representing the sample should be reported in order for the sample to be more fully defined and to support research.

The USBNS and personal information form were applied to the students in the classroom. Before the application, the students were briefly informed about the scope

of the research and it was stated that the data would be used only within the scope of the research. Filling of the scales by students was completed in about fifteen minutes.

### Data Analysis

The compatibility of the data obtained from the research to normal distribution was determined by the Kolmogorov-Smirnov test. In the analysis of data, Mann Whitney U test and Kruskal Wallis tests were used to determine whether there was a statistically significant difference. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS 18.0). Data analysis was valid at 95% confidence level and the significance level was taken as .05.

## Results

Normal distribution analyses of the data obtained in the research were conducted. The mean score, minimum and maximum score range, skewness and kurtosis coefficients were calculated within the scope of this analysis. Since the number of participants was over 50, compliance of the obtained data with the normal distribution was determined by the Kolmogorov-Smirnov test. Data analysis was valid at 95% confidence level and its significance level was accepted as .05. According to the tests performed, the results of the tests of normality for the scores of the measurement sets are presented below (Table 2).

**Table 2**

*Results of Normality Tests for Distribution of Data*

	Kolmogorov-Smirnov (a)			Median	Skewness	Kurtosis
	Statistic	df	p			
Survival	.120	82	.006	4.875	-.185	-.374
Power	.076	82	.200	5.250	-.428	.470
Entertainment	.148	82	.001	5.750	-.499	-.899
Love and Belongingness	.194	82	.001	6.167	-.637	-1.028
Freedom	.150	82	.001	5.750	-1.008	.799

*df*: Degree of freedom

*p*: Significance level

As a result of Kolmogorov-Smirnov (a) analysis, it was determined that the distribution of the data related to power subscale was normal ( $p > .05$ ). However, it was determined that the distribution of data on survival, entertainment, love, and belonging and freedom subscales were not normal ( $p < .05$ ). When the other assumptions of normality, which are the proximity of the mean and median to each other and the necessity that the values of skewness and kurtosis to be between -2.5 and +2.5 are examined, it was determined that these values complied with the normal distribution according to the variables. In the central limit theorem, it is posited that a sample size of more than 30 makes the distribution close to normal. Since the sample size was 82 in this research, it was concluded that even though the distribution was not normal, it was not far away from the normal distribution given by the central limit

theorem. In the light of this information, it was determined that the data were not far away from normal distribution.

The data on the level of fulfilment of the basic needs of the students are summarized in Table 3. When the descriptive statistics of the USBNS were examined, it was determined that the subscale having the highest level was love and belonging ( $X=5.793$ ), while the lowest subscale was survival ( $X=4.716$ ) (Table 3).

**Table 3**

*Descriptive Statistics of the University Students Basic Needs Scale*

Subscales	N	$\bar{X}$	SD
Survival	82	4.716	1.059
Power	82	5.296	.944
Entertainment	82	5.317	1.369
Love and Belongingness	82	5.793	1.197
Freedom	82	5.396	1.104

N: Sample size

$\bar{X}$ : Sample mean

SD: Standard deviation

The Kruskal Wallis H test was applied to determine whether there was a significant difference between the mean scores of the students' basic needs and their academic achievement (Table 4).

**Table 4**

*Results of Differences between Students' Scores of Subscales According to Their GPAs*

Subscales	Academic GPA	N	Mean Rank	$\chi^2$	SD	p	Difference
Survival	2.01-2.50	25	40.36	7.517	3	.057	
	2.51-3.00	34	45.82				
	3.01-3.50	13	26.42				
	3.51-4.00	10	49.25				
Power	2.01-2.50	25	39.62	3.445	3	.328	
	2.51-3.00	34	40.71				
	3.01-3.50	13	37.42				
	3.51-4.00	10	54.20				
Entertainment	2.01-2.50	25	34.06	11.141	3	.011*	1-2
	2.51-3.00	34	51.85				2-3
	3.01-3.50	13	33.38				2-4
	3.51-4.00	10	32.95				
Love and Belongingness	2.01-2.50	25	44.60	11.236	3	.011*	1-3
	2.51-3.00	34	43.69				2-3
	3.01-3.50	13	22.23				3-4
	3.51-4.00	10	51.35				
Freedom	2.01-2.50	25	40.16	8.902	3	.031*	
	2.51-3.00	34	49.51				2-3
	3.01-3.50	13	28.04				
	3.51-4.00	10	35.10				

\* $p < .05$

$\chi^2$ : Chi-square

When the data in Table 4 were analyzed, it was seen that there was no statistically significant difference between the level of fulfilment of students' survival and power needs and the academic grade point average ( $p > .05$ ). On the other hand, it was determined that there was a statistically significant difference between the students' level of fulfilment of the needs of entertainment, love and belonging, freedom and their academic grade point average ( $p < .05$ ). In the present case,  $H_1$  hypothesis was partially accepted. In the survival subscale, it was observed that the average of the students whose grade point average was 3.51-4.00 had the highest (Mean rank=49.25), and those whose grade point average was 3.01-3.50 (Mean rank=26.42) had the lowest ranking of average. In the power subscale, it was found that the students with an academic GPA of 3.51-4.00 (Mean rank=54.20) had the highest rank average, the students with an academic GPA of 3.01-3.50 (Mean rank=37.42) had the lowest rank average. In the entertainment subscale, it was determined that the students with the academic average 2.51-3.00 (Mean rank=51.85) had the highest ranking of average, while the average of the students between 3.51-4.00 (Mean rank=32.95) had the lowest ranking of average. In the love and belonging subscale, it was found that the students with an academic GPA of 3.51-4.00 (Mean rank=51.35) had the highest rank average, and the students with an academic GPA of 3.01-3.50 (Mean rank=22.23) had the lowest rank average. In the freedom subscale, it was found that the students with an academic GPA of 2.51-3.00 (Mean rank=49.51) had the highest rank average, and the students with an academic GPA of 3.01-3.50 (Mean rank=28.04) had the lowest rank average.

The Mann Whitney U test was used to determine whether the mean scores of the students' basic needs were significantly different according to their gender (Table 5).

**Table 5**

*Results of Differences between Students' Scores of Subscales According to Their Genders*

Subscales	Gender	N	Mean Rank	U	p
Survival	Female	46	44.41	694.00	.208
	Male	36	37.78		
Power	Female	46	42.13	799.00	.786
	Male	36	40.69		
Entertainment	Female	46	43.07	756.00	.499
	Male	36	39.50		
Love and Belongingness	Female	46	46.77	585.50	.022*
	Male	36	34.76		
Freedom	Female	46	45.47	645.50	.086
	Male	36	36.43		

\* $p < .05$

U: U value

According to the Mann Whitney U test, there was no significant difference among the level of survival, power, entertainment and freedom of male and female students ( $p > .05$ ). The difference in the level of fulfilment of the need for love and belonging of students was found statistically significant at 95% confidence level ( $U=585.50$ ,  $p=.022$ ,  $p < .05$ ). In the present case,  $H_2$  hypothesis was partially accepted. It was observed that the love and belonging levels of the females (Mean rank=46.7) were higher than the males (Mean rank=34.76).

Kruskal Wallis H test was used in order to determine whether there was a significant difference between the average of fulfilment of the students' basic needs compared to the average of the settlement where they spend most of their lives (Table 6).

**Table 6**

*Results of Differences between Students' Scores of Subscales According to Their Settlement Places*

Subscales	Settlement Places	N	Mean Rank	$\chi^2$	SD	p	Difference
Survival	Village-Town	12	37.79	.999	3	.802	
	District	12	42.42				
	Province	32	44.34				
	Metropolitan city	26	39.29				
Power	Village-Town	12	51.96	11.177	3	.011*	1-3
	District	12	49.63				
	Province	32	30.83				
	Metropolitan city	26	46.06				
Entertainment	Village-Town	12	20.13	12.803	3	.005*	1-2 1-3 1-4
	District	12	45.92				
	Province	32	41.72				
	Metropolitan city	26	49.06				
Love and Belongingness	Village-Town	12	47.92	6.108	3	.106	
	District	12	49.83				
	Province	32	33.86				
	Metropolitan city	26	44.10				
Freedom	Village-Town	12	28.50	6.012	3	.111	
	District	12	43.54				
	Province	32	40.03				
	Metropolitan city	26	48.37				

\* $p < .05$

According to the results of Kruskal Wallis H test, it was determined that there was no statistically significant difference between the fulfilment level of survival, love and belonging, freedom needs of the students, and the settlement units ( $p > .05$ ). In contrast, the fulfilment level of the students' power ( $\chi^2 = 11.177$ ,  $p = .011$ ,  $p < .05$ ) and entertainment ( $\chi^2 = 12.803$ ,  $p = .005$ ,  $p < .05$ ) were found statistically significant at 95% confidence level compared to settlement units. In the present case,  $H_3$  hypothesis was partially accepted. When the data in Table 6 were examined, the highest rank average in the survival subscale belonged to the students who spend most of their lives in "Province" (Mean rank=44.34), while the lowest average belonged to the students living in a "Village-town" (Mean rank=37.79). It was seen that the highest order average in the power subscale belonged to the students who have spent most of their lives in "Village-

town" (Mean rank=51.96) while the lowest average belonged to the students living in "Province" (Mean rank=30.83). It was found that the highest average rank in the entertainment subscale belonged to the students who spend most of their lives in "Metropolitan city" (Mean rank=49.06) while the lowest average belonged to students living in the "Village-town" (Mean rank=20.13). It was determined that the highest rank average in the love and belonging subscale belonged to the students who spend most of their lives in the "District" (Mean rank=49.83) while the lowest average belonged to the students living in the "Province" (Mean rank=33.86). In the freedom subscale, it was seen that the highest rank average belonged to the students, who spend most of their lives in "Metropolitan city" (Mean rank=48.37), while the lowest rank average belonged to students living in "Village-town" (Mean rank=28.50).

Kruskal Wallis H test was used in order to determine whether there was a significant difference in the level of fulfilment of the basic needs of the students according to the status of their mother's education (Table 7).

**Table 7**

*Results of Differences between Students' Scores of Subscales According to Their Mothers' Level of Education*

Subscales	Mothers' Level of Education	N	Mean Rank	$\chi^2$	SD	p	Difference
Survival	Primary-School	52	44.96	5.828	2	.054	
	High school	21	30.76				
	University	9	46.56				
Power	Primary-School	52	42.57	.416	2	.812	
	High school	21	40.67				
	University	9	37.28				
Entertainment	Primary-School	52	37.27	5.043	2	.080	
	High school	21	46.97				
	University	9	53.61				
Love and Belongingness	Primary-School	52	44.72	6.831	2	.033*	1-3
	High school	21	41.64				
	University	9	22.56				
Freedom	Primary-School	52	40.97	8.960	2	.011*	1-3
	High school	21	33.98				
	University	9	62.11				

\* $p < .05$

According to the results of Kruskal Wallis H test, it was determined that there was no statistically significant difference between the level of survival, power and

entertainment needs of the students and the levels of maternal education ( $p>.05$ ). However, the difference in the students' levels of the fulfilment of love and belonging according to the mother's educational status was found statistically significant at 95% confidence level ( $\chi^2=6.831, p=.033, p<.05$ ) and freedom ( $\chi^2=8.960, p=.011, p<.05$ ). In the present case,  $H_4$  hypothesis was partially accepted. When the data in Table 7 were examined, it was determined that the students whose mothers were "University" graduates had the highest average (Mean rank=46.56), and those whose mothers were "High school" graduates (Mean rank=30.76) had the lowest average in the survival subscale. In the power subscale, it was observed that the students whose mothers were "Primary-Secondary school" had the highest average (Mean rank=42.57), and those whose mothers were "University" graduates (Mean rank=37.28) had the lowest average. In the entertainment subscale, it was determined that the students whose mothers were "University" graduates had the highest average (Mean rank=53.61), and those whose mothers were "Primary-Secondary school" (Mean rank=37.27) had the lowest average. In the love and belonging subscale, it was determined that the students whose mothers were "Primary-Secondary school" graduate had the highest average (Mean rank=44.72), and those whose mothers were "University" graduate (Mean rank=22.56) had the lowest average. Freedom subscale, it was determined that the students whose mothers were "University" graduate had the highest average (Mean rank=62.11), and those whose mothers were "High school" graduate (Mean rank=33.98) had the lowest average.

Kruskal Wallis H test was used in order to determine whether there was a significant difference between the level of fulfilment of the basic needs of the students according to their father's education level (Table 8).

**Table 8**

*Results of Differences between Students' Scores of Subscales According to Their Fathers' Level of Education*

Subscales	Father's Level of Education	N	Mean Rank	$\chi^2$	SD	p	Difference
Survival	Primary-Secondary School	28	42.39	.597	2	.742	
	High school	21	44.00				
	University	33	39.15				
Power	Primary-Secondary School	28	42.96	2.345	2	.310	
	High school	21	34.76				
	University	33	44.55				
Entertainment	Primary-Secondary School	28	39.09	4.501	2	.105	
	High school	21	34.60				
	University	33	47.94				

Table 8 Continue

Subscales	Father's Level of Education	N	Mean Rank	$\chi^2$	SD	p	Difference
Love and Belongingness	Primary-Secondary School	28	36.25	2.635	2	.268	
	High school	21	41.36				
	University	33	46.05				
Freedom	Primary-Secondary School	28	38.95	6.179	2	.046*	2-3
	High school	21	33.19				
	University	33	48.95				

\* $p < .05$ 

According to the results of Kruskal Wallis H test, it was determined that there was no statistically significant difference between the level of survival, power, entertainment and love and belonging needs of the students and the status of the father's education ( $p > .05$ ). However, the difference in the students' levels of the fulfilment of freedom according to the father's educational status was found statistically significant at 95% confidence level ( $\chi^2 = 6.179$ ,  $p = .046$ ,  $p < .05$ ). In the present case,  $H_5$  hypothesis was partially accepted. When the data in Table 8 were analyzed, it was determined that the students whose fathers were "High school" graduate had the highest average (Mean rank=44.00), and those whose fathers were "University" graduate (Mean rank=39.15) had the lowest average in the survival subscale. In the power subscale, it was determined that the students whose fathers were "University" graduate had the highest average (Mean rank=44.55), and those whose fathers were "High school" graduate (Mean rank=34.76) had the lowest average. In the entertainment subscale, it was determined that the students whose fathers were "University" graduate had the highest average (Mean rank=47.94), and those whose fathers were "High school" graduate (Mean rank=34.60) had the lowest average. In the love and belonging subscale, it was determined that the students whose fathers were "University" graduate had the highest average (Mean rank=46.05), and those whose fathers were "Primary-Secondary school" graduate (Mean rank=36.25) had the lowest average. In the freedom subscale, it was determined that the students whose fathers were "University" graduate had the highest average (Mean rank=48.95), and those whose fathers were "High school" graduate (Mean rank=33.19) had the lowest average.

### Discussion, Conclusion and Recommendations

The first research question aimed at determining the level of fulfilment of the basic needs of the students. As a result of the analyses, it was determined that the level of fulfilment of the basic needs of the architectural students participating in the research had an average of over 4, which is generally a neutral score level. Among the five basic needs, students were found to have received the highest satisfaction from the need for love and belonging. The level of fulfilment of the need for love and belonging was followed by the levels of freedom, entertainment, power and survival, respectively. It



was observed that the lowest level regarding fulfilment of the basic needs was related to the survival need. This result supports the findings of the studies conducted by Diener and Diener (1995) and Turkdogan (2010).

For the second question of the research, it was determined whether there was a significant difference between the level of fulfilment of students' basic needs and their academic achievement. It is observed that there was a statistically significant difference between the grade point average of the students and the level of their needs for love and belonging, freedom and entertainment being met. Accordingly, it can be said that students whose academic grade point average were between 2.51-3.00 were more satisfied in their lives and had a higher level of satisfaction about sparing time for the activities they are interested in. It was seen that the satisfaction of the need of love and belonging was higher for students with an average of academic grade between 3.51-4.00. This finding suggests that students' satisfaction with their family and friendship relations is in parallel with their good level of academic achievement.

When fulfillment level of requirement of freedom was considered, it was seen that students with 2.51 to 3.00 academic grade point averages had a higher level of satisfaction in making their own choices and expressing themselves freely, which reveals that students need an interaction-based learning environment which enables them to act independently in making their own decisions. Onat (2006) suggests that it is required to provide creative environments and processes that will be able to head students towards creativity. This process makes it essential to give importance to lesson, try to understand the essence of contents, and participate enthusiastically in the stages of examination and evaluation. Therefore, it is preferable to allow for methods and approaches that help students to act in accordance with their own choices and express themselves freely.

Within the scope of the third question of the research, it was questioned whether the level of fulfilment of the basic needs of the students showed a significant difference according to the variables such as gender, settlement unit, mother's education status and father's educational status. Analyses carried out according to gender variables showed that only the levels of fulfilment of the need for love and belonging of the students differed according to gender. The levels of love and belonging of female students were found to be higher than that of males. It was seen that female students had higher levels of love-being loved, emotional attachment and belonging satisfaction than male students. From the perspective of participation in social life and socialization, it can be said that this is an expected result depending on gender.

It is seen that the level of fulfilment of the power and entertainment needs of the students varied according to the settlement unit. The highest satisfaction in terms of power needs belonged to the students who spend most of their lives in the village-town, and the lowest satisfaction belonged to the students who spend most of their lives in the province. This finding shows that students' perceptions of self-esteem and competence do not change according to the size of the settlement unit. Given the fact that being recognized in the social circle, relations and the sense of belonging increase towards rural areas, this is an expected result. On the contrary, it was determined that

the students who spend most of their lives in villages-towns had the lowest satisfaction in need for fun, and those who spend most of their lives in big cities had the highest satisfaction. In terms of providing pleasant places such as cinema, theater, shopping center, cafe/restaurant, the metropolitan has increased the opportunity for students to participate in social and artistic activities; and hence, the satisfaction need for entertainment. This differentiation, which is determined according to the unit of life, is similar to that of Turkdogan (2010).

It was seen that the fulfillment level of students' needs for love & belonging and freedom who participated in the research varied depending on mother's educational status. It was revealed that students whose mothers were elementary-middle school graduate had the highest satisfaction level with the need for love and belonging while those whose mothers were university graduate had the lowest one. This situation can be explained by means of the fact that mothers with a good level of education give more particular importance to their children's education. It was found out that the students whose mothers were university graduate had a higher satisfaction level with the need for freedom. Similarly, it was seen that the students whose fathers were university graduate had the highest satisfaction level with the need for freedom. The fact that the satisfaction level of the need for freedom varies in parallel with both mothers' and fathers' education status suggests that parents with high education level are able to more deliberately guide their children in making decisions related to their own lives.

In this research, the level of fulfilment of the basic needs of first-year students studying at the Department of Architecture of Karadeniz Technical University was determined and presented with supporting socio-demographic data. Findings showed that students' perceptions about basic needs satisfaction varied according to their grade point averages, genders, settlements where they spend the majority of their lives, and parental educational attainment. With its unique structure, architecture education has learning environments that provide students with the opportunity to be free in their own development, creative thinking and design. From this point of view, it seems possible to increase the satisfaction of architecture students' power and freedom needs in particular. Since interactive processes experienced, especially in practical courses, allow to get familiar with students, directing students to their areas of interest can also be made easier. In addition, it is thought that the participation of the students in social, artistic and sportive activities in the department or campus is expected to contribute to increase the satisfaction of their entertainment needs. In addition to these, educational environment of architecture that is based on on informal learning is a guide to providing students with personal and professional development through potentials such as tours, panels, and workshops. Group work, which will enable students to communicate-interact with each other during the course, is important in terms of increasing the satisfaction of their love and belonging and freedom needs. Exchange of information and ideas, and cooperative decision-making can be effective in increasing the motivation of students and making them feel good about themselves. The ability to express students' ideas freely in the learning process

is important in the context of the satisfaction of their basic need for power, as it will bring them closer to the sense of success and sufficiency.

Limitation of the research was the fact that the research consisted of only the first-year students of Karadeniz Technical University, Department of Architecture in 2018-2019 academic year fall semester. For this reason, it may be advisable to carry out studies on the level to which basic needs are met at different stages of architectural education in order to achieve generalizable results. Thus, depending on the class level, it may be ensured that more comprehensive evaluations are made about the students' perceptions of needs. In new studies, other variables that might have an effect on basic needs satisfaction may also be included. Also, in the future studies, the fulfilment level of the basic needs may be related to the data obtained from different measurement tools.

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## Mimarlık Öğrencilerinde Temel İhtiyaçların Karşılanma Düzeylerinin İncelenmesi

### Atıf:

- Kilicaslan, H. (2020). The investigation of the level of fulfilment the basic needs in architecture students. *Eurasian Journal of Educational Research*, 87, 29-46. DOI: 10.14689/ejer.2020.87.2

### Özet

*Problem Durumu:* Yaşamın yapılı çevre içinde geçmesi, mimarlık mesleğinin en eski mesleklerden olduğunu göstermektedir. Hem kişisel hem de mesleki gelişime katkı sağlamayı hedefleyen mimarlık eğitiminde yer alan birey, süreç içerisinde edindiği deneyimlerle mesleki donanımını geliştirmek durumundadır. Yeni bir sosyal çevreye ve mesleğe ilk adım açısından üniversitenin ilk yılı, eğitim süreci için ayrı bir önem taşımaktadır. Bu açıdan bakıldığında, mimarlık eğitimi alan birinci sınıf öğrencilerinde temel ihtiyaç algılarının ortaya çıkarılması eğitim kalitesinin artırılması yönünde önemlidir. Kendine özgü yapısı ile mimarlık eğitimi, öğrencilerin kendilerini geliştirmelerinde, yaratıcı düşüncelerinde ve tasarımlarında özgür davranma imkânı sunan öğrenme ortamlarına sahiptir. Bu açıdan bakıldığında, mimarlık öğrencilerinin özellikle güç ve özgürlük ihtiyaç doyumlarının artırılabilmesi olanaklı gibi görünmektedir. Uygulamalı derslerde yaşanan interaktif süreçler, öğrencilerin yakından tanınmasını sağladığından, onların ilgi duydukları alanlara yönlendirilmeleri de kolaylaştırabilir. Bunların yanı sıra öğrencilerin bölüm veya kampüs içinde sosyal, sanatsal ve sportif etkinliklere katılımlarının, eğlence ihtiyaç doyumunun artırılmasına katkı sağlayacağı düşünülmektedir. Ders süresince

öğrencilerin birbirleriyle iletişim-etkileşim içinde olmalarını sağlayacak grup çalışmaları, sevgi ve ait olma ve özgürlük ihtiyaç doyumlarının artırılması açısından önemlidir. Bilgi ve fikir alışverişinde bulunma, birlikte karar verme eylemleri öğrencilerin motivasyonlarını artırmada ve kendilerini iyi hissetmelerinde etkili olabilecektir. Öğrenme sürecinde öğrencilerin fikirlerini özgürce ifade edebilmelerine olanak tanınması, kendilerini başarıya ve yeterli hissetmelerine yakınlaraştıracağından, güç temel ihtiyacının doymu bağlamında önemlidir. Alan yazın incelendiğinde, mimarlık öğrencilerinde temel ihtiyaçların karşılanma düzeylerinin herhangi bir araştırmaya konu edilmediği görülmüştür. Bu bağlamda araştırma, mimarlık eğitimi alan birinci sınıf öğrencilerinin temel ihtiyaçlarının karşılanma düzeylerini ortaya koymayı amaçlamıştır.

*Araştırmanın Amacı:* Bu araştırmanın amacı, mimarlık eğitimi alan birinci sınıf öğrencilerinin temel ihtiyaçlarının hangi düzeyde karşılanmakta olduğunu incelemektir. Araştırma kapsamında Karadeniz Teknik Üniversitesi Mimarlık Bölümü'nde eğitim alan birinci sınıf öğrencilerinin temel ihtiyaçlarının karşılanma düzeyleri tespit edilmiş ve sosyo-demografik verilerle desteklenerek sunulmuştur.

*Araştırmanın Yöntemi:* Bu çalışmada, genel tarama modellerinden ilişkisel tarama modeli kullanılmıştır. Tarama modelleri, geçmişte ya da halen var olan bir durumu var olduğu şekli ile betimlemeyi amaçlayan araştırmalar için uygun yaklaşımlardır. Araştırma, 2018-2019 eğitim-öğretim bahar yarıyılında Karadeniz Teknik Üniversitesi Mimarlık Fakültesi Mimarlık Bölümü'nde öğrenim görmekte olan birinci sınıf öğrencileri ile gerçekleştirilmiştir. Araştırmaya 46'sı kadın ve 36'sı erkek olmak üzere toplam 82 öğrenci katılmıştır.

*Araştırmanın Bulguları:* Yapılan analizler sonucunda araştırmaya katılan mimarlık öğrencilerinin temel ihtiyaçlarının karşılanma düzeylerinin genel olarak nötr puan düzeyi olan 4'ün üzerinde bir ortalamaya sahip olduğu belirlenmiştir. Öğrencilerin beş temel ihtiyaç arasında en yüksek doymu sevgi ve ait olma ihtiyacından aldıkları ortaya çıkmıştır. Sevgi ve ait olma ihtiyacı karşılanma düzeyini, sırasıyla özgürlük, eğlence, güç ve hayatta kalma ihtiyaçlarının karşılanma düzeyleri takip etmektedir. Öğrencilerin eğlence, sevgi ve ait olma ve özgürlük ihtiyaçlarının karşılanma düzeyleri ile akademik not ortalamaları arasında istatistiksel olarak anlamlı bir farklılık olduğu görülmektedir. Cinsiyet değişkenine göre yapılan analizler, öğrencilerin yalnızca sevgi ve ait olma ihtiyacının karşılanma düzeylerinin cinsiyete göre farklılaştığını göstermektedir. Cinsiyeti kadın olan öğrencilerin sevgi ve ait olma düzeyleri erkeklere göre daha yüksek bulunmuştur. Kadın öğrencilerin sevme-sevilme, duygusal bağlılık ve aidiyet doyumlarının erkeklere göre daha yüksek düzeyde olduğu görülmektedir. Yaşamlarının büyük bölümünü köy-kasabada geçiren öğrencilerin güç ihtiyacı açısından en yüksek doyma, ilde geçirenlerin ise en düşük doyma sahip olduğu belirlenmiştir. Bunun aksine, eğlence ihtiyacında en düşük doyma yaşamlarının büyük bölümünü köy-kasabada, en yüksek doyma ise büyükşehirde geçiren öğrencilerin sahip olduğu tespit edilmiştir. Sevgi ve ait olma ihtiyacında, anneleri ilköğretim-ortaokul mezunu olan öğrencilerin en yüksek doyma, üniversite mezunu olanların ise en düşük doyma sahip oldukları bulunmuştur. Anneleri üniversite mezunu olan öğrencilerin özgürlük ihtiyaç doyumlarının daha

yüksek düzeyde karşılandığı belirlenmiştir. Anne eğitim durumuna benzer şekilde, babaları üniversite mezunu olan öğrencilerin de özgürlük ihtiyacının en yüksek doyuma sahip olduğu bulunmuştur. Özgürlük ihtiyaç doyumunun hem anne hem de baba eğitim durumuna paralel olarak değişmesi, yüksek eğitim düzeyine sahip ebeveynlerin çocuklarını, kendi kararlarını almalarında daha bilinçli yönlendirebileceklerini akla getirmektedir.

*Araştırmanın Sonuçları ve Önerileri:* Bu çalışmada Karadeniz Teknik Üniversitesi Mimarlık Bölümü'nde eğitim alan birinci sınıf öğrencilerinin temel ihtiyaçlarının karşılanma düzeyleri tespit edilmiş ve sosyo-demografik verilerle desteklenerek sunulmuştur. Bulgular, öğrencilerin temel ihtiyaç doyumuna ilişkin algılarının akademik not ortalamalarına, cinsiyetlerine, yaşamlarının büyük çoğunluğunu geçirdikleri yerleşim birimlerine ve anne-baba eğitim durumlarına göre farklılaştığını göstermektedir. Kendine özgü yapısı ile mimarlık eğitimi, öğrencilerin kendilerini geliştirmelerinde, yaratıcı düşüncelerinde ve tasarımlarında özgür davranma imkânı sunan öğrenme ortamlarına sahiptir. Bu açıdan bakıldığında, mimarlık öğrencilerinin özellikle güç ve özgürlük ihtiyaç doyumlarının artırılabilirliği olanaklı gibi görünmektedir. Özellikle uygulamalı derslerde yaşanan interaktif süreçler, öğrencilerin yakından tanınmasını sağladığından, onların ilgi duydukları alanlara yönlendirilmeleri de kolaylaştırılabilir. Öğrencilerin bölüm veya kampüs içinde sosyal, sanatsal ve sportif etkinliklere katılımlarının, eğlence ihtiyaç doyumunun artırılmasına katkı sağlayacağı düşünülmektedir. Bunların yanı sıra informal (kurum dışı) öğrenmeden beslenen mimarlık eğitimi ortamı, öğrencilerin gezi, panel, workshop gibi potansiyellerle hem kişisel hem de mesleki gelişimin desteklenmesinde yol gösterici konumdadır. Ders süresince öğrencilerin birbirleriyle iletişim-etkileşim içinde olmalarını sağlayacak grup çalışmaları, sevgi ve ait olma ve özgürlük ihtiyaç doyumlarının artırılması açısından önemlidir. Bilgi ve fikir alışverişinde bulunma, birlikte karar verme eylemleri öğrencilerin motivasyonlarını artırmada ve kendilerini iyi hissetmelerinde etkili olabilir. Öğrenme sürecinde öğrencilerin fikirlerini özgürce ifade edebilmelerine olanak tanınması, kendilerini başarıya ve yeterli hissetmelerine yakınlaştıracığından, güç temel ihtiyacının doyumuna bağlamında önemlidir. Araştırmanın sınırlılığını, 2018-2019 eğitim-öğretim bahar yarıyılı kapsamındaki Karadeniz Teknik Üniversitesi Mimarlık Bölümü birinci sınıf öğrencileri oluşturmaktadır. Bu nedenle, genellebilir sonuçlara ulaşabilmek için mimarlık eğitiminin farklı kademelerinde temel ihtiyaçların karşılanma düzeylerine ilişkin araştırmaların yapılması önerilebilir.

*Anahtar Kelimeler:* Mimarlık öğrencileri, temel ihtiyaçlar, Üniversite Öğrencileri Temel İhtiyaçlar Ölçeği, akademik başarı, sosyo-demografik değişkenler.



## Pre-School and Primary School Pre-Service Teachers' Attitudes towards Using Technology in Music Education

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### ABSTRACT

**Purpose:** The present study aims to develop a valid and reliable scale that measures attitude towards using technology in music education and to investigate pre-school and primary school pre-service teachers' attitudes towards using technology in music education concerning their demographic variables and musical experiences.

**Research Methods:** A total of 640 students studying in pre-school and primary education departments at a public university in Turkey participated in this research (N=640). Data were collected using a questionnaire for collecting the demographic information and the musical background of the respondents in addition to Attitude towards Using Technology in Music Education Scale, which was developed by the researchers in this study.

**Findings:** Analyses resulted in an 8-item Attitude towards Using Technology in Music Education Scale with a Cronbach's  $\alpha$  of 0.931. Confirmatory factor analysis demonstrated a statistically significant model fit to the data with six indices indicating a good fit and three indicating a substantial fit. Attitude towards using technology in music education did not show any significant difference concerning gender and musical background. However, primary school pre-service teachers had a more positive attitude than those of pre-school pre-service teachers. Finally, age correlated with the attitude towards using technology in music education.

**Implications for Research and Practice:** Attitude towards Using Technology in Music Education Scale is a valid and reliable research instrument. Having more experience in using technology or perceiving that the future profession and instructional program at the universities necessitate the use of technology improves attitude towards using technology. Positive attitudes of pre-service teachers, who feel themselves inadequate about using their voice and instruments, and have inadequate musical experience, maybe due to their belief that they will be able to compensate for these deficiencies in music with the opportunities offered by technology.

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## **Introduction**

The relationship between technology and learning is becoming increasingly important in music education (Addessi & Pachet, 2005). The widespread use of information technology (IT) in schools has made these technologies an indisputable part of learning and teaching for most individuals (Savage, 2005). In recent years, many musicians, music educators, and music students have been using computer-based technology more frequently in their music lives (Comber, Hargreaves & Colley, 1993).

Technology provides many benefits to music education. The use of technology in music education increases the performance (Byrne & MacDonald, 2002), participation (Crow, 2006), interest (Comber et al., 1993; Savage, 2007), and motivations (Ho, 2004; Kim, 2013; Savage, 2007) of students, as well as their musical perceptions (Kim, 2013). Furthermore, it contributes to their musical creativity (Addessi & Pachet, 2005; Savage, 2005) and functions by improving their psychological states (Hanrahan, Hughes, Banerjee, Eldridge & Kiefer, 2019). Additionally, using technology in music education makes it possible for children to relate more closely to school music and facilitates students' creation of connections between the music they listen to and their real lives (Cain, 2004). Besides, it has been found to be beneficial by teachers about improving the quality of education (Ho, 2004) and facilitating assessment and accessibility (Byrne & MacDonald, 2002).

The widespread use of technology has also led to a change in the perception of traditional musical talent and the evolution of music concerning an area of expertise, into an area where everyone can perform and create. Comber et al. (1993) reported that before the use of technology in music education, effective musical learning focused on traditional music performance skills, knowledge, and understanding. With the use of technology, a new perspective has emerged concerning the dimensions of composing, performing, and listening in music education (Cain, 2004). The use of technology has enabled many people who do not perceive themselves as being musicians to be able to deal with, create, and communicate with music (Comber et al., 1993), and has provided students with a lack of traditional instrument skills to compose music (Cain, 2004; Savage, 2007).

The effects of technology on music education are not limited to these aspects. Ho (2004) states that the use of IT in music education does not only mean replacing blackboards with electronic displays and multimedia presentations, rather IT also provides an opportunity to restructure music education, resulting in fundamental reforms in the curriculum and pedagogy. In addition, the widespread use of technology in music education requires a change in the teacher's role (Cain, 2004). This is because an effective change in music education through the introduction of technology is only possible when the teachers have competence in this regard (Ho, 2004). Therefore, in addition to traditional roles and competencies, teachers need to assume new roles and acquire new competencies about the integration of technology into music education. However, studies have pointed out that teachers face some



obstacles and have difficulties in integrating technology into music education (Byrne & MacDonald, 2002; Haning, 2016).

Ertmer (1999) has mentioned that there are two types of barrier when it comes to teachers integrating technology into their programs- internal and external. External barriers, such as equipment, time, training and support, are deemed to be first-degree barriers (Gurer, Tekinarslan & Gonultas, 2019). Self-efficacy for and attitude towards educational technology, epistemological and pedagogic beliefs, and beliefs, such as the perceived value of technology in learning environments, are viewed as internal barriers, which are deemed to be second-degree barriers (Gurer et al., 2019). Due to investments in educational technology, first-degree barriers have become increasingly overcome (Fraillon, Ainley, Schulz, Friedman & Gebhardt, 2014; Gurer et al., 2019), and research has focused on second-degree barriers (Abbitt, 2011; Celik & Yesilyurt, 2013; Niederhauser & Perkmen, 2010; Yusuf & Balogun, 2011). In this context, teachers' and pre-service teachers' attitudes towards educational technology have been an important issue in recent years (Teo & Noyes, 2011; Yesilyurt, Ulas & Akan, 2016).

Attitude is defined as the "graded affective characteristic that an individual directs toward a certain-purposeful behavior" (Fishbein & Ajzen, 1975, p. 216). Many studies have revealed that attitude is the most powerful factor in the intention to use technology in education (Chau & Hu, 2002; Hebert & Benbasat, 1994; Louho, Kallioja & Oittinen, 2006; Schaper & Pervan, 2007). Moreover, it has been seen that there is a close relationship between the attitude towards technology, the intention to use technology, and the extent of using technology (Louho et al., 2006). Moreover, in technology models, such as the Theory of Reasoned Action (Ajzen & Fishbein, 1980), the concept of attitude plays a critical role in the formation of an individual's intent that affects him concerning using technology. In this context, it can be considered that teachers' attitudes towards technology have a significant effect on their use of technology. Accordingly, previous research has revealed that teachers have positive attitudes towards technology and that technology experience and education are important variables that affect attitudes towards technology (Sexton, King, Aldridge & Goodstadt-Killoran, 1999; Tsitouridou & Vryzas, 2003).

### *Significance and Purpose*

In Turkey, music education in pre-school and primary school is provided by pre-school and primary school teachers, respectively. This period has critical importance concerning the intellectual, social, and personal development of the child, along with gaining musical skills for the child (Hallam, 2010). However, pre-school and primary school teachers often do not see themselves as having sufficient skills when it comes to teaching music (Russell-Bowie, 2010). Since they perceive music as a field that requires special skills (Seddon & Biasutti, 2008; Hennesy, 2000; Holden & Button, 2006), they are concerned about the teaching aspects (Hennesy, 2005). Their beliefs about their inadequacy in terms of music education and their musical experiences during their undergraduate years play an important role in the formation of these views (Burak, 2019).

As mentioned earlier, the widespread use of technology has led to significant changes in school curriculum and the practice of music education. Pre-school and primary school teachers, who have the responsibility for providing music education and ensuring the musical development of children, need to be aware of and competent about these changes in music education. This is because teachers possess important positions on the issue of the use of technology in education (Ho, 2004). The effective use of technology by teachers in music education in the pre-school and primary school years can increase a child's interest, creativity and motivation for music. Effectively using technology in music education could be beneficial in terms of developing confidence in music education for teachers and teaching candidates who do feel inadequate on the topic of music or who think that music is a field of special skill. Also, using technology in music education can lead to an increase in the motivation of pre-school and primary school teachers and pre-service teachers in addressing music teaching. However, considering that attitude is an important indicator of intent that determines behavior (Fishbein and Ajzen, 1975), it is necessary to have a positive attitude towards using technology in music education to use technology in music education. Pre-school and primary school pre-service teachers who have positive attitudes towards using technology in music education may use this technology effectively in the classroom, and using technology effectively may contribute to their future music teaching. This study aimed to develop a valid and reliable scale that measures attitude towards using technology in music education and to investigate pre-school and primary school pre-service teachers' attitudes towards using technology in music education concerning their demographic variables and musical experiences, such as instruments and vocals, that may be correlated to the use of technology in music education for pre-service teachers.

## Method

### *Research Design*

This research was designed as a quantitative study. Initially, a scale development study consisting of two phases was conducted. The first research aimed to explore the factor structure of the newly developed Attitude towards Using Technology in Music Education Scale while the second research aimed to confirm the extracted factor structure. Then, correlational analyses were conducted on participants' attitudes towards using technology in music education, their demographic information and musical background.

### *Participants*

This research was conducted on students studying in departments of the pre-school and primary education in the Faculty of Education at a public university in the southern part of Turkey. A total of 640 pre-service teachers –an accessible population– was enrolled in those departments during this study (N=640). The pre-service teachers who were available for this study were sampled; hence, a convenience sampling method was employed. Only consenting individuals participated in this research. Of the 640 pre-service teachers, 117 (18.28%) individuals participated in the pilot study

and 523 (81.72%) individuals participated in the confirmatory study. The demographic information concerning the participants is shown in Table 1.

**Table 1**

*Demographic Information*

		Pilot Study		Confirmatory Study	
		f	(%)	f	(%)
Gender	Female	92	82.1	386	73.8
	Male	21	17.9	137	26.2
Program	Pre-school	62	52.1	271	51.8
	Primary School	57	47.9	252	48.2
Grade	1 <sup>st</sup>			130	24.9
	2 <sup>nd</sup>			120	22.9
	3 <sup>rd</sup>	93	79.5	131	25.0
	4 <sup>th</sup>	24	20.5	142	27.2

*Research Instruments and Procedures*

Data were collected by a paper-and-pencil survey that was comprised of the Attitude towards Using Technology in Music Education Scale (AUTMES), which was developed by the researchers in this study, in addition to a questionnaire for collecting the demographic information and the musical background of the respondents. The questionnaire included questions about the participants' age, gender, and grade, as well as whether they had previously played musical instruments, whether they had previously taken voice training, and their beliefs about effectively using technology, their voice or instruments, in music education. A pilot instrument included the pilot scale and the demographic questions. Permission was obtained from institution officials. The first study (the pilot study) concluded with a 10-item revised scale extracted by exploratory factor analysis (EFA). In the second study (the confirmatory study), data were collected with the use of a new paper-and-pencil survey consisting of the revised scale, demographic questions, and questions about the respondent's musical background.

*Data Analysis*

Statistical analyses were performed using IBM SPSS Statistics (IBM SPSS Statistics version 25) and IBM SPSS Amos (IBM SPSS Amos version 24) computer programs. EFA was employed to explore the underlying factor structure of the AUTMES. To investigate whether items were clustering into factors (Tavsancil, 2002), a principal component analysis (PCA) with varimax rotation was performed on the data collected as part of the pilot study. Varimax rotation minimizes factor complexity with a maximized variance of factor loadings (Tabachnick & Fidell, 2013). For checking the reliability of the instrument, Cronbach's  $\alpha$  internal consistency estimate was computed for the pilot scale. Finally, confirmatory factor analysis (CFA) was performed on the data collected by the revised scale for determining whether or not the factor structures

could be confirmed. After factor analyses, a one-way analysis of variance (ANOVA) was applied to the scores of the groups to reveal the significant differences according to participants' year of study. Thereafter, t-tests were applied to the scores of the groups to reveal significant differences concerning gender, departments, playing the recorder or an instrument other than the recorder, opinions about using instruments and their voices effectively in music education. For non-normal groups, the Mann-Whitney U tests were applied to the scores to reveal significant differences about having music training outside of that provided in school and having vocal training. Finally, Pearson's product-moment correlation coefficient was used to investigate the relationship between participants' age and their attitudes towards using technology in music education.

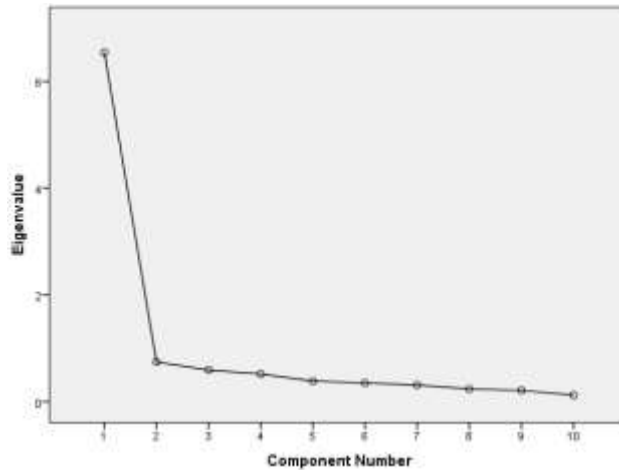
## Results

### *Development of Attitude towards Using Technology in Music Education Scale*

Initially, 117 students attending pre-school or primary school education programs, who were taking a music education course, were asked to write a composition regarding their thoughts about using technology in music education. In addition to these compositions, related literature was reviewed and previously-prepared attitude scales were examined (Albirini, 2006; Palaigeorgiou, Siozos, Konstantakis & Tsoukalas, 2005; Tyson, 2005). The compositions were qualitatively analysed and the resulting thematic structure -together with the attitude scales examined- were used as the basis for creating a pool of 75 items. Two experts in educational measurement & evaluation, an expert in music education, an expert in Turkish instruction, and an expert in educational technology reviewed the item pool. Unclear statements were corrected and similar items were removed from the pool. Davis (1992) technique was utilized to establish the content validity of the scale (Yurdugul, 2005). The content validity index value of each item was calculated by dividing the number of experts who rated "Relevant" by the total number of experts. The content validity index of 15 of the items yielded more than 0,80. Hence, other items were discarded (Davis, 1992; Yurdugul, 2005). Consequently, a 15-item "pilot -scale" was constructed. The pilot scale took the form of a 5-point Likert-type scale. The rating scale ranged from 1 (strongly disagree) to 5 (strongly agree).

After administering the pilot instrument on 117 pre-service teachers, an EFA was performed on the collected data. There were no missing values for the items. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.882, indicating that the sample size was adequate (Tavsancil, 2002). Bartlett's test of sphericity was significant ( $\chi^2(105)=1146.280$ ,  $p=0.000$ ), indicating that the sphericity assumption was not violated and that the correlation matrix among the items was not an identity matrix (Field, 2018). It was found that the scale had three factors with an Eigenvalue greater than 1. The cumulative variance of the scale was 69.397% and the factor loadings of the items in Factor 1 ranged between 0.722 and 0.876. All item loadings were above 0.722, and there were no item cross-loadings. Therefore, no items were removed as a result of this EFA procedure. However, in the reliability analysis, it was observed that Item 15 decreased the Cronbach's  $\alpha$  of the scale. Therefore, Item 15 was removed, and a

second EFA procedure was conducted. The number of items loading both Factors 2 and 3 decreased to two. Hence, the researchers reached the conclusion that Factors 2 and 3 were not making a significant contribution to the scale. Therefore, the four items loading Factor 2 and 3 were discarded. Figure 1 displays the scree plot of the pilot scale.



**Figure 1.** Scree Plot of the Pilot Scale

The scree plot and communalities (0.521-0.768) supported a single factor structure, as well. Once again, EFA and reliability analysis were applied. It was observed that the Cronbach's  $\alpha$  of the scale increased after the removal of each of the aforementioned five items. Consequently, Item 05, Item 08, Item 09, Item 12, and Item 15 were removed from the scale. As a result, a 10-item single factor "revised scale", explaining 65.415% of the variance, was obtained with a Cronbach's  $\alpha$  of 0.940. Table 2 illustrates the EFA results of the revised scale.

**Table 2**

*EFA Results of the Revised Scale*

	Item-Total Correlation	Factor Loadings	$\bar{x}$	SD
Item 01	0.750	0.803	4.11	0.911
Item 02	0.837	0.876	4.28	0.753
Item 03	0.828	0.867	4.18	0.819
Item 04	0.751	0.808	4.27	0.844
Item 06	0.750	0.799	3.91	0.844
Item 07	0.754	0.803	4.07	0.777
Item 10	0.786	0.832	4.04	0.762
Item 11	0.708	0.765	3.85	0.907
Item 13	0.659	0.722	4.03	0.740
Item 14	0.751	0.802	4.16	0.745

In the second dataset collected for the CFA, missing values and normal distribution of item scores were checked again for satisfying the assumptions of the CFA. The CFA results validated the factor structure of the revised scale:  $\chi^2(17)=42.273$ ,  $p=0.001$ ,  $\chi^2/df=2.47$ , RMSEA=0.05, GFI=0.980, AGFI=0.957, RMR=0.012, SRMR=0.018, NFI=0.985, NNFI=0.985, CFI=0.991. However, Item 01 and Item 02 were discarded to ensure that the index values comply with the fitness criteria. On the other hand, the error variance of Item 03 was correlated with the error variances of Item 04 and Item 10; and the error variance of Item 05 was correlated with the error variance of Item 04. These correlations were understood to be stemming from the item contents. All of those items were concerned with the need to use educational technology to make music instruction more effective and easier. The model was accepted with the error variances on the grounds that the scale made theoretical sense when it included those items and those items yielded remarkable values for all of the analyses performed on the model (Brown, 2015; Byrne, Shavelson, & Muthén, 1989; Wheaton, 1987). According to the evaluation criteria proposed by Schermelleh-Engel, Moosbrugger, and Müller (2003), an overview of the fit indices is illustrated in Table 3.

**Table 3**

*Fit Indices for the Hypothesized Model*

Index	Criterion	Result	Evaluation
p	>0.05	0.001	No fit
$\chi^2/df$	$\leq 3$ acceptable, $\leq 2.5$ substantial	2.47	Substantial fit
RMSEA	<0.1 mediocre, <0.08 adequate, <0.05 good	0.05	Good fit
GFI	>0.85 acceptable, >0.90 good, >0.95 substantial	0.980	Substantial fit
AGFI	>0.80 acceptable, >0.90 good, >0.95 substantial	0.957	Substantial fit
RMR	Close to 0 is good fit	0.012	Good fit
SRMR	<0.1 acceptable, <0.05 good	0.018	Good fit
NFI	>0.90 acceptable, >0.95 good	0.985	Good fit
NNFI	>0.95 acceptable, >0.97 good	0.985	Good fit
CFI	>0.95 acceptable, >0.97 good	0.991	Good fit

As summarized in Table 3, six indices indicated a good fit in addition to three substantial fit evaluations. Hence, the indices produced by CFA demonstrated a statistically-significant model fit to the data. As a result, an 8-item single factor scale explaining 67.479% of the variance was obtained with a Cronbach's  $\alpha$  of 0.931. Inter-item correlations ranged between 0.503 and 0.734 ( $\bar{x}=0.627$ ). Item-total correlations ranged between 0.698 and 0.808 ( $\bar{x}=0.761$ ). Scree plot and communalities (0.588-0.738) supported a single factor structure, as well. The means of the items ranged between 3.97 and 4.21 ( $\bar{x}=4.08$ ). The path diagram of AUTMES is displayed in Figure 2.

Finally, a significant correlation between a global item (asking the participant to indicate how important he or she thinks using technology is in music education) and the total score of the scale supported the nomological validity of the scale ( $r=0.450$ ,  $n=523$ ,  $p=0.000$ ) (Edison & Geissler, 2003). Nomological validity is a form of construct validity and is defined as "the degree to which predictions in a formal theoretical

network containing a construct of interest are confirmed" (Bagozzi, 1981, p. 327). In a similar vein, American Psychological Association defines nomological validity as "the degree to which a measure assesses the specific construct it is designed to assess, as formulated from the nomological network for the construct being measured" (2020). Therefore, this final 8-item version of the pilot scale was accepted as the "AUTMES". The scale includes items, such as "I believe that the use of technology makes music instruction more effective", "I can access the necessary resources for music instruction more easily using technology", and "I need technology while teaching music".

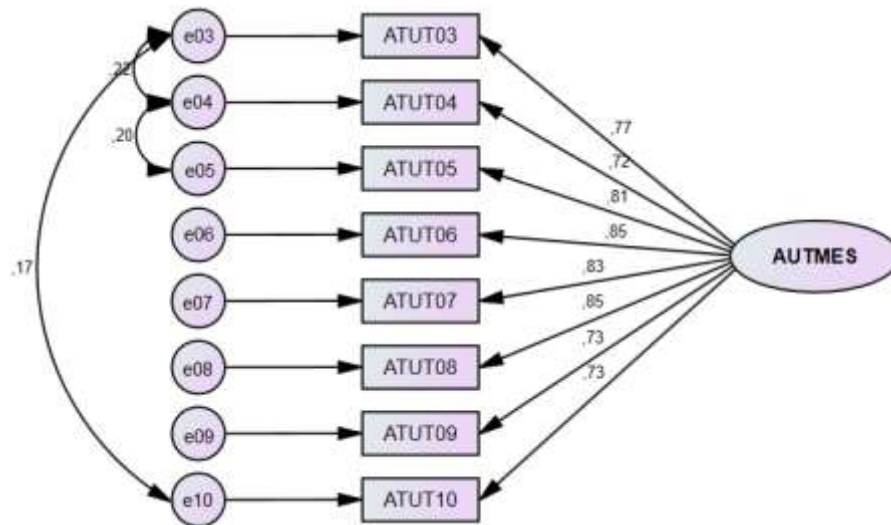


Figure 2. Path Diagram of AUTMES

#### Descriptive Findings Regarding Participants' Musical Experience

Initially, descriptive analyses were applied to the questions asked for collecting information about the musical experiences of pre-service teachers. Table 4 illustrates the descriptive findings regarding participants' musical experience.

It was understood that 56.6% of the pre-service teachers knew how to play the recorder and that 43.4% of them did not. While the rate of pre-service teachers who knew how to play an instrument other than recorder was 23.9%, the rate was 75.3% for the ones who did not. It was observed that 22.8% of pre-service teachers received music education outside of the education provided in the schools and that 76.9% of them did not. The findings showed that 5% of the pre-service teachers received vocal training, while 94.5% of pre-service teachers did not receive. Despite this, 53.7% of the pre-service teachers thought that they would effectively use a musical instrument in their instruction, and 38.1% thought they would effectively use their voices. Of all the pre-service teachers, 74.2% thought that they could effectively use technology in music education.

**Table 4***Descriptive Results Regarding Participants' Musical Experience*

Variable	Group	Frequency	Percentage
Extra-scholastic music education	No	402	76.90
	Yes	120	22.80
Having previous vocal training	No	494	94.5
	Yes	29	5.5
Knowing how to play recorder	No	227	43.4
	Yes	296	56.60
Knowing how to play other instrument	No	394	75.30
	Yes	125	23.9
Can use instrument effectively	No	239	45.7
	Yes	281	53.7
Can use his/her voice effectively	No	321	61.4
	Yes	199	38
Can use educational technology effectively	No	133	25.4
	Yes	388	74.2

*Correlational Findings regarding Demographics and AUTMES*

A one-way ANOVA was applied to the scores of the groups to reveal significant differences according to participants' years of study. Table 5 depicts the results of ANOVA on AUTMES. As seen from Table 5, the participants' attitudes towards using technology in music education showed meaningful differences depending on their grades ( $F(3,519)=5.189$ ,  $p=0.002$ ,  $\eta^2=0.05$ ).

**Table 5***Results of ANOVA on AUTMES and Year of Study*

Grade	N	$\bar{x}$	S	Source	S	MS	df	F	p	$\eta^2$
1 <sup>st</sup>	130	31.12	5.73	between Groups	446.57	148.858	3	5.18	*0.002	0.05
2 <sup>nd</sup>	120	32.53	5.23							
3 <sup>rd</sup>	131	33.21	5.65	Total	15335.98		522			
4 <sup>th</sup>	142	33.49	4.78							
Total	523	32.61	5.42							

Note: \* $p<0.001$

The effect size was close to the medium level. Tukey's test results of post hoc analyses revealed that the attitude scores of the pre-service teachers in the first grade ( $\bar{x}=31.12$ ) were significantly lower than those of pre-service teachers in the third ( $\bar{x}=33.21$ ) and fourth grades ( $\bar{x}=33.49$ ). To reveal significant differences in terms of sex



and department, independent t-tests were applied to the scores of the groups. Table 6 depicts the results of t-test analyses on participants' demographic variables and AUTMES levels.

**Table 6**

*Results of t-test Analysis on AUTMES and Demographic Variables*

Variable	Groups	N	$\bar{x}$	S	df	t	p	$\eta^2$
Sex	Female	386	32.41	5.325	521	-1.431	.153	
	Male	137	33.18	5.662				
Department	Pre-School	271	31.75	5.276	521	-3.849	*0.000	0.02
	Primary	252	33.55	5.428				

Note: \* $p < 0.001$

As can be seen in Table 6, the levels of the participants' attitude towards using technology in music education did not show any significant difference in terms of gender ( $t(521) = -1.431$ ,  $p = 0.153$ ). On the other hand, the participants' age and attitudes towards using technology in music education had small but positive and significant correlations ( $r = 0.125$ ,  $p = 0.006$ ). In addition, an independent t-test was applied to the scores of the groups to reveal any significant differences depending on the department in which the pre-service teachers were studying. Participants' attitude towards technology use in music education showed significant differences depending on their departments ( $t(521) = -3.849$ ,  $p = 0.000$ ,  $\eta^2 = 0.02$ ). Primary school pre-service teachers' attitudes regarding using technology in music education were significantly more positive than those of pre-school pre-service teachers. However, the effect size was small.

#### *Correlational Findings Regarding Musical Experience and AUTMES*

This study aimed to reveal whether the pre-service teachers' musical experiences and their opinions with regards to teaching music effectively had a relationship with their attitudes towards using technology in music education. Table 7 illustrates the results of independent t-test analyses on variables regarding participants' musical experience and their AUTMES level.

Pre-service teachers' attitudes towards using technology in music education did not show significant differences concerning the variables related to music, such as playing the recorder ( $t = -1.341$ ,  $p > 0.05$ ), playing an instrument other than recorder ( $t = 0.694$ ,  $p > 0.05$ ). In addition, the pre-service teachers' attitudes towards using technology in music education did not show significant differences concerning their opinions about using instruments ( $t = 1.244$ ,  $p > 0.05$ ) and their voices ( $t = 0.272$ ,  $p > 0.05$ ) effectively in music education. Furthermore, pre-service teachers' attitudes towards using technology in music education differed significantly concerning their opinions about using technology effectively in music education ( $t(519) = -3.389$ ,  $p = 0.000$ ,  $\eta^2 = 0.05$ ). With a close to medium effect size, pre-service teachers who think that they can use technology effectively in music education had a significantly higher attitude towards the use of technology in music teaching.

**Table 7***Results of Independent t-test Analysis on AUTMES and Musical Experience*

Variable	Groups	N	$\bar{x}$	S	df	t	p	$\eta^2$
Knowing how to play recorder	No	227	32.25	5.279	521	-1.341	.180	
	Yes	296	32.89	5.519				
Knowing how to play other instrument	No	394	32.69	5.229	517	.694	0.488	
	Yes	125	32.30	6.011				
Can use instrument effectively	No	239	32.95	5.497	518	1.244	0.214	
	Yes	281	32.35	5.352				
Can use his/her voice effectively	No	321	32.68	5.377	518	0.272	0.786	
	Yes	199	32.54	5.521				
Can use educational technology effectively	No	133	30.47	5.530	519	-5.403	*0.000	0.05
	Yes	388	33.33	5.191				

Note: \* $p < 0.001$ 

Finally, the Mann-Whitney U tests were applied on teachers' attitudes towards using technology in music education to differ based on extra-scholastic music education and having previous vocal training, since attitudes towards using technology in music education did not normally distribute across the groups of those two dichotomous variables. Table 8 depicts the results of the Mann-Whitney U tests.

**Table 8***Results of Mann-Whitney U test Analysis on AUTMES*

Variable	Group	N	Mean Rank	Sum of Ranks	U	p
Extra-scholastic music education	No	402	264.18	106201.50	22639.5	0.371
	Yes	119	250.25	29779.50		
	Total	521				
Having previous vocal training	No	494	262.53	129690.50	6900.5	0.738
	Yes	29	252.95	7335.50		
	Total	523				

As seen in Table 8, pre-service teachers' attitudes towards using technology in music education did not show significant differences about having music training outside of that provided in school ( $U=22.639$ ,  $p>0.05$ ) or having previous vocal training ( $U=6900.500$ ,  $p>0.05$ ).

### Discussion, Conclusion and Recommendations

The present study aims to develop a valid and reliable scale that measures attitude towards using technology in music education and to investigate the relationships between pre-school and primary school pre-service teachers' attitudes towards using technology in music education concerning their demographic variables and musical experiences. In this research, the musical experiences of pre-service teachers were

limited to playing instruments and having vocal training. Besides, this research aims to develop a valid and reliable measurement tool to measure the attitudes of pre-service teachers towards using technology in music education. For this purpose, the Attitude towards Using Technology in Music Education Scale was developed by the researchers. The EFA, CFA, and the reliability coefficient showed that the scale consisting of 8 items and a single factor is a valid and reliable measurement tool that can be used to measure attitude with regard to using technology in music education.

For developing the scale, firstly, 117 students attending pre-school or primary school education programs, who were taking a music education course, were asked to write a composition regarding their thoughts about using technology in music education. Related literature was reviewed and previously prepared attitude scales were examined, as well (Albirini, 2006; Palaigeorgiou, Siozos, Konstantakis & Tsoukalas, 2005; Tyson, 2005). Two experts in educational measurement and evaluation, an expert in music education, an expert in Turkish instruction, and an expert in educational technology reviewed the pool of 75 items created by qualitative analysis of the compositions Davis (1992) technique was utilized to establish the content validity of the scale. Consequently, a 15-item "pilot-scale" was constructed. The pilot-scale took the form of a 5-point Likert-type scale. The rating scale ranged from 1 (strongly disagree) to 5 (strongly agree). After administering the pilot instrument, the data were analyzed using EFA and Cronbach's  $\alpha$  internal consistency estimates were computed. After three sets of EFA and Cronbach's  $\alpha$  computations, a 10-item single factor "revised scale", explaining 65.415% of the variance, was obtained with a Cronbach's  $\alpha$  of 0.940. In the second dataset, a CFA was performed on the data collected by the revised scale for determining whether the factor structures could be confirmed. The CFA results validated the factor structure of the revised scale:  $\chi^2(17)=42.273$ ,  $p=0.001$ ,  $\chi^2/df=2.47$ , RMSEA=0.05, GFI=0.980, AGFI=0.957, RMR=0.012, SRMR=0.018, NFI=0.985, NNFI=0.985, CFI=0.991. However, two more items were discarded to ensure that the index values comply with the fitness criteria. As a result, an 8-item single factor scale explaining 67.479% of the variance was obtained with a Cronbach's  $\alpha$  of 0.931.

According to the findings obtained in this study, attitudes of pre-school and primary school pre-service teachers in this respect did not show significant differences depending on gender. This result was similar to research results that did not show gender differences concerning attitudes towards technology (Jennings & Onwuegbuzie, 2001; Kadijevich, 2000; Suri & Sharma, 2013). However, there are also studies which report that men's attitudes to the computer are more positive, they are more confident about computer use, and use computers more than women (Colley & Comber, 2003; Comber, Colley, Hargreaves & Dorn, 1997). Comber et al. (1993) have stated that men have more confidence than women with regard to music technology, which increases their interest in music. Similarly, Savage (2007) has reported that male students' interest in technology makes them more interested in music than females. The conclusions obtained from this study are consistent with the findings of research in which male individuals' interest in and attitude towards the use of technology in music are higher.

In this study, a small but significant relationship was found between pre-service teachers' ages and their attitudes towards using technology in music education. As the ages of the pre-service teachers increase, their attitudes towards using technology in music education become more positive. This result is consistent with the research findings, which indicates that using technology in music increases with age (Colley & Comber, 2003). Moreover, results from ANOVA analyses have revealed that the attitudes of pre-service teachers who are in the 3<sup>rd</sup> and 4<sup>th</sup> grades with regard to using technology in music education are more positive than that of those in the 1<sup>st</sup> grade. This result is inconsistent with research findings that do not show any difference in technology attitudes depending on the year of the study (Atabek & Burak, 2019; Ipek & Acuner, 2001). This difference between the attitudes of pre-service teachers in 3<sup>rd</sup> and 4<sup>th</sup> grades with regard to using technology in music education and those in 1<sup>st</sup> grade may be due to the effects of technology-based courses taken during the undergraduate period. It has been observed that as the pre-service teachers' experiences in technology increase, their attitudes towards using technology in music education also become more positive.

The attitude towards using technology in music education also showed a significant difference depending on the program. The attitudes of primary school pre-service teachers with regard to using technology in music education were found to be significantly more positive than those of pre-school pre-service teachers. This can be explained by the content differences of the courses in the programs. The primary school teacher program requiring more technology usage, and the courses in the pre-school teaching program being more practical, might be seen as the reason for this. This result also suggests that pre-service primary school teachers intend to use technology more in their future music education and perceive the primary school curriculum as being more likely to require the use of technology. The mean score of the pre-school and primary school pre-service teachers from the scale was 4.08. Atabek and Burak (2019) found that the mean of pre-service music teachers' attitudes towards using technology in education was 3.81. The result can be interpreted that the attitudes of pre-service pre-school and primary school teachers towards using technology in education are more positive than those of pre-service music teachers. The findings suggest that pre-service teachers' attitudes towards using technology improve if their future professions and instructional programs at their universities necessitate the use of technology.

Descriptive findings obtained from the analyses on pre-service teachers' musical experiences also showed that pre-school and primary school pre-service teachers have very inadequate musical experiences. The majority of the pre-service teachers did not know how to play an instrument other than the recorder; they did not have vocal training, and have not received music training apart from what is provided in school. This result supports research related to the insufficiency of musical experiences of pre-service pre-school and primary school teachers (Russel-Bowie, 2010; Seddon & Biasutti, 2008). Despite inadequate musical experiences, almost half of the pre-service teachers think that they can use their instruments effectively in music education. On the other hand, pre-service teachers who think that they can use their voices effectively

remain in the minority. This result is similar to the results of the study, which reported that pre-service teachers found themselves inadequate for using both their voice effectively (Baris & Ozata, 2009; Swain & Allen, 2014) and instruments (Topoglu, 2015). However, another important finding of this study is that most of the pre-service teachers think that they can use technology effectively in music education. Pre-service pre-school and primary school teachers think that music education is a special field and requires special talent (Hennesy, 2000; Seddon & Biasutti, 2008). One of the most important effects of the spread of technology in the field of music education is to change the perceptions of people with regard to music and to allow music to be perceived as an area that everyone can perform. In this respect, the positive attitudes of pre-service teachers who feel themselves inadequate about using their voice and instruments, and have inadequate musical experience, maybe due to their belief that they will be able to compensate for these deficiencies in music with the opportunities offered by technology. They may think that technology will contribute to an increase in the quality of music education they will provide in the future.

The inadequacy of musical experience on the part of pre-service pre-school and primary school teachers and their positive attitudes towards using technology in music education show that this is an area that should be emphasized in the education of these pre-service teachers. The opportunities offered by technology concerning music education should be considered as an opportunity for pre-service teachers whose main branch is not music to compensate for their perceived inadequacies in music. In this context, technology-directed courses should be increased in undergraduate programs for pre-service teachers to be able to effectively use technology in music education. Using the attitude towards using technology in music education scale developed in this research, pre-service teachers' attitudes and other features, such as interest in technology, motivation and musical experiences, such as musical creativity can be investigated.

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### Okul Öncesi ve Sınıf Öğretmeni Adaylarının Müzik Eğitiminde Teknoloji Kullanımına Yönelik Tutumları

#### Atf:

Atabek, O., & Burak, S. (2020). Pre-School and primary school pre-service teachers' attitudes towards using technology in music education. *Eurasian Journal of Educational Research*, 87, 47-68. DOI: 10.14689/ejer.2020.87.3

#### Özet

*Problem Durumu:* Türkiye'de okul öncesi ve ilkököl yıllarında müzik eğitimi, okul öncesi ve sınıf öğretmenleri tarafından gerçekleştirilmektedir. Bu dönem müzik eğitimi, çocuğa müziksel becerileri kazandırması ile birlikte çocuğun entelektüel, sosyal ve kişisel gelişimi açılarından da kritik bir öneme sahiptir. Fakat okul öncesi ve sınıf öğretmenleri çoğu zaman kendilerini müzik eğitimi konusunda yeterli görmemekte, müziği özel yetenekler gerektiren bir alan olarak algılayarak, öğretim konusunda kaygı yaşamaktadırlar. Bu görüşlerinin oluşmasında, onların lisans döneminde aldıkları müzik eğitiminin ve geçmiş müziksel deneyimlerinin yetersizliği ile ilgili inançları önemli rol oynamaktadır.

Teknoloji kullanımının yaygınlaşması, müzik eğitimi program ve uygulamalarında önemli değişikliklere neden olmuştur. Müzik eğitimi verme ve çocukların müziksel gelişimini sağlama sorumluluğuna sahip okul öncesi ve sınıf öğretmenlerinin, müzik eğitiminde yaşanan bu değişimler konusunda farkındalık ve yeterlilik sahibi olmaları gerekmektedir. Müzik eğitiminde teknolojiyi etkili kullanmak, kendilerini müzik konusunda yeterli hissetmeyen ya da müziğin özel bir yetenek alanı olduğunu düşünen öğretmen ve öğretmen adayları için müzik öğretimlerinde kendilerine olan güvenlerinin gelişmesi açılarından yararlı olabilir. Ayrıca müzik eğitiminde teknoloji kullanımı, okul öncesi ve sınıf öğretmeni ve öğretmen adaylarının müzik öğretimine yönelik motivasyonlarının artmasına da neden olabilir. Bununla birlikte, tutumların davranışı belirleyen niyetin önemli bir göstergesi olduğu göz önünde bulundurulduğunda, müzik eğitiminde teknolojiyi kullanmak için olumlu tutumlara sahip olunması gerekmektedir. Müzik eğitiminde teknoloji kullanımına yönelik olumlu tutumlara sahip okul öncesi ve sınıf öğretmeni adaylarının bu teknolojiyi müzik eğitiminde etkili bir biçimde kullanma yoluna

gidecekleri, bu durumun ileride verecekleri müzik eğitimlerine olumlu katkılarının bulunacağı düşünülmektedir.

*Araştırmanın Amacı:* Bu çalışmada, müzik eğitiminde teknoloji kullanımına yönelik tutumu ölçen geçerli ve güvenilir bir ölçme aracının geliştirilmesi ile okul öncesi ve sınıf öğretmeni adaylarının müzik eğitiminde teknoloji kullanımına yönelik tutumlarının onların demografik değişkenleri, çalgı ve ses gibi müziksel deneyimleri ile olan ilişkilerinin ortaya çıkarılması amaçlanmıştır.

*Araştırmanın Yöntemi:* Araştırmaya Akdeniz Üniversitesi Eğitim Fakültesi Sınıf Öğretmenliği ve Okul Öncesi Öğretmenliği Anabilim Dallarında öğrenim gören 640 öğretmen adayı katılmıştır. Veriler araştırmacılar tarafından geliştirilen anket ile toplanmıştır. Bu anket, Müzik Eğitiminde Teknoloji Kullanımına Yönelik Tutum Ölçeği ile katılımcıların yaşları, cinsiyetleri ve sınıfları ile daha önce müzik aleti çalıp çalmadıkları, daha önce ses eğitimi alıp almadıkları ve teknolojiyi, seslerini veya müzik eğitiminde enstrümanları etkin bir şekilde kullanma konusundaki inançları hakkındaki soruları içermektedir. Araştırmada verilerin çözümlenmesi için IBM SPSS Statistics (25) ve IBM SPSS Amos (24) bilgisayar programları kullanılmıştır. Müzik Eğitiminde Teknoloji Kullanımına Yönelik Tutum Ölçeğinin geliştirilmesinde faktör yapısının belirlenebilmesi için Açıklayıcı faktör analizi uygulanmıştır. Ölçeğin güvenilirliğinin ölçülmesinde iç tutarlılık katsayısı hesaplanmıştır. Faktör yapılarının doğrulanıp doğrulanamayacağıın tespiti için revize edilen ölçek tarafından toplanan veriler üzerinde doğrulayıcı faktör analizi yapılmıştır. Ek olarak, verilerin analizinde ANOVA, t testi, Mann-Whitney U testi ve Pearson korelasyon katsayısı kullanılmıştır.

*Araştırmanın Bulguları:* Geliştirilen "Müzik Eğitiminde Teknoloji Kullanımına Yönelik Tutum Ölçeği", 8 maddeden ve tek faktörden oluşmaktadır ve Cronbach  $\alpha$  değeri 0.931 olarak hesaplanmıştır. Maddelerin ortalaması 3.97 ile 4.21 arasında değişmektedir (ortalama = 4.08). Okul öncesi ve sınıf öğretmeni adaylarının müzik eğitiminde teknoloji kullanımına yönelik tutumları onların cinsiyetlerine göre anlamlı farklılık göstermemektedir ( $t=-1.431$ ,  $p>0.05$ ). Araştırmada, öğretmen adaylarının müzik eğitiminde teknoloji kullanımına yönelik tutumları ile yaşları arasında ise anlamlı ilişki bulunmuştur ( $r=0.125$ ,  $p=0.006$ ). Öğretmen adaylarının yaşları yükseldikçe müzik eğitiminde teknoloji kullanımına yönelik tutumları artmaktadır. Ayrıca 3. ve 4. sınıfa devam eden öğretmen adaylarının müzik eğitiminde teknoloji kullanımına yönelik tutumları 1. sınıftakilere göre daha yüksek olarak hesaplanmıştır ( $F(3,519)= 5.189$ ,  $p= 0.002$ ,  $\eta^2=0.05$ ). Müzik eğitiminde teknoloji kullanımına yönelik tutum, okunan programa göre de anlamlı farklılık göstermektedir ( $t(521) =-3.849$ ,  $p=0.001$ ,  $\eta^2=0.02$ ). Sınıf öğretmeni adaylarının müzik eğitiminde teknoloji kullanımına yönelik tutumları okul öncesi öğretmen adaylarına göre anlamlı derecede yüksek olarak hesaplanmıştır. Öğretmen adaylarının sorulara verdikleri yanıtlar analiz edildiğinde onların %56.6'sının blokflüt çalmayı bildiği anlaşılmıştır. Blokflüt dışında çalgı çalmayı bilen öğretmen adayları %23.9 oranındadır. Okulda verilen eğitim dışında müzik eğitimi alan öğretmen adaylarının %22.8, ses eğitimi almış olan öğretmen adaylarının ise %5 oranında olduğu saptanmıştır. Buna karşın öğretmen adaylarının %53.7'si bir müzik enstrümanını öğretimlerinde etkili bir biçimde kullanacaklarını düşünmekte, %38'i, seslerini etkili bir biçimde kullanacaklarını

düşünmektedirler. Öğretmen adaylarının %74.2'si ise teknolojiyi müzik eğitiminde etkili bir biçimde kullanabileceklerini düşünmektedirler. Öğretmen adaylarının müzik eğitiminde teknoloji kullanımına yönelik tutumları, blokflüt çalmayı bilme ( $t=-1.341$ ,  $p>0.05$ ), blokflüt dışında bir enstrüman çalmayı bilme ( $t=0.694$ ,  $p>0.05$ ), okulda verilen eğitim dışında müzik eğitimi almış olma ( $U=22.639$ ,  $p>0.05$ ) ve ses eğitimi almış olma ( $U=6900.500$ ,  $p>0.05$ ) gibi müzikle ilgili değişkenlere göre anlamlı farklılıklar göstermemektedir. Ayrıca öğretmen adaylarının müzik eğitiminde teknoloji kullanımına yönelik tutumları onların enstrümanlarını ( $t=1.244$ ,  $p>0.05$ ), ve seslerini ( $t=0.272$ ,  $p>0.05$ ) müzik eğitiminde etkili bir biçimde kullanma ile ilgili görüşlerine göre de anlamlı farklılıklar göstermemektedir. Öte yandan, teknolojiyi müzik eğitiminde etkili bir biçimde kullanabileceğini düşünen öğretmen adaylarının müzik öğretiminde teknoloji kullanımına yönelik tutumları anlamlı derecede yüksek olarak hesaplanmıştır ( $t(519) = -3.389$ ,  $p=0.000$ ,  $\eta^2=0.05$ ).

*Araştırmanın Sonuçları ve Önerileri:* Okul öncesi ve sınıf öğretmeni adaylarının kendilerini, çalgılarını ve seslerini müzik eğitiminde yeterli kullanamayacaklarına yönelik görüşleri ile müziksel deneyimlerinin yetersizliği değerlendirildiğinde; müzik eğitiminde teknoloji kullanımına yönelik olumlu tutumları ve teknolojiyi etkili kullanabileceklerine yönelik görüşleri, müzik eğitiminde teknoloji kullanımının oldukça önem verilmesi gereken bir konu olduğunu göstermektedir. Teknolojinin müzik eğitimi açısından sunduğu olanaklar, asıl branşı müzik olmayan öğretmen adayları için müzikteki yetersizliklerini telafi etmeleri için bir fırsat olarak değerlendirilmelidir. Bu bağlamda öğretmen adaylarının teknolojiyi müzik eğitiminde etkili bir biçimde kullanabilmeleri için lisans programlarında teknolojiye yönelik derslerin artırılması gerekmektedir. Öğretmen adaylarının lisans dönemi boyunca aldıkları müzik derslerinde teknolojiyi nasıl daha etkili kullanacakları yönünde uygulamalar yapılmalıdır. Araştırmada geliştirilen ölçek, öğretmen adaylarının müzik eğitiminde teknoloji kullanımına yönelik tutumları ile müzik eğitiminde teknoloji kullanımına yönelik ilgi ve motivasyonları ile ilişkilerinin incelenmesinde kullanılabilir. Ayrıca, ölçek, müzik eğitiminde teknoloji kullanımına yönelik tutum ile bu çalışma kapsamında ele alınmayan diğer müziksel özellikler arasındaki ilişkilerin ortaya çıkarılmasında da kullanılabilir. Deneysel çalışmalar ile öğretmen adaylarının müzik eğitiminde teknoloji kullanımına yönelik tutumlarına etki eden değişkenlerin ortaya çıkarılması yönünde çalışmalar yapılabilir.

*Anahtar Kelimeler:* Eğitim teknolojisine yönelik tutum, müzik eğitiminde teknoloji kullanımı, okul öncesi eğitimi, sınıf eğitimi.



## The Future of Education in Turkey's 2023 Educational Vision Document: Views of Academicians in the Faculty of Education

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### ABSTRACT

**Purpose:** This study was conducted to reveal the views of academicians, working in the Faculty of Education, on the 2023 Vision Document of the Ministry of National Education.

**Method:** Qualitative research method was used in this study. The study group consisted of six faculty members. In the determination of participants, easily accessible situation sampling, which is one of the purposive sampling methods, was used. A descriptive qualitative research design was used in this study; interview technique and semi-structured interview form were used as data collection tools.

**Findings:** The findings showed that the views of academicians, who participated in this study, about the education system were based on a philosophical foundation that continues from individuality to sociality, from material dimension to spiritual dimension, and emphasizes an original national and spiritual thought system extending from local to universal. Also, results indicated that, firstly, students should gain national and universal values and then should be equipped with 21st-century skills and competencies if the courses are satisfactory concerning quality, the reduction of the course hours can be positive; emphasis can be given on the necessity of giving the pedagogical formation education rather than giving it.

**Implications for Research and Practice:** The findings obtained from this study suggest that the views of the academicians may contribute to the successful implementation of the document. Studies should be carried out to reveal the opinions of teachers and school administrators, which are important components of education programs, within the framework of the document.

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## **Introduction**

The change has been the interest of almost everyone interested in science since the early ages. As Heraclitus says "No man ever steps in the same river twice, for it's not the same river and he's not the same man.", it is generally accepted that change is an inevitable process which affects all areas of interaction resulted from living together and becoming a social being. The century that we live in indicates a period of time in which developments took place at a dizzying pace. In general, the concept of development, which includes technological developments, is widely accepted by the masses. Industrialization, software development, coding, science, engineering and art education are the interests of almost every institution. The ultimate goal of such training is defined as raising the competitiveness of the country concerning development and human development criteria, both in the globalized world and in the market economy conditions. Achieving the goals of development means investing in society. Resolving the problem of increasing human capital is seen as the main duty of educational institutions.

The acquisition of new skills for the 21<sup>st</sup>-century student is vital both to the individuals and the country. Thus, the education system should be expanded to include political, legal, economic reforms, learning innovations, skills-based approaches, industry and classroom links, employment skills acquisition, lifelong learning and equality of opportunity in education. In the future, the success of meeting the growing industrial demands of the world and the country's economy will be measured by the ability of the education system to adapt to the change that enables the country's innovative inventors, problem solvers, entrepreneurs, global citizens and critical thinkers to produce.

People form their own value judgments according to their belief mechanisms and lifestyles. The transfer of these judgments from generation to generation is also actualized through education (Ozdemir, Ozan, & Akgun, 2017, p. 36). The Turkish nation, which has spread over a wide geography with different states, has established throughout history, has also made the success of living and preserving its language, religion, traditions and transferring them to the next generations. As in every period, updating the education systems and following the innovative practices have been the prior policies of today's bureaucrats to keep up with rapidly changing living conditions and needs of the nation, to meet their expectations and to grow up a hopeful generation.

Besides that, education is a process that begins with the existence of the human being; it is an area where all societies and thinkers are paying attention from the past to the present. Societies show an effort to shape their future by preserving their own history (Cam, 2018, p. 1). According to Kiziloluk (2010, 212), the aims of education vary from society to society, as well as within society in time given that the type of people that every society wants to have is different. Education aims to educate individuals who are required for political purposes and political ideology of the state. As seen in the monarchy, oligarchy and democracies, with the change of the political system, the

aims and content of education have changed. In short, the demands of the political system have been constantly considered. Moreover, to put forward the practices related to education and training which the Turkish nation has created and recognized; to investigate the type of human being to be grown, to examine the relationship between education and training with the peace of Turkish communities; To solve today's education problems, to draw conclusions from past experiences have been the aims of Turkish education history from past to present (Akyuz, 2016, p. 1).

To sum up, modern man lives in a world that changes faster than ancient times. As a result of the findings obtained, the sciences are constantly changing, renewed and developed. Many vehicles used by societies 25 years ago are not used today, the speed of the means of transportation is constantly increasing, and the speed of the vehicles used by the previous generation seems to be ridiculously slow. In short, world resources, which are declining against the increasing population, bring about new and increasingly aggravating problems for societies. In the face of these problems, people should find new solutions, and new solutions require change and development. At this point, it is the education's responsibility to enable the individual to adapt to the changes in his environment and to achieve the competence that can bring about the desired change in the environment as it is not possible to meet the expectations of the future with the skills used in the past. In other words, it is impossible to meet the future needs of a country with yesterday's schools. The development of our country depends on the educational institutions' success to educate the future generations that will deal with the problems of the country in the future at an expected level (Basaran, 1978, pp. 13-14).

When we look at the aims and principles of today's Turkish National Education which came into force with the Basic Law No. 1739, it is seen as: "To educate all individuals of Turkish nation as citizens who are loyal to Ataturk's reforms and principles and to Atatürk nationalism expressed in the constitution; who adopt, protect and improve national, moral, humanitarian, spiritual and cultural values, who know their duties and responsibilities towards the Republic of Turkey which is a democratic and social state of law; To train constructive, creative and productive individuals who have a balanced personality, a wide world view in terms of body, mind, morality and soul, respectful of people, who are responsible towards society; To develop the interests, capacities and abilities of individuals to prepare them for life, help them to [have] a profession that will make them happy and therefore contribute to the happiness of the society; Thus, by supporting the economic, social and cultural development in national unity and integrity, to make the Turkish nation a constructive, creative and distinguished partner of contemporary civilization" (Kiran, 2009, pp. 130-134).

To achieve these goals, sudden and frequent changes were made in our national education system in various periods, but the stated targets were not reached at the desired level. Based on this requirement, the Ministry of National Education issued a 2023 Educational Vision document to determine the educational needs of the age from

early childhood to lifelong learning and to have an education system that sees the future.

#### *Turkey's 2023 Educational Vision Document*

The vision statement is a statement of the objectives of the institution aimed to guide its own decision-making process. The concept of vision is defined as follows by the Turkish language institution. It is defined as the guiding principle, which is the purpose that can only be reached later, and which increases the man above the world of the senses and which will never be fully realized. The vision document is not limited to business organizations, according to Ozdem's (2011) definition, but can also be used by non-profit NGOs and public institutions. Considering broadly, the expression of corporate vision as a tool of strategic management and planning includes future long-term goals.

In accordance with the Presidency program, the main aim of the objectives of Ministry of National Education's 2023 Educational Vision is to equip citizens with the 21<sup>st</sup>-century skills and to adapt to the global change that will form the education system that encourages the development of the most appropriate human capital. In the document, the education system is presented as a holistic system that includes activities that transform children into critical thinking, reasoning and productive citizens. In addition, the objective of the student to be individuals who are dependent on their root values but also ready to be prepared for the global competition is clearly defined as one of the most important duties of the education system. Turkey's 2023 Educational Vision is seen to include the targets for the needs of the whole education system from philosophy to politics, from measuring and evaluation to guidance, from foreign language education to special education.

In this study, it was aimed to reveal the views of academicians working in the education faculties of education regarding the 2023 Educational Vision document, which was prepared by the Ministry of National Education. For this purpose, the following research questions were sought:

1. How do faculty members make sense of the philosophical explanations in the vision document? What are their views on this subject?
2. How do the faculty members make sense of the knowledge, skills and values included in the vision document that are intended to be acquired by today's students? What are their views on this subject?
3. What are the views of faculty members about how the vision document objectives will address the problems of the 21<sup>st</sup>-century?
4. What are the views of faculty members on the reduction of course hours in secondary education and the introduction of pedagogical formation as graduate education from the new regulations expressed in the vision document?



## Method

Qualitative research techniques were used in this study. Qualitative research is defined as “research in which qualitative data collection methods, such as observation, interview and document analysis, are used and a qualitative process is carried out to present perceptions and events in the natural environment in a realistic and holistic way” (Yildirim & Simsek, 2005, p. 39). The descriptive and qualitative research design was used in this study. The aim of the research in this design is to summarize the specific events experienced by individuals or groups of individuals. According to Merriam (2002), a basic descriptive qualitative study exemplifies all the features of qualitative research. The researcher is interested in understanding how participants make sense of a situation. Descriptive analysis is a form of qualitative research. The key to this qualitative research is the use of narratives as data. In this study, different views of academicians about the same question were discussed and conveyed as obtained from the interviewees. According to Altunisik, Coskun, Yildirim, and Bayraktaroglu (2010, p. 322), the descriptive analysis consists of four stages as follows:

- Creating a framework for descriptive analysis,
- Processing of data according to the thematic framework,
- Identification of findings,
- Interpretation of findings.

To systematically determine the data to be obtained for this purpose, process texts, such as transcription of speech texts and classification of responses, were followed. The data obtained by the descriptive analysis were summarized under the headings previously determined and interpreted, and the results were concluded. In this approach, data were collected by interview method, which was considered to be the most appropriate for the situation mentioned above. The method applied here allows the researchers to explore interaction, flexibility and helpful questions to reveal the experiences and meanings of the facts. Interview method increases the reliability and validity of the research, as the researchers have the opportunity to confirm this with the interviews when they reach any data (Yildirim & Simsek, 2005, pp. 72-74).

### *Participants*

In the qualitative research tradition, since the aim is not to generalize the subject but to reach a holistic conclusion by examining it with all possible details, instead of probability-based sampling methods, *purposive sampling methods* were used which allowed the study of situations thought to have rich knowledge (Yildirim & Simsek, 2005, p. 135). The main purpose of this method is to get the lowdown about the person, case or situation that constitutes the research object for a specific purpose. The purposive sampling method allows the researchers to reach *the most information in the easiest and most reliable way*. In this study, the study group was selected by criterion sampling as methods of purposive sampling. The sampling, which will be the subject of the research by the researchers, is formed by introducing a certain criterion. The

researchers decide which type of person or situation to study and determine the criterion themselves. According to the criterion sampling method, the sampling, which will be the subject of this research, is formed by introducing a certain criterion by the researcher (Yildirim & Simsek, 2005, 140). The criterion of this research was to choose the academicians who read the vision document. The study group consisted of six academicians: three from Bartin University and three from Bulent Ecevit University. Demographic data about the gender, year of service, and academic title status of the participants were presented in Table 1. The lack of female participants was one of the limitations of this study.

**Table 1**

*Qualifications of the Participants (Qualifications of the Participants)*

Codes of Participants	Academic Title	Department	Gender	Year of Service (year)
AB1	Assistant Professor	Curriculum	Male	14
AB2	Assistant Professor	Science Education	Male	8
AB3	Assistant Professor	Lifelong Learning	Male	19
AZ1	Assistant Professor	Curriculum	Male	2
AZ2	Associate Professor	Educational Administration	Male	5
AZ3	Assistant Professor	Psychological Counseling and Guidance	Male	1

The validity and relevance of the data obtained in this study were accepted to be proportional to the richness of information and the observation and analysis of the selected participants.

#### *Data Collection Tools*

In this descriptive qualitative study, interview technique and semi-structured interview form, which were the main data collection tools of our design, were used to reveal the opinions of academicians about the vision document in their minds. Interviewing as a method involves social communication with people and the main purpose of using this method is that it is a natural way of generating data. Thus, participants express their experiences and insights with their own sentences. A semi-structured interview technique was used in this study. This technique is used free of questions, can be deepened in the desired topic and the answers are used because of the directive feature (Yildirim & Simsek, 2005, p. 119).

Semi-structured interview form which was used in this study was prepared as a draft document by examining Turkey's 2023 Educational Vision document. The expert evaluation form was composed to assess it concerning reliability and validity. Some

changes were made according to the expert evaluation form with the feedback given by three faculty members who are experts in the field of Curriculum and Instruction. After the creation of the interview form, the pilot scheme was carried out before the actual implementation and the problems which might be encountered in the process and time management were tried to be overcome. A pilot interview was held with a faculty member at Bulent Ecevit University to examine the comprehension of the questions in the form by the faculty members to be interviewed. After the pilot interviews, regulations were made on the form concerning interviewers' observations and their evaluations about the questions. Final amendments regarding the changes were made and it was put into final form. The interview form was titled "Academician Interview Form" (Annex 1). The interviews were conducted with faculty members from different departments at Bartın University and Bulent Ecevit University. It was paid attention that the participants were from different branches. Before the interview, participants were informed about the content of the subject matter and the "2023 Educational Vision Document" by the Ministry of National Education was presented to inform them about the proposals of the ministry. Questions that focused on the future of education in the framework of Turkey's 2023 Educational Vision document were directed to the participating faculty members during semi-structured interviews and their responses were recorded. Interviews with academicians were conducted by the researchers. The duration of the interviews varied between 40-50 minutes. When the interviews finished, participants were asked to submit a consent form indicating that they participated in this study voluntarily.

### *Data Analysis*

As a result of the interviews, the results were presented in a descriptive manner. Direct quotations emphasizing the essence of the matter were made. Content analysis method was used to analyze the data collected from the study group. Content analysis requires a more detailed review and access to concepts and themes that explain the data obtained (Yildirim & Simsek, 2005, p. 89). All these forms of research provided data to the researcher by analyzing the views of the faculty members about how to apply the concepts mentioned in the 2023 Educational Vision document to teaching practices. The following procedure was followed in the research steps; the purpose of the analysis is to organize the interview data in a way that makes it possible to understand how participants reflect and justify their preferences within the context. Thus, an analytical computer program helping to create themes and categories was utilized to form the basis of discussion and interpretation. The first step of the analysis was to be able to identify emerging themes. This study was approached with a holistic approach. For this purpose, the responses of the participating academicians were automatically coded with the support of the computer program and the answers to the questions about the sub-objectives were evaluated as a whole. MAXQDA2018 program was used in this regard. The themes and codes for sub-objectives were developed and they provided the basis for data acquisition and analysis. The themes that emerged with the data were discussed and defined.

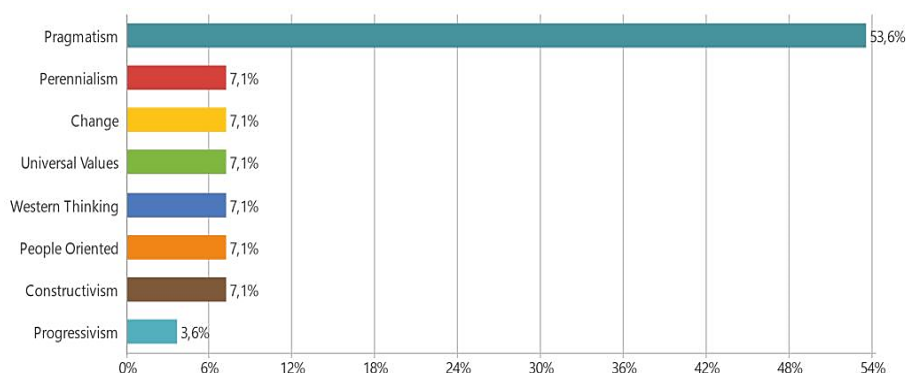
### *Reliability and Validity*

To ensure reliability and validity, researchers first worked together on analyzing and analyzing sound recordings and discussing proposals for emerging themes. Among the possible themes, the themes considered relevant are selected. The codes determined for each theme were also reviewed by the researchers and their compatibility with the theme was evaluated and necessary corrections were made. Samples showing that faculty members express their own understanding, words and examples are used directly to better express the perspective of the main interpretations. At this stage, to ensure the reliability and validity of the theme, three researchers who had previously conducted qualitative research were asked to give their opinions and the themes and codes were revised within the framework of these views and agreed on the mentioned codes and themes. Two different universities were preferred to provide diversity in interview data. To ensure reliability in the interview records, the participants were informed at the beginning of the interview and informed that the name and information would remain confidential in this study, and they were informed about the consent form that they participated in this study with their consent. After the interview records were transferred to the computer, they were sent to the participating academicians via e-mail and confirmation of whether the statements they used belonged to them or not. At this stage, a model was created and interpreted within the framework of thematicization and visual maps. The data obtained as a result of the interviews were presented in a rich and detailed manner in this study, and then interpreted, discussed and concluded.

## **Results**

### *Findings for the First Sub-goal*

For the first sub-goal in our study, a question was posed to obtain responses for the demands 'How do faculty members of the faculty of education interpret the philosophical approach in the vision document?' and 'What are their views on this subject matter?' This question is; How do you interpret the philosophical criticism of Pragmatism in the 2023 Educational Vision document? How do you assess the impacts of the philosophical approach of The Ministry of National Education in this document? The answers of the faculty members who answered the question were collected under the title of philosophy theme. The codes under our theme were indicated as people-oriented, perennialism, constructivism, pragmatism, progressivism, change, western culture, universal values.



**Figure 1.1.** Philosophy Theme and Percentages of Preferred Codes

As shown in Figure 1, the most frequently discussed code was pragmatism and the least expressed code was progressivism. It is believed that frequently expression of pragmatism attributed to the criticism of pragmatism concept in the 2023 Educational Vision document. 2023 Educational Vision document approaches by highlighting the link between education and philosophy as historically. The interviewed academician AZ1 supported the humanitarian approach in the document with the following statements.

*AZ1: I think the vision document is trying to address that issue. Especially one of the most important parts of the vision document is that it is people-oriented, child-oriented, and student-oriented. I think it is satisfying from the perspective of the vision document. Child-oriented, people-oriented[...] because education can involve a mechanical process, education is a system. We can make such definitions, but education is essentially child-oriented.*

*AB2: supported the same idea regarding this issue.*

*AB2: I think that our philosophy of education should be people-oriented.*

As can be understood from the quotation above, AB2 stated that a people-oriented philosophical approach should be at the heart of the education system. AZ1 also expressed the reflections of the idea of change on our understanding of education as:

*AZ1: [...] We are going through an incredible transformation process. To be able to adapt to this change and transformation, these values, objectives and foresight in the vision document should be urgently reflected in the education system and our lives in a sensible and reasonable manner. Only then we can find solutions to the problems stated in the vision document.*

The idea of a soul that makes human beings mature from man to humanity is also stated as the basic philosophy of 2023 Educational Vision. This approach points out that there are influences of perennialism and essentialism out of educational philosophies in the vision document. In this point, AB3 expressed his opinion as:

*AB3: I feel that there is perennialism in its philosophy. Besides, the ideal human and ideal society are always important in perennialism. Moral values have a place in perennialism. Even human is the most valuable creature. Perennialism also approaches to the subject matter as it takes its basis from idealism, and it focuses on the human being. However, I think it would also be beneficial to progress in this way by referring to existentialism and reconstructionism.*

In addition to the philosophical approach, AB3 stated that the limbic system of the brain, which helped students constructing and learning by practicing the subject as distinct from memorization, was addressed in the vision document. Besides, the development of affective quality in brain-based learning, brain functions, and especially the limbic properties were emphasized.

Another outstanding point in the document from the philosophical point of view was that the human approach, which was the basis of the system, was not only one-dimensional but rather the spiritual being of the human being. It was emphasized that teachers should develop not only the material dimension of their students but also their spiritual dimension. In the vision document, the two wings of education were emphasized and trying to put the material and spiritual dimensions on ontological and epistemological foundations constituted another dimension of dualistic approach. In this way, teachers were expected to approach their students from different perspectives, provided guidance to their students in their personality development and educate them as happy individuals. The academician AB3 noted as follows:

*AB3: As Kohlberg mentions in his theory of moral development, I think we need an education system that can detract people from the stage of individualism and develop skills, such as caring for society and respecting others in the framework of individual freedoms and showing empathy. I think and hope that we will reap the benefit of that approach.*

It is stated that pragmatism, which is expressed critically in the document and accepts the information as truth according to its practicality and to the extent that it works, does not only move away from ontology but also neutralizes epistemology. This is the relationship between the metaphor of a bird trying to fly with a single wing and the relationship between knowledge and benefit. The relationship between knowledge and benefit should be reconstructed by the Turkish society as in the metaphor of a single-winged bird trying to fly. The academicians interviewed also used expressions supporting this criticism. For example, the participant AB1 emphasized the view in the following statement that the critical approach in the content of the document is adopted:

*AB1: Actually, criticism of pragmatism is not unusual. The most outstanding point here is that we have tried to create an education system based on pragmatism and progressivism. The criticism of pragmatism in terms of both theory and practice can actually be seen as the pains of new birth. In this sense, if everything had been adopted in the 2023 Educational Vision document, what would have been changed would be questioned. It can be seen as a contradiction because we made our education*

*framework, which is based on pragmatism. However, if we handle it with a positive perspective, it may be considered as the pains before birth.*

The same participant went on stating the following opinions.

*AB1: I think that we couldn't adapt ourselves to Pragmatism or Progressivism, or we weren't able to interiorize their principles properly, and not only as an educational community but also as a whole society. Therefore, I do not expect a different dimension in the role of constructivism than what it was in the past.*

AB2 also expressed his similar opinions on this issue. He regards pragmatism in the eyes of western policy.

*AB2: Pragmatism has made an important contribution to the rapid development of American and British people. So, I think that this concept is related to imperialism and colonialism. I would like to state that the main point of pragmatism or the wrong thing here is that the benefit is strikingly brought into the forefront. The concept of truth is hidden.*

AZ1 had similar ideas regarding this matter. According to him, the following suggestion should be handled for the competencies in the document:

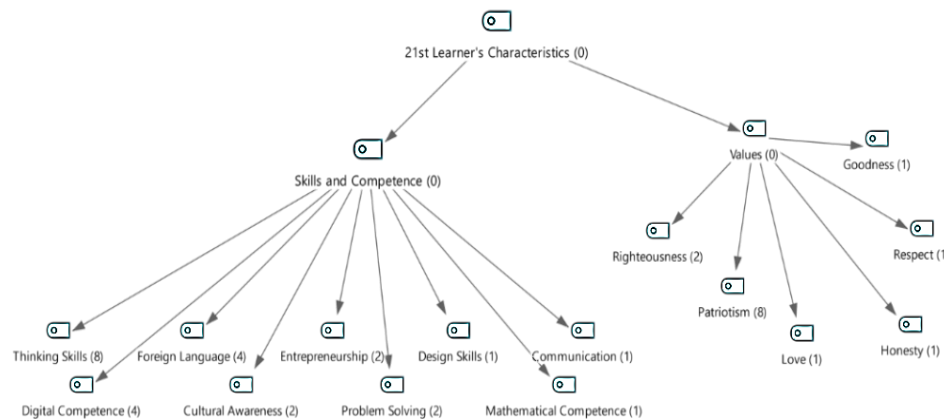
*AZ1: We need to go beyond pragmatism to gain these competencies. Anyway, we must develop an understanding or a philosophy as it is stated in the document.*

*AB3: I have thought that pragmatism has negative effects on education both in our country and in the world for many years. How? Especially the new generation called as Z needs a guide in their educational environment. Moreover, at this point, pragmatism-based education is unfortunately not working. This generation has the idea that something is good, only if it is useful, otherwise it is not. We are faced with a generation that consumes everything quickly. Of course, this is because of technology. Of course, it is undeniable that society, family, and culture have an impact in the last period.*

The vision document historically emphasizes the link between education and philosophy. The document emphasizes that there are strong ties established with the past on the basis of the successes of the countries which have a strong performance in the field of education in the world and that the conceptual framework and philosophical approach that take the human to the center succeed. It is stated that philosophical approaches, which have a solid foundation on the basis of the changes and transformations encountered in the field of education in various periods, are based on the paradigms which take the human development of their own civilizations on the basis. Nevertheless, the document criticizes the global powers for their approach to the determination of creativity, critical thinking, teamwork and global communication skills for human development. From the industrial revolution to the digital age, from the technological developments to the present day of the introduction of the hyper information communication systems, the importance of reconsidering the relationship between education and philosophy was emphasized and the main subject of the education system was emphasized as a human being.

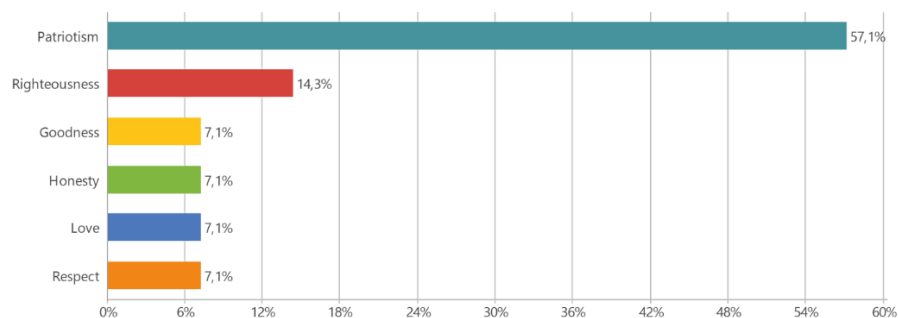
### Findings Related to the Second Sub-goal

In this study, the second sub-goal was determined as “How do faculty members of education faculty express the meaning of the knowledge, skills and values that students should acquire today?” To put forward their views on this purpose, the faculty members were asked such questions: “What do you think are the knowledge, skills and values that today’s students need to learn to prepare for life and shape their future? Does 2023 Education Vision Document meet your expectations these knowledge, skills and values?” Based on the answers of the faculty members to the questions asked for this sub-goal while Learner’s Characteristics was determined as the main theme, “Values” and “Skills and Competencies” as two sub-themes were formed.



**Figure 2.1.** Hierarchical Code Model of the 21<sup>st</sup> Learner's Characteristics

Patriotism, goodness, righteousness, honesty, respect and love are placed under the values theme. The skills and competencies theme includes codes of thinking skills, foreign language, digital competence, problem-solving skills, communication, entrepreneurship, cultural awareness, mathematical competence, and design skills.



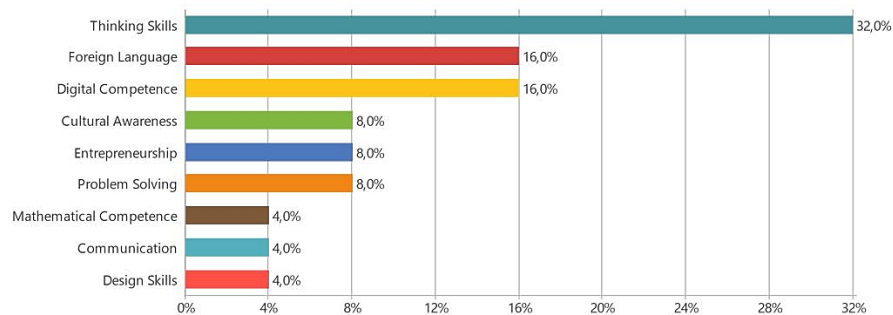
**Figure 2.2.** Values Theme and Percentages of Preferred Codes



Figure 2.2 indicated that faculty members' the most emphasized value was patriotism. It can be concluded that they think that it is important to equip today's students both with national and spiritual values. In addition, the results revealed that the faculty members think that students should have values, such as goodness, righteousness, honesty, respect and love, especially patriotism.

*AB1: We focus on the direct education of some programs or professions, but we should not ignore the needs of being a person, being a citizen, being a successful individual while educating, which we have often neglected here.*

*AB2: Our fundamental values are justice, truthfulness, honesty, patience, love, respect, self-control, patriotism or patriotism, which is the most important of all because I think that our center should be this and others may be important in this axis. Our values should be like this.*



**Figure 2.3.** Skills and Competencies Theme and Percentages of Preferred Codes

It is very important that students should be trained with the necessary skills and competencies to adapt to today's world. The codes generated according to the answers given by the faculty members to this theme included some skills and competencies related to 21st Century Skills, also, included some skills and competencies that were expected to be acquired as a global citizen. Figure 2.2 revealed that faculty members most commonly expected students to have the skills called cognitive thinking skills. Afterwards, it can be said that they care about being equipped in the fields of foreign language and digital competence. Finally, it can be said that faculty members think that entrepreneurship, communication, mathematical competence and design skills, respectively, are the skills and competencies they think they should gain.

*AB1: These are problem solving, critical thinking, reflective thinking, and creative thinking. But, to be honest, these are skills easy to say but hard a little difficult to have and apply.*

*AB2: In terms of competence, communication in the native language and communication in foreign languages, mathematical competence skills. Moreover, that is also expressed in the vision, skills, such as digital competence, learning to learn, entrepreneurship also comes to the fore in our program. Skills, such as scientific process skills, basic skills, causal skills or skills that can be expressed as experimental skills, actually very famous in our country, can be listed.*

AB2: This is a new explanation for the digital content skills in learning processes in the 2023 Education Vision. The document contains a subtitle called digital content and skill-assisted conversion. I've just said this again, but it is obviously pleasing to create a national archive of digital content for the strong future. This can be combined with digital materials and printed materials to develop high-level thinking skills required in international examinations, such as TIMSS and PISA.

AB3: In addition, the 21<sup>st</sup> century skills of children or different skills to get the skills of this era, social entrepreneurship or cultural awareness or the development of language skills, various studies have been mentioned. Current targets have been set, but more concrete progress is needed on how to do it, which will probably be over time. Somehow we should not fall behind this era, especially in the period of technology, and we need to have such a generation to success this. Cultural awareness is one of the competencies. Eight competencies, such as self-expression in the mother tongue related to cultural awareness, self-expression in foreign language and technology competence in mathematics. One of them is social awareness, cultural awareness.

AZ1: It is necessary to be able to work in non-governmental organizations. This is similar to the items I'm counting, yes, are the most important 21<sup>st</sup> century competencies. Society equipped with these skills needs to be trained [.....] For example, digitalization, digital citizens, digital individuals [.....] Yes, called as 21<sup>st</sup> century skills contain more critical thinking, higher scientific thinking, higher-order thinking, self-efficacy beliefs, students to trust themselves, to have a digital spirit, people's emerging as a global citizen in the world.

AZ2: Students should definitely be practical, think fast, respond quickly, have developed problem-solving skills, exhibit different behaviors, and be able to demonstrate different skills against different events. I think responsibility is very important.

AZ3: When the new Educational Vision is examined, it can be concluded that it is aimed to educate individuals who have one's head screwed on the right way. Therefore, instead of approaching ontological or epistemological concepts or imposing only one of them, it is necessary to produce holistic paradigms, including both concepts.

Furthermore, the opinions of the faculty members about whether the expected value, skills and competencies of the students will be gained with the aid of the 2023 Vision Document were taken into consideration in the study. In this regard, the faculty members stated that they can see these characteristics in the document and that they think that the document is intended to gain features.

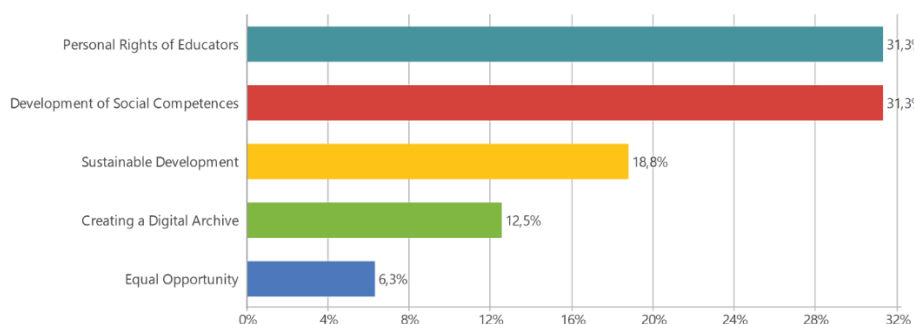
AB1: The skills and competencies in the vision document meet my needs and meet my expectations. Yes, it does.

AB2: Expressions in the vision document are sufficient, yes, it meets.

AB3: In this context, when we look at the vision document, I felt that there would be a few nice works about it.

### Findings Related to the Third Sub-goal

Another question of our study is to take the opinions about how the objectives of the 2023 Education Vision document will solve some of the problems which are important problems of the 21<sup>st</sup> century, such as population growth, migration, urbanization and increasing social and cultural diversity encountered in the global. Opinions on this subject were organized under the theme “Solution Proposals for 21<sup>st</sup> Century Problems”.



**Figure 3.1.** Solution Proposals for 21<sup>st</sup>-Century Problems Theme and The Percentages of Preferred Codes

We see that faculty members who participated in this study mentioned different areas to conduct 21<sup>st</sup>-entury education problems. One of the participants indicated the problem of the personal rights of educators that was one of the problems experienced in the field of education.

The participant's opinion regarding the personal rights of educators is as follows:

*AB2: Again, when we look at the vision, it is stated that especially the personal rights of school administrators will be improved. I have also discussed with teachers on this issue. At the end of the consultation, the result is actually the following: it is not important what personal rights and individuals budget of teachers are and what the physicians, doctors and teachers do. It motivates our people. If I can get my salary more or better in a way that I deserve, the quality of my life increases. Therefore, I feel happier when the quality of my life increases. I'm more motivated so that I can work much better. Therefore, the increase in the quality of education actually depends on this, in some way. Teachers graduate from the faculty of education and become teachers. Engineers graduate from the faculty of engineering and become engineers. Moreover, doctors get a university education and become doctors. All these people get university education. When we look at budgets and personal rights, we see that they are not in the same category. This is a disadvantage.*

The views of participants AB3 and AZ2 were coded as the development of social competencies. Participant's opinions are given below.

*AB3: When we look at social qualifications, does the 2023 vision document provide them or not? Then, if we bring this type of skills, we will say that our country has been receiving*

*immense immigration against migration. We should answer the questions; is our society ready for migration recently? How ready? What is the point of view of the new refugee we call as the other? So, let's say that we give universal values to our students? When they graduate, they would embrace the people who wouldn't approach them with chauvinistic feelings, and both would be able to live with them. And, what can they give them? Is it a document that aims to teach them how to live together? When we look in the context of a general expression, yes, maybe it does something, but when we enter the special goals when we enter a little more detailed, I think it should be evaluated in-depth. Maybe there are certain goals related to these issues and related to these types of topics, but they should be more specifically observed under specific headings.*

*AZ2: Global population growth, migration, urbanization and increased social and cultural equality may lead to chaotic consequences when not well managed. Racism and xenophobia are the main problems of these situations. The relationship between these hitches and the education system is undeniable. Because it is a futile effort to think or wait for a crowd that centers only interpersonal competition, solves its own nation's problems, and excludes other races and societies will find solutions to these problems in the process of forming an information society. Therefore, the paradigm of people education in the 2023 Education Vision document will provide solutions to these problems.*

One of the solutions to the targets in the vision document was the state of sustainable development to the 21<sup>st</sup>-century problems. The participant's statements are as follows:

*AB2: In fact, these issues are directly related to sustainable development. This is not a very direct link, but I may have indirect explanations. There are three dimensions of sustainable development. This is the case when we look at the literature. What are these? Society, economy and environment. Sustainability means continuity. Sustainability of something means that it can be continued. In this context, plans were made within the framework of targets.*

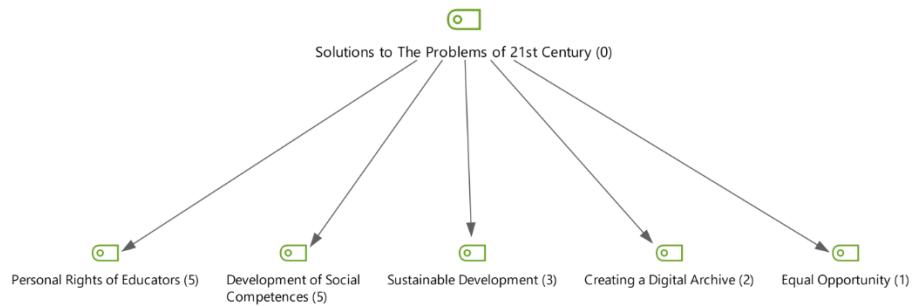
One of the solutions to the problems of the 21<sup>st</sup> century on the vision document was put forward as creating digital archives. The participant's statement on this subject is as follows:

*AB2: Also, given that I have just expressed, moreover, to creation of a digital content archive, that is, making them a homogeneous structure will be created in all of Turkey. So in this way indirectly if we maintain the quality of the schools, the cleanliness of the boarding houses to be safe, our children safeness, the quality of education and, therefore, all the schools are like this, there is no need that I have to move from here to anywhere, nor does my child.*

One of the solutions to the 21<sup>st</sup>-century problems was considered as equal opportunity and the participant's opinion is given below.

*AB2: That's why I have this idea for migration. This fact can also be referred to as the basic law of MoNE? How? Because there is an equal opportunity in the law. The opportunity for all individuals should be equal. And, in this way I think that equality of opportunity can be achieved. I also think that if we can equalize the living standards in the same way, we will see that migration will be the same name.*

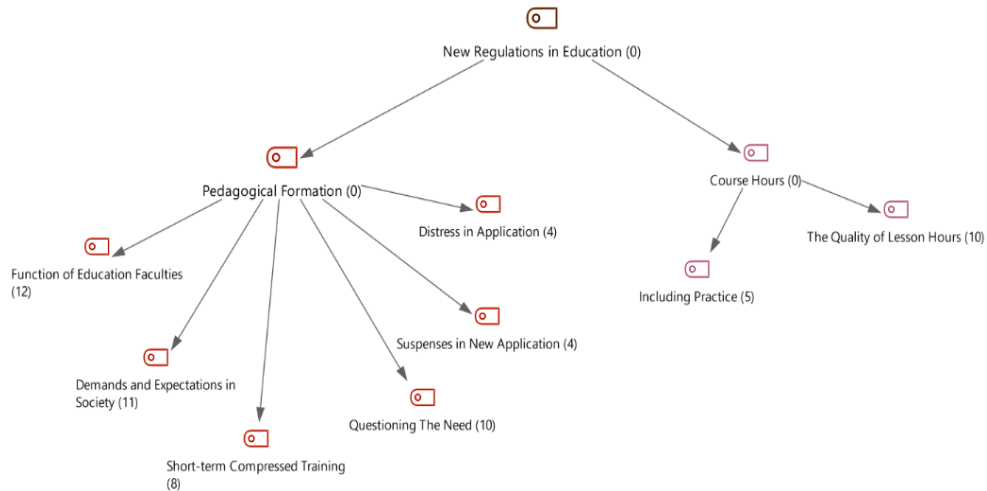
The following codes were formed from the opinions of the faculty members of the Faculty of Education on how the objectives mentioned in the 2023 Vision Document would solve the 21<sup>st</sup>-century problems.



**Figure 3.2.** Hierarchical Code Model of Solution Proposals to The 21<sup>st</sup>-Century Problems

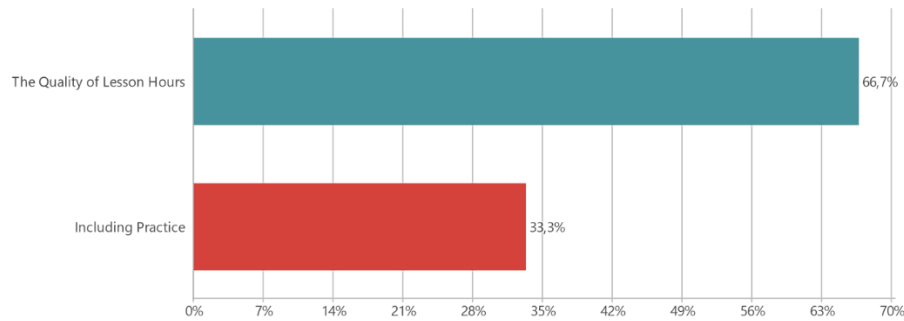
*Findings Related to the Fourth Sub-goal*

In the current study, the opinions of the faculty members were asked about the reduction of course hours and changes in pedagogical formation education from the new regulations included in the vision document. The answers were grouped under the theme “new regulations in education” and were organized into two sub-themes as follows: “Course hours” and “Pedagogical formation”.



**Figure 4.1.** Hierarchical Code Model of New Regulations in Education

The faculty members were asked the following question: “What do you think about reducing the lessons hours by half, especially in secondary school. In accordance with the answers to this question, two codes for the sub-theme of the course hours were created: “The quality of course hours” and “Including practice”.



**Figure 4.2.** Course Hour's Theme and Percentages of the Preferred Codes

The figure reveals that the faculty members emphasize the quality of the lesson hours. This finding suggests that faculty members generally have a positive attitude towards reducing the lesson hours. However, it is emphasized that this positive view depends on the quality of the lessons as satisfactory:

*AB1: “Yes, I think it is positive to reduce lesson hours. We can't teach anything when we say we have been teaching everything. Or learning has below what we aim.*

*AB2: I think it would be useful to evaluate this from both a quantitative and qualitative perspective. I think it is not important to have a low number of lessons for a course that is effective and qualified.*

*AZ1: I find it important to increase the quality of the lessons rather than to reduce or increase the number of lessons. You increase the 2-hour course to 4 hours. On the contrary that the lesson is unqualified; it makes no sense. You reduce the 4-hour lesson to 3 hours, but if you are teaching a highly qualified lesson, I'm sure it is of better quality. Therefore, to be able to comment on the results of the reduction of courses in the future, we need to see at which level the quality of the lessons is.*

*AZ3: For me, success is not related to course hours; it is important how the lessons are. Therefore, I do not think that reducing lesson hours will be a failure. The important thing is that the lesson hour is full of.*

With the help of reduction of the course hours, the theoretical dimension of the lesson, as well as the application dimension, can be included. Moreover, the chance of students' improving themselves outside the school is expressed as a positive situation:

*AZ2: If the reduction of the course hours will provide the opportunity to practice in the basic courses. In this sense, it will be a good decision for individuals to stop the solely theoretical learning that we have been criticizing for years. Because after the theoretical parts of the*

subjects are given, dealing with the theoretical part will consist of turning around the same point.

AB1: A certain hour for this lesson is envisaged, but do you need more hours? In fact, no. Can this content be given in a shorter time? It can be given that the size of the practice can also be used very comfortably.

[.....] I mean, there's no point in getting a permanent information upload. Instead, it will be more valuable to focus on the individual's ability to learn as he learns, to improve himself, to gain skills in lifelong learning, to learn how to learn and to acquire as much information as he needs when needed.

Participant AB3 pointed out that the time gained by reducing the course hours will allow students to develop themselves in a social and sportive way and to plan the applications in these areas:

AB3: It is not enough to reduce the curriculum only. I think it is necessary to do something sportive and artistic in a way that fills the gap after the curriculum is reduced. I think the Ministry should plan it with the experts and competent people in the field.

The question, "What is your opinion about giving pedagogical formation education in the form of postgraduate education?" was asked to the faculty members. In line with their answers, six codes for the sub-theme of pedagogical formation were formed as "Function of education faculties", "Demands and expectations in society", "Questioning the need", "Short-term compressed training", "Distress in new application" and "Uncertainties in new application".

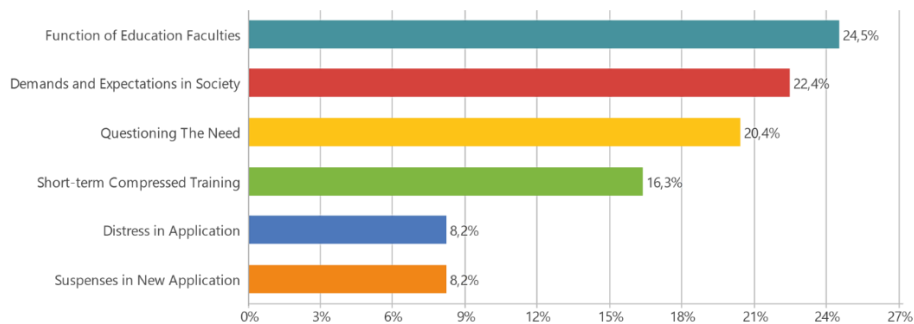


Figure 4.3. Pedagogical Formation Theme and Percentages of Preferred Codes

According to Figure 4.3, it is seen that the faculty members mentioned the necessity of giving pedagogical formation education rather than giving this education. We can say that the participating faculty members see the faculties of education as the main source of teacher training, and they think that it is not necessary to train teachers through the pedagogical formation:

*AB2: I certainly do not find pedagogical formation education useful. Individuals who want to be teachers should be educated in education faculty because the faculties of education are for this. We have great potential, but we don't need so many teachers.*

*AB1: First of all, we need to question whether we need pedagogical formation. I certainly don't agree. While there are faculties that train teachers, there is no need to train teachers in this way. Teachers can be trained by these kinds of training from outside the faculty of education in case of urgent need of teachers. We don't need that right now.*

*AZ1: Currently, there are situations where even the prospective teachers in the current faculties of education cannot be appointed. In addition, the training of teacher candidates from different faculties increases the population. This situation also reduces the quality of teachers and creates chaos.*

*AZ3: Pedagogical formation education is an unsolved problem in the country. A distressing subject, I think. While there are more teachers than need, students of the faculty of literature are being criticized as being teachers with pedagogical formation. I think it's a problem in itself.*

Three of the participants stated that pedagogical formation education was the result of the demands and expectations of society. As to the reasons for the provision of pedagogical formation education, we can say that they have the idea that they are born from the expectations of the society, not the need of teachers in the field:

*AB1: The graduates of some of our existing programs are almost not appointed. However, the students of the faculty of science and literature get pedagogical formation education in the hope of being appointed. In fact, it is not efficient. Clearly, the demand for pedagogical formation of society is quite high. There are many student groups demanding job teaching from many different faculties.*

*AZ1: Students in faculties, such as science, literature and theology, may also want to teach. There may be no problem in this sense. However, this needs to be solved logically and rationally. It is mentioned that about 300 thousand teacher candidates are waiting to be appointed according to the related studies and media. In this case, in addition to educating teachers through the pedagogical formation, I think it is getting a will-o'-the-wisp for the students who take this training.*

*AZ2: As an educator who has given the pedagogical formation education for years, I think that this program hurts the students more than benefits. Pedagogical formation education could not go beyond than just instilling hope to students with highly compressed programs.*

It is seen that the participant faculty members describe pedagogical formation education as a compressed and time-lapse education given in a short time. Moreover, it could be said that the participants agreed that long-term education in the faculties of education as the most accurate way of teaching pedagogical formation:



AB1: It is not right to train students from different faculties with an expedited course at the end of their final year or after graduation. Therefore, the principal education faculty graduates are hard done by. The students of the faculty of education get this training in a long period of time and during long lesson hours. These students may oppose the acquisition of teaching skills with a short-term certificate program. I think they're quite right about it.

AB3: Pedagogical formation education is very serious training. It is not right to train prospective teachers with compressed education. You cannot consider pedagogical formation education as a course. It is a process that spans years. It's not a three-month or six-month-old thing. We are spreading this training in education faculties for years. We shouldn't give it in compressed form.

AZ1: Pedagogical formation certification training is all along inadequate. We offer four years of vocational training in the faculty of education. In the pedagogical formation education, we can say that we are giving a time-lapse teaching course. You can interpret the difference in terms of quality.

AZ2: Pedagogical formation education is given within the framework of highly compressed programs. This education cannot go beyond just instilling hope to students.

It can be inferred from the statements of the participating faculty members about the pedagogical formation that they think this education has a troubling quality. It is possible to say that participants approached pedagogical formation education in a wrong way:

AB1: Yes, the pedagogical formation is very perplexed. This is a much-debated issue. It is an area where most applications are already wrong.

AZ1: Pedagogical formation is a problem that cannot be solved for years. It is a "gangrene" of the education faculties.

AZ2: As an educator who has given pedagogical formation education for years, I think that this program harms students rather than benefits.

AZ3: Pedagogical formation is a problem that cannot be solved in the country. I think something distracted.

The findings also revealed that the faculty members were cautious about the planned change in pedagogical formation education in the form of graduate education. Participants were required to submit a positive or negative opinion about the planned implementation; they needed to explain more about the content, nature, and how it would change:

AB1: Pedagogical formation education in the form of graduate education is more logical. However, I think that those who are assigned should not be taught until the end of the formation education. I don't know how to overcome this problem.

AB3: An application like this was made before. There were pedagogical formation studies in the form of a non-thesis master's degree. I think their results are

*unfavorable. What was wrong with this period? Is there any answer to how it should be done now? Is it going to be done that way again or in a new way? What will be the content? How long will it be done? It is difficult to comment on this without getting answers to these questions. I can say neither good nor bad.*

*AZ1: I'm against the idea that we can increase the quality of pedagogical formation by the non-thesis master. I just think we've changed its name. In the meantime, I say that, but I think I'm talking about the lack of information. This change is not much talked about, things to do was not done in much detail. It was said that only pedagogical formation certificate training would be removed, and it would be held as a non-thesis master's degree. It is not elaborated to whom, how, instructions not created. That's why I can't foresee too much.*

*AZ3: Pedagogical formation education may be positive in the form of postgraduate education. But I think this structure is troubled totally.*

We can say that the views of the participant AB2 on pedagogical formation education and especially the redundancy of the field reflect a different perspective:

*AB2: So, what can be done in this case? In this case, it should be considered to consume existing potentials, to improve existing faculties or to close them if necessary. It will be closed for a while, so the student will not. There's nothing else to do.*

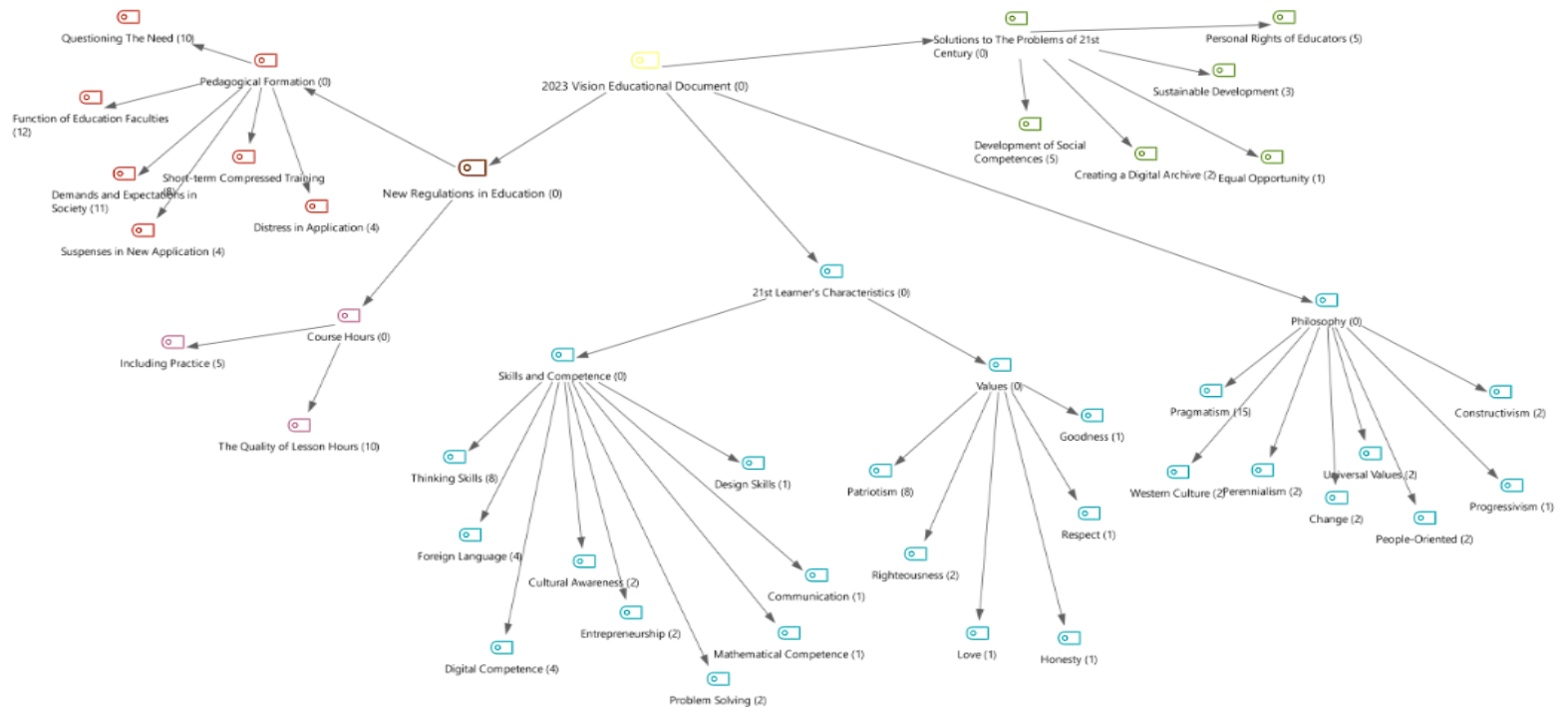


Figure 4.4. Total model for 2023 Vision educational Document

The model created as a result of the analysis of the faculty members' views about the vision document is shown in Figure 4.4. The results of the analysis carried by faculty members on the document indicating a significant transformation in the Turkish education system reveal an integrative structure consisting of eight themes and thirty-five categories under the title of 'Model 2023 Vision Document'.

### **Discussion, Conclusion and Recommendations**

When the philosophy hierarchical coding model expressed in the 2023 Educational Vision document is considered as a whole, the opinions of faculty members do not cover all aspects of the human in the purely practical sense of the practical education of the individual; it is seen that a national and spiritual thought system that tries to avoid is emphasized. Another issue investigated in the study is to determine the opinions of the faculty members about which knowledge, skills and values the 21<sup>st</sup> century's students should acquire. Today, the young generation should be equipped with some crucial characteristics to able to continue their lives in a more qualified way, to be sensitive and problem-solving to the problems they face, to analyze the events by looking from different perspectives and to be more successful, effective and competent in their professional, social and individual lives. Although these characteristics are listed under different headings or with some differences in the literature, they are generally called as the 21<sup>st</sup>-century skills (Aygun, Atalay, Kilic, & Yasar, 2016; Ananiadou & Claro, 2009; Kozikoglu & Altunova, 2018; Partnership for the 21<sup>st</sup>-Century Skills, 2008). The main objective of the 2023 Education Vision is as follows: "It is to educate individuals who are equipped with the skills of the future and the future and who can use this equipment for the benefit of humanity, love the science, love the culture and are sensitive, qualified, moral people" (Ministry of National Education [MONE], 2018). In general, in this study, it was concluded that also the faculty members think that the 21<sup>st</sup>-century students gain firstly national and universal values and, then, the skills and competencies. Furthermore, it was concluded that the opinions expressed by the faculty members and the goals set by the vision document overlap. The importance of students not only having skills but also gaining some important values is underlined both in the vision paper and in this study. Thus, the opinions related to this sub-problem of the study were accepted to be called as the theme of 21<sup>st</sup>-century learner's characteristics. Gunuc, Odabasi, and Kuzu (2013) reached a similar result in their study that they intended to determine how student teachers define the characteristics of the students of 21<sup>st</sup> century. In the current study, the main theme, "21<sup>st</sup>-century learner's characteristics" that was conducted through the opinions of the faculty members are supported by two sub-themes. Patriotism, goodness, honesty, respect and love codes are gathered under the sub-theme, "Values" while The importance of thinking skills, foreign language, digital competence, problem-solving skills, communication, entrepreneurship, cultural awareness, mathematical competence and design skills is emphasized under the sub-theme "Skills and Competencies" (Gunuc, Odabasi, & Kuzu, 2013; ISTE. (bt.); Koenig, 2011; Kozikoglu & Altunova, 2018; Partnership for 21<sup>st</sup>-Century Skills, 2008).

In this study, it has been investigated with a question whether the objectives of the vision document can provide solutions to the problems of the 21<sup>st</sup> century. In addition to this, the solutions can be produced were checked. When the literature was examined, it was determined that because of overpopulation and the possibility of self-renewal of nature disappeared and the balance of nature deteriorated. This balance disorder also threatens human health. Moreover, the increase in the population causes increases in production and consumption. To establish the balance of production and consumption, human beings should learn to live in peace with nature. He must live by understanding the laws of nature to adapt himself to nature. Otherwise, the functioning of nature may cause problems. It may cause harm to human beings in the form of various disasters (Sayhan & Camurcu, 2013). These difficulties in production and consumption, as well as the rapid growth of communication technology, bring different challenges to the world. At the same time, that the world is in the process of globalization brings the economies of the countries closer together and makes them dependent. In these, the underdeveloped countries caused the migration of their citizens towards the developed countries. The intensity of the refugee movement and the political and economic crises in the world make it difficult for economic policies to act independently. In summary, gradually, the old world faces with much more problems and can be managed more difficultly (Yilmaz, 2017). In our research, faculty members generally think that the vision document targets are sufficient against the problems of the 21<sup>st</sup>-century, and these goals will solve the problems. However, to solve the problems, each faculty member produced different solutions. A consensus could not be determined except for the development of social competencies. The faculty members have expressed individual solutions, such as creating archives, improving the personal rights of education workers, sustainable development and equality of opportunity. Sayhan and Camurcu (2013), who support the sustainable development solution, stated that there is a need for modern societies consisting of individuals who understand the problems of sustainable development and that produce solutions and the prerequisite to establish such societies is education.

It can be said that the participant faculty members' opinions about the reduction of course hours were positive if the lessons were qualified. As for pedagogical formation education, it was observed that they emphasize the necessity of giving this education rather than the way it is given. Faculty members accept the education faculties as the main source of teacher training. Azar (2011), Akdemir (2013), Yildirim and Vural (2014), and Kose (2017) also stated the same result in their work, and they emphasized that teacher training should be carried out by faculties of education whose main purpose is educating teachers. In the study, faculty members described pedagogical formation education as a troublesome process. Kose (2017) indicated the same situation with the results of his work: *"As a result of the research, it is revealed that academicians have a general understanding of the existence of many negative aspects of pedagogical formation."* In the same study, it was observed that pedagogical formation education is characterized by the expression "compressed programs". In this study, the participant faculty members defined the formation education with the same expression. Moreover, it is also observed that the participants have the idea that there

is no need to train teachers through the pedagogical formation. In the study of Kose (2017), it was concluded that the participant academicians agreed to abolish the application of pedagogical formation. In the current study, it was concluded that faculty members found the explanations made by the in the vision document were not sufficient to explain the changing of the related subjects.

The current study was prepared to determine how the faculty members of the faculty of education understand the MoNE 2023 Vision Document. It is thought that the results obtained from the views of the faculty members will be taken into consideration during the implementation of the vision document and will contribute to the successful implementation of the document. Although the current study contributes to the relevant literature base, some limitations need to be stated for the consideration of future studies. First of all, this study was conducted with faculty members of two different universities. Similar studies can be conducted with teachers and school administrators and ideas of the actual practitioners of the training programs can be taken. As a second limitation, the participants are all male. Therefore, future studies may be conducted with samples, including both male participants and female participants.

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## **Türkiye 2023 Eğitim Vizyonu Belgesinde Eğitimin Geleceği: Eğitim Fakültesi Öğretim Üyelerinin Görüşleri**

### **Atıf:**

Semerci, C., Hatipoğlu, C., Guneri, B., Sevimbay, A., Akcaalan, M., & Cengiz Demir, Y. (2020). The future of education in Turkey’s 2023 educational vision document: Views of academicians in the faculty of education. *Eurasian Journal of Educational Research*, 87, 69-100. DOI: 10.14689/ejer.2020.87.4

### **Özet**

*Problem Durumu:* Günümüz insanı, eski çağlardan daha hızlı bir şekilde değişen bir dünyada yaşamaktadır. Bilimler ise elde edilen bulgular neticesinde sürekli değişmekte, yenilenmekte ve gelişim göstermektedir. Toplumların 25 yıl önce kullandığı birçok araç bugün kullanılmamakta, ulaşım araçlarının hızı sürekli artmakta, bir önceki neslin kullandığı araçların hızı ise gülünç düzeyde yavaş görünmektedir. Kısacası, artan nüfus karşısında azalan dünya kaynakları toplumlar için yeni ve gitgide ağırlaşan problemler çıkarmaktadır. Bu problemler karşısında insanlar yeni çözüm yolları bulmak zorundadır, yeni çözüm yolları ise değişmeyi ve gelişmeyi gerekli kılmaktadır. Bu noktada, bireyi hem çevresindeki değişimlere uyum sağlamasına olanak sağlayacak hem de çevrede istenen değişimi ortaya çıkarabilecek yeterliğe erdirmek eğitimin sorumluluğundadır. Bu hedeflere ulaşabilmek için milli



eğitim sistemimizde çeşitli dönemlerde ani ve sık değişiklikler yapılmış ancak belirtilen hedeflere istendik düzeyde ulaşamamıştır. Bu gereksinimden yola çıkarak, erken çocukluktan hayat boyu öğrenmeye kadar çağın gerektirdiği eğitim ihtiyaçlarını saptamak ve geleceği gören bir eğitim sistemine sahip olmak için Milli Eğitim Bakanlığımız tarafından 2023 Eğitim Vizyonu Belgesi düzenlenmiştir. Cumhurbaşkanlığı programına uygun olarak, MEB 2023 Eğitim Vizyonu belgesinin hedeflerinin genel amacı vatandaşları 21. yüzyıl için becerilerle donatmak ve en uygun insan sermayesi gelişimini teşvik eden eğitim sistemini oluşturacak küresel değişime uyum sağlamak olarak ifade edilmiştir. Belgede eğitim sistemi, çocuğu eleştirel düşünen, akıl yürüten ve üretken vatandaşlara dönüştüren faaliyetleri içeren bütünsel bir sistem olarak sunulmaktadır. Ayrıca öğrencinin kök değerlerine bağlı ama aynı zamanda küresel rekabete hazır nitelikte donatılmış bireyler olması hedefi eğitim sisteminin en önemli görevleri içinde sayılarak net bir şekilde tanımlanmıştır. Türkiye 2023 Eğitim Vizyonunun felsefeden politikaya, ölçme değerlendirmeden rehberlik hizmetlerine, yabancı dil eğitiminden özel öğretime kadar tüm eğitim sisteminin ihtiyaçlarına yönelik hedefleri kapsadığı görülmektedir. Sonuç itibarıyla öğretim görevlilerinin bakış açılarından vizyon belgesinin çeşitli açılardan ele alınmasının alan yazınına faydalı olacağı değerlendirilmiştir.

*Araştırmanın Amacı:* Bu çalışmada Milli Eğitim Bakanlığı tarafından hazırlanan 2023 Eğitim Vizyonu Belgesine ilişkin eğitim fakültelerinde görev yapan akademisyen görüşlerinin ortaya çıkarılması amaçlanmıştır. Öğretim üyelerinin, vizyon belgesinde ifade edilen yeni düzenlemelerden ortaöğretimde ders saatlerinin azaltılması ve pedagojik formasyonun yüksek lisans eğitimi olarak verilmesi hakkındaki görüşleri nelerdir? Eğitime ilişkin çeşitli ve önemli değişiklik ve hedefleri kapsayan bu belge hakkında eğitim konusunda uzman akademisyenlerin görüşlerinin alınmasının belgenin değerlendirilmesi açısından önem taşıdığı ve konu ile ilgili yapılacak uygulamalara yön vermesi açısından da önemli olduğu düşünülmektedir.

*Araştırmanın Yöntemi:* Bu çalışmada nitel araştırma teknikleri kullanılmıştır. Çalışmamızın desenini betimsel nitel araştırma deseni oluşturmuştur. Bu desende araştırmaların amacı, bireyler veya birey grupları tarafından yaşanan belirli olayları kapsamlı bir özetlenmesidir. Araştırmacı katılımcıların bir durum veya olguyu nasıl anlamlandırdığını anlamakla ilgilenmektedir. Betimleyici analiz, bir nitel araştırma şeklidir. Bu nitel araştırmanın anahtarı anlatıların veri olarak kullanılmasıdır. Betimsel nitel araştırma deseni kategorik olmayan bir sorgulama yöntemi olarak görülmelidir. Çalışmamızda akademisyenlerin aynı soru hakkındaki farklı düşüncelerini ele alınmış ve görüşülenlerden elde edildiği şekliyle aktarılmıştır. Bu amaçla elde edilecek verileri sistematik olarak belirlemek üzere; konuşma metinlerinin yazıya dökülmesi, alınan cevapların sınıflandırılması gibi işlem başlıkları takip edilmiştir. Betimsel analiz ile elde edilen veriler, daha önceden belirlenen başlıklar altında özetlenmiş ve yorumlanarak sonuca bağlanmıştır. Yukarıda belirtilen durum için en uygun olarak değerlendirilen görüşme yöntemiyle veri toplanmıştır. Zengin bilgiye sahip olduğu düşünülen durumların çalışılmasını sağlayan amaçlı örnekleme yöntemleri kullanılmaktadır. Amaçlı örnekleme yöntemi, araştırmacının en fazla ve en güvenilir şekilde en fazla bilgiye ulaşmasını sağlar. Bu çalışmada, katılımcı örnekleme

yöntemlerinden kolay ulaşılabilir durum örnekleme yöntemi kullanılmıştır. 3'ü Bartın Üniversitesi'nden ve 3'ü Bülent Ecevit Üniversitesi'nden çeşitli alan, kademe ve yaş aralığından çalışmaya katılmayı kabul eden öğretim görevlilerinden meydana gelen 6 kişi çalışma grubumuzu oluşturmuştur. Çalışmada yarı yapılandırılmış görüşme formu kullanılmıştır. Formdaki soruların görüşme yapılacak olan öğretim üyeleri tarafından anlaşılabilirliğinin incelenmesi için Bülent Ecevit Üniversitesinde görev alan bir öğretim üyesi ile bir pilot görüşme yapılmıştır. Pilot görüşmenin ardından görüşmecilerin gözlemleri ve görüşme yaptıkları öğretim üyesinin sorulara ilişkin değerlendirmeleri çerçevesinde formda düzenlemeler yapılmıştır. Değişikliklere ilişkin son düzenlemeler gerçekleştirilerek görüşme formuna nihai şekli verilmiştir. Görüşme Formu "Akademisyen Görüşme Formu" olarak adlandırılmıştır. 2023 Eğitim Vizyonu Belgesi çerçevesinde eğitimin geleceğine odaklanmış sorular, yarı yapılandırılmış görüşmelerde katılımcı öğretim üyelerine yönlendirilmiş, verdikleri cevaplar kaydedilmiştir. Temaları ve kategorileri oluşturmaya yardımcı olan analitik bir bilgisayar programından yararlanılmıştır. Bu konuda MAXQDA2018 programından yararlanılmıştır. Alt amaçlara ait tema ve kodlar geliştirilmiş ve veri elde etme ve çözümlenme için temel teşkil etmiştir. Veriler ile ortaya çıkan temalar tanımlanarak tartışılmıştır. Görüşmeler sonucunda elde edilen veriler çalışmada zengin ve detaylı bir şekilde sunulmuş, ardından yorumlanması, tartışılması ve sonuca bağlanması gerçekleştirilmiştir.

*Araştırmanın Bulguları:* Akademisyen görüşlerinin bireyin eğitiminde pratik saf anlamıyla fayda düşüncesinin insanın tüm yönlerini kapsamadığı ve toplumsallıktan bireyselliğe, maddi boyuttan manevi boyuta devam eden bir felsefi temel üzerine oturtularak yerelden evrensel uzanan ve batı taklitçiliğinden sakınmaya çalışan milli ve manevi bir düşünce sisteminin vurgulandığı; Öğrencilerin öncelikle milli ve evrensel değerler kazanmaları ve daha sonra 21. yy. beceri ve yetkinlikleriyle donatılmış olmaları gerektiği; Vizyon belgesi hedeflerinin 21. Yüzyıl sorunlarına karşı yeterli olduğu ve bu hedeflerin sorunlara çözüm getireceği, ancak sosyal yeterliliklerin geliştirilmesi dışında ortak bir görüş birliği tespit edilemediği; Derslerin nitelik olarak doyurucu olması halinde ders saatlerinin azaltılmasının olumlu bulunduğu; Pedagojik formasyon eğitimiyle ilgili olarak ise bu eğitimin verilme şeklinden ziyade verilme gerekliliğine vurgu yaptıkları görülmektedir.

*Araştırmanın Sonuçları ve Önerileri:* Katılımcı öğretim üyelerinin, derslerin nitelik olarak doyurucu olması halinde ders saatlerinin azaltılmasını olumlu buldukları söylenebilir. Pedagojik formasyon eğitimiyle ilgili olarak ise bu eğitimin verilme şeklinden ziyade verilme gerekliliğine vurgu yaptıkları görülmektedir. Öğretim üyeleri, öğretmen yetiştirmede asıl kaynak olarak eğitim fakültelerini görmektedirler. Çalışmada öğretim üyeleri, pedagojik formasyon eğitimini sıkıntılı bir süreç olarak nitelendirmişlerdir. Araştırma sonucunda akademisyenlerin pedagojik formasyon uygulamasının birçok olumsuz yönünün varlığı noktasında genel bir anlayış içerisinde oldukları ortaya çıkmıştır. Katılımcı öğretim üyeleri formasyon eğitimini aynı ifade ile nitelendirmişlerdir. Ayrıca, katılımcıların pedagojik formasyon yoluyla öğretmen yetiştirmeye ihtiyaç olmadığı fikrine sahip oldukları da görülmektedir. 2023 Eğitim Vizyonu belgesinde ifade edilen model bir bütün olarak değerlendirildiğinde

akademisyen görüşlerinin bireyin eğitiminde pratik saf anlamıyla fayda düşüncesinin insanın tüm yönlerini kapsamadığı ve toplumsallıktan bireyselliğe, maddi boyuttan manevi boyuta devam eden bir felsefi temel üzerine oturtularak yerelden evrensel uzanan ve batı taklitçiliğinden sakınmaya çalışan milli ve manevi bir düşünce sisteminin vurgulandığı görülmektedir. Öğretim üyelerinin görüşlerinden elde edilen sonuçların vizyon belgesinin uygulamaya konulması sırasında dikkate alınıp belgenin başarılı bir şekilde hayata geçirilmesine katkı sağlayacağı düşünülmektedir. Bununla birlikte, benzer bir çalışma eğitimin diğer paydaşları olan öğretmen ve yöneticileriyle de gerçekleştirilerek eğitim programlarının asıl uygulayıcılarının fikirleri alınabilir. Ayrıca, bu çalışmanın katılımcılarını erkek akademisyenler oluşturmaktadır. Bu nedenle, gelecekte erkek ve kadın katılımcıların bir arada olduğu ve karşılaştırılmalı bir analiz yapılabilecek çalışmalar hazırlanabilir.

*Anahtar Kavramlar:* MEB, Türkiye 2023 eğitim vizyon belgesi, akademisyen görüşleri





## Examining of Internal Consistency Coefficients in Mixed-Format Tests in Different Simulation Conditions\*

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### ABSTRACT

**Purpose:** The present study aims to evaluate how the reliabilities computed using  $\alpha$ , Stratified  $\alpha$ , Angoff-Feldt, and Feldt-Raju estimators may differ when sample size (500, 1000, and 2000) and item type ratio of dichotomous to polytomous items (2:1; 1:1, 1:2) included in the scale are varied.

**Research Methods:** In this study, Cronbach's  $\alpha$ , Stratified  $\alpha$ , Angoff-Feldt, and Feldt-Raju reliability coefficients were estimated on simulated datasets

(sample sizes 500, 1000, 2000) and the number of dichotomous versus polytomous item ratios (2:1, 1:1, 1:2).

**Findings:** In the simulation conditions of this research, in all sample size conditions, estimated Angoff-Feldt, and Feldt-Raju reliability coefficients were higher when the number of dichotomous items in the item-type ratio was higher than that of polytomous items. This was also the case for the estimated  $\alpha$  and Stratified  $\alpha$  reliability coefficients when the item-type ratio was reversed. While all different reliability estimators gave similar results in the large samples ( $n \geq 1000$ ), there were some differences in reliability estimates depending on the item-type ratio in the small samples ( $n=500$ ).

**Implications for Research and Practice:** In the light of the findings and conclusions obtained in this study, it may be advisable to use  $\alpha$  and Stratified  $\alpha$  for mixed-type scales when the number of polytomously scored items in the scale is higher than that of the dichotomously scored items. On the other hand, the coefficients Angoff-Feldt and Feldt-Raju are recommended when the number of items scored dichotomously is higher.

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## Introduction

Tests in which different item types are used in the same test are called mixed-format tests. Berger (1998) considers mixed-format test from different perspectives and describes it as a test that emerges when a combination of the item types that require different scoring forms, such as dichotomous and polytomous scoring. Because the mixed-format tests are composed of different scoring items, the total test score is defined as a composite score. In this context, estimating reliability depends on how to obtain these composites.

In the general framework, reliability, a feature that must be present in mixed-format tests, as well as in all tests, is defined as the reproducibility of measurements of a given characteristic applied to the same individuals in similar conditions (Crocker & Algina, 2008). One or more application-based methods are used to estimate reliability. The test-retest method and equivalent form methods are based on multiple applications, while Cronbach's  $\alpha$  is based on a single application. Among these methods, Cronbach's  $\alpha$  is easier to use because they need just one application. On the other hand, when tests contain heterogeneous substance types, the classical reliability coefficients (e.g., Cronbach'  $\alpha$  coefficient) may yield misleading results in mixed-format tests (Zinbarg et al., 2005). If the parts differ in their standard deviations but are tau equivalent, Cronbach's  $\alpha$  is appropriate. However, if the two parts comprise heterogeneous item types, a less well-known estimate, the Angoff-Feldt coefficient, is appropriate (Feldt & Charter, 2003).

There are several methods, including Stratified  $\alpha$ , Raju, Angoff-Feldt, Feldt-Gilmer, Kristof coefficients, to estimate the reliability of the composite score of the mixed-format test (Osburn, 2000). All these coefficients are estimated by considering the strata or subtests of the test. Young and Yoon (1998) stated that the total score of a mixed-format test is a composite score, and this composite score is stratified with the different types of items or tasks. In this context, it is obvious that open-ended items and multiple-choice items can be defined as the different strata or subtest of a mixed-format test. Stratified  $\alpha$  assumed that the components of a composite can be divided into subgroups based on content or difficulty. When the components of a composite can be grouped into subtests, Stratified alpha may provide a better estimation of the reliability than Cronbach's  $\alpha$  coefficient computed on the same composites (He, 2009; Cronbach, Schonemanve McKie, 1965 as cited in Osburn, 2000). The following formula is given by Feldt and Brennan (1989) for the Stratified  $\alpha$  coefficient:

$$\text{Stratified } \alpha = \frac{1 - \sum \sigma_i^2 (1 - \alpha_i)}{\sigma_x^2}$$

$\sigma_i^2$ : subtest i variance

$\sigma_x^2$ : test total variance

$\alpha_i$ :  $\alpha$  coefficient in subtest i

The Angoff-Feldt coefficient can be used when the length of the test parts, called as sub-tests or parts of different item types, are arbitrary. The Angoff-Feldt coefficient ( $r_{AF}$ ), which is less known than the Cronbach's  $\alpha$  coefficient, is used if the two parts contain heterogeneous item types or are not equal concerning functional length. The Angoff-Feldt coefficient assumed that test could be divided into only two parts of arbitrary length; the scores could only be congeneric equivalent and the sum of the error variances for the two parts is equal to the error variance of the total test. Feldt and Brennan (1989) have given the following formula for the Angoff-Feldt coefficient:

$$\rho = \frac{4\sigma_{12}}{\sigma_x^2 - \left(\frac{\sigma_1^2 - \sigma_2^2}{\sigma_x}\right)^2}$$

$\sigma_{12}$  : 1. and 2. item covariance

$\sigma_x^2$ : Total variance

$\sigma_1^2$ : First subtest variance

$\sigma_2^2$ : Second subtest variance

$\sigma_x$ : Total covariance

The Feldt-Raju coefficient is a coefficient obtained by combining the Raju coefficient and the Feldt coefficient. It has been developed to estimate the reliability when a different number of items are placed in sub-tests (expressed as part of a test) or in sections comprised of different item types. The Feldt-Raju coefficient assumed that the parts of a test are most congeneric. Osbourn (2000) has given the following formula for the Feldt-Raju coefficient:

$$F - R_{\rho} = \frac{(\sigma_i^2 - \sum \sigma_i^2)}{(1 - \sum \lambda_i^2) \sigma_i^2}$$

$\sigma_i^2$  : Item i variance

$\sigma^2$  : Total point variance

$\sigma_{it}$  : Covariance between item i and total

$\lambda_i = \sigma_{it} / \sigma_i^2$ : The functional additive of the first component

As seen in the formula above, for mixed-format tests, the accuracy of estimating the reliability depends on the strata or subtests and their characteristics. Defining the

strata or subtests, the number of items each subtest, item types, item, and total test scoring mechanism are crucial for accuracy.

When the studies on mixed-format tests are examined in general, it has been seen that vast majority of these studies are based on mixed-format test equating (Bastari, 2000; Cao, 2008; Gubes, 2014; He, 2011; Hu, 2018; Kim & Lee, 2018; Kirkpatrick, 2005; Lee & Lee, 2016; Li, Chen, & Li, 2018; Uysal & Kilmen, 2016) and the weighting of the items in mixed-format tests by different methods (Gultekin, 2011; Saen-amnuaiaphon, Tuksino & Nichanong, 2012). There is also research on the comparison of different weighting methods (Ercikan et al., 1998; Gultekin, 2011), comparison of different calibration methods, item analysis methods and scale transformation methods in mixed-format tests (Kim & Lee, 2006; Kinsey, 2003), scoring of mixed-format tests (Donoghue, 1993; Skyes et al., 2001), the classification accuracy of mixed-format tests (Kim and Lee 2019; Wang, Drasgow & Liu, 2016), and opinions of teachers and students on using the mixed-format tests in classrooms (Eren, 2015).

As mentioned above, there are many research studies on the mixed-format tests, yet only a few of them focus on the reliability of mixed-format tests in particular (Falk & Savalei, 2011; Osburn, 2000). These studies investigate how different item types used in different ratios influence reliability estimates for given conditions. As mentioned before, there are some options. However, as far as we know, there are no studies comparing various methods by examining both the effects of item-type ratios and sample sizes on the resulting reliability estimations. It is of great importance that researchers should be able to choose the reliability estimator best suited to their particular study conditions involving mixed item-type tests with different item type ratios given the sample sizes at hand. In this context, for mixed-format tests, it should be clarified which reliability coefficients would be more accurate and how they change under some specific conditions.

The present study aims to define how the Cronbach's  $\alpha$ , Stratified  $\alpha$ , Angoff-Feldt, and Feldt-Raju change and the descriptive relationship between the estimations of these coefficients; when the sample size (500, 1000 and 2000) and the proportion (2:1; 1:1 and 1:2) of the item types used in the mixed-formed tests vary. As mentioned before,  $\alpha$  is not appropriate for the mixed-format test (DeVellis, 2003; Lucke, 2005a; Zinbarg et al., 2005). However, it is also one of the very common techniques. In this study, Cronbach's  $\alpha$  was used as a criterion for assessing the other coefficients.

## Method

### *Research Design*

In this study, several different reliability estimates of test scores were examined under the conditions that were determined on the basis of mixed-format simulation design. This research was conducted as basic research.

### *Simulation Design*

In this study, response patterns were produced for a 30-item test, including both dichotomously and polytomously scored items in different ratios. The factors that



were held constant in the conditions were the number of item types (2: dichotomous and polytomous) used generating the model (unidimensional 2PL for dichotomous items and unidimensional PCM for polytomous items), the total number of items ( $k=30$ ), the number of response categories (2 for dichotomous and 4 for polytomous), the total scoring method, the item discriminations and the item difficulties.

The Partial Credit Model was chosen for the items that were categorized in the generating data since this model was developed by Master (1982) for the analysis of multistep test items. While determining the total number of items, it was considered that it was preferred often 30-item test length for the studies in the related literature of previous years (Baker, 1998; Kinsey, 2003) and item numbers of the subtests in the large-scale tests applied in Turkey generally ranges between 20 and 30 (KPSS and LGS). While determining the number of response categories, it was considered that in applications where the item and ability parameters are predicted, TIMSS and PISA use quadripartite response according to the IRT scale for the success variable. For the total scoring method, it has been considered that Wainer (1976) recommended the use of equal weighting in mixed-format tests. As of the item discrimination, it has been considered that Hambleton, Swaminathan and Rogers (1991) stated that the item discrimination index ( $a$ ) in the IRT model is expressed as the defined normal range (0.00-2.00). For the item difficulty, it is produced in a uniform distribution (-3.00; 3.00), considering that it is close to real values. When the literature related to sample size is examined, it is taken into account the use of 500 (Baker, 1998; Odabas, 2016), 1000 (Odabas, 2016) and 2000 (Gao & Chen, 2005; Spray, 1990) individuals were taken into consideration.

#### *Data Production*

The data for each sample size were produced in the size of the sample concerned, with the ability estimates of the individuals fixed and the normal distribution of individuals with an actual score average of 0.00 and standard deviations of 1.00. 20 items scored dichotomously were produced by using a Two-Parameter Logistic Model. Then, 10 items scored polytomously were produced with a response category number of four. Twenty-five replications were performed to obtain the corresponding number of response patterns for each run. The number of samples (500, 1000 and 2000) and item rates (2:1, 1:1 and 1:2) were changed and the first five steps were repeated for each of these conditions. It is expected that the simulations considered should present data that are reasonably close to real-world conditions. Real-world includes the conditions that polytomously scored items are less than dichotomously scored items. However, this study includes the conditions that polytomously scored items are equal or more than dichotomously scored items. The reason for that is to observe and define the effects of the item rates in a more clear way.

In this study, response data were generated to be unidimensional. Lord (1980) states that unidimensionality is also a sign of local independence. Also, because there are no missing and time limitations in generating process, data do not show the speed test structure. Harwell, Stone, Hsu and Kirisci (1996) state that errors decrease and the effect approaches 1.0 after 25 replications. Also, there is some research using this

criterion. For example, Gul (2015) also used 25 replications. Considering this situation, 25 replications were made in generating data. Thus,  $9 \times 25 = 225$  different datasets were produced for  $3 \times 3 = 9$  different experimental conditions. The WinGen program was used to produce data suitable for the conditions determined for this research. All simulation conditions used in the study are presented in Table 1.

**Table 1**

*Simulation Conditions*

Sample Size	Number of Items		Item Type Ratio
	Polytomous Items	Dichotomous Items	
500	20	10	2:1
	15	15	1:1
	10	20	1:2
1000	20	10	2:1
	15	15	1:1
	10	20	1:2
2000	20	10	2:1
	15	15	1:1
	10	20	1:2

According to Table 1, sample sizes are 500, 1000 and 2000; item type ratios are 1: 2, 1: 1 and 2:1 and the first part of the test consists of polytomous items.

*Data Analysis*

For Cronbach's  $\alpha$  and standard error value for each condition and replication, SPSS was used for each dichotomous and polytomous items. Mean values of Cronbach's  $\alpha$  coefficients obtained from 25 replication and standard error values were taken and tabulated. Table values are evaluated and interpreted at a descriptive level by considering the average and standard errors. Stratified  $\alpha$ , Angoff-Feldt, and Feldt-Raju reliability coefficients formulas were written to Excel; standard error values were calculated separately for each dataset using SPSS. For 25 replication, the obtained Stratified  $\alpha$ , Angoff-Feldt, and Feldt-Raju reliability coefficients and standard error values were averaged and tabulated. The table values were evaluated and interpreted at a descriptive level, taking into consideration the averages and standard errors. A mixed ANOVA was run in which the reliability coefficient estimation technique is the within-subject factor. Sample size and ratio are the between-subject factor.

**Results**

The values of Cronbach's  $\alpha$  reliability coefficient calculated according to changing sample size and item rates are given in Table 2.

**Table 2**

*A Reliability Estimates for Different Sample Sizes and Item Type Ratio in 25 Replication*

Sample Size	Number of Items	Item Type*	Mean (concerning 25 replications)	Standard Error
500	20	D	.634	.0039
	10	P	.812	.0015
	30	Total	.796	.0019
	15	D	.516	.0049
	15	P	.881	.0010
	30	Total	.835	.0011
	10	D	.338	.0098
	20	P	.908	.0087
	30	Total	.859	.0058
1000	20	D	.743	.0017
	10	P	.817	.0009
	30	Total	.852	.0007
	15	D	.639	.0026
	15	P	.873	.0005
	30	Total	.857	.0007
	10	D	.484	.0031
	20	P	.901	.0004
	30	Total	.873	.0006
2000	20	D	.754	.0010
	10	P	.810	.0008
	30	Total	.858	.0004
	15	D	.639	.0015
	15	P	.874	.0004
	30	Total	.868	.0003
	10	D	.516	.0027
	20	P	.908	.0003
	30	Total	.892	.0003

\*D: Dichotomous, P: Polytomous

According to Table 2, when the sample size is considered, as the sample size increases, the Cronbach’s  $\alpha$  coefficient increases or tends to increase in all item ratios. When the item rates are taken into account, it is observed that the number of items that scored dichotomously in all the sample sizes, and accordingly, the Cronbach’s  $\alpha$  values decrease as the ratio of the dichotomous items increase. Table 3 shows the comparison of the reliability coefficient values calculated on the basis of the changing sample size and item rates.

**Table 3***Reliability Estimates for Different Sample Sizes and Item Type Ratio in 25Replication*

Sample Size	Item Ratio	Reliability Coefficient- Standard Errors								
		True Reliability	Cronbach's $\alpha$	SE	Stratified $\alpha$	SE	Angoff-Feldt	SE	Feldt-Raju	SE
500	2:1	.802	.796	.0019	.797	.0018	.852	.0027	.849	.0026
	1:1	.839	.835	.0011	.835	.0014	.810	.0023	.808	.0023
	1:2	.876	.859	.0058	.867	.0010	.751	.0041	.748	.0041
1000	2:1	.858	.852	.0007	.852	.0007	.892	.0009	.891	.0008
	1:1	.862	.857	.0007	.857	.0007	.857	.0017	.855	.0018
	1:2	.877	.873	.0006	.873	.0006	.818	.0019	.817	.0019
2000	2:1	.860	.858	.0004	.857	.0005	.892	.0017	.892	.0016
	1:1	.870	.868	.0003	.869	.0003	.861	.0011	.860	.0011
	1:2	.894	.892	.0003	.892	.0003	.840	.0013	.839	.0013

\*Item Ratio= Dichotomous/ Polytomous (Total Item Number= 30)

When Table 3 is examined, considering the sample size, it is observed that as the sample size increases, the Stratified  $\alpha$  values increase or tend to increase at all item ratios. When the item rates are considered, it is observed that as the number of items dichotomously scored in all samples increases, the value of Stratified  $\alpha$  decreases. This situation could also be due to increased scale sensitivity provided by the categorical item scoring since polytomous item scoring can, ideally, be more precise, and consequently, a higher reliability coefficient estimates that of dichotomous item scoring.

As shown in Table 3, it is generally observed that as the sample size increases, the Angoff-Feldt reliability coefficient values increase or tend to increase. For example, in Table 3, for a 1:2 item ratio, if the sample size is 500, then  $r_{AF}=.751$ , if sample size is 1000, then  $r_{AF}=.818$ , and if the sample size is 2000, then  $r_{AF}=.840$ . When the item rates are considered, it is observed that the Angoff-Feldt reliability coefficient values increase or tend to increase as the number of items dichotomously scored in all samples increases. Accordingly, higher Angoff-Feldt estimates are obtained if the number and ratio of the polytomously scored items in a mixed-format test are higher. According to Table 3, when the sample size is considered, the Feldt-Raju reliability coefficient values increase at all item ratios as the sample size increases. When the item rates are taken into consideration, it is observed that the Feldt-Raju values increase as the number of items dichotomously scored in all samples increases. In addition, when

Table 3 is examined, it is seen that Angoff-Feldt and Feldt-Raju values have almost the same values.

When Table 3 is examined, and the sample size is considered, it is observed that as the sample size increases, the reliability coefficient values obtained with four reliability coefficients in all item ratios are also increased. That is, in large samples, all four reliability coefficients tend to give higher estimates. In addition, as the sample size increases, the standard errors for the averages of the estimates of the four reliability coefficients approach zero by decreasing. This is an expected result since the standard error is inversely proportional to the sample size.

When item ratios are taken into consideration, it is observed that as the number of items polytomously scored in all samples increases, Cronbach's  $\alpha$  and Stratified  $\alpha$  values increase, while Angoff-Feldt and Feldt-Raju values decrease. In other words, Cronbach's  $\alpha$  and Stratified  $\alpha$  values give higher predictions for the tests with a high polytomous item ratio, while Angoff-Feldt and Feldt-Raju give higher estimates for the tests with high dichotomous item ratio. From a different view point, it can be conceivable that in the case of number and rate of dichotomous items were higher than polytomous items,  $\alpha$  and Stratified  $\alpha$  give lower limit in these four reliability coefficients. And also, it can be conceivable that  $\alpha$  and Stratified  $\alpha$  give upper limit in these four reliability coefficients when the number and rate of dichotomous items are lower than polytomous items. It is also possible to express this finding by taking into account the Angoff-Feldt and Feldt-Raju coefficients. Thus, if the rate of dichotomous items is higher, it can be conceivable that Angoff-Feldt and Feldt-Raju give the upper limit in these four reliability coefficients. Also, when the standard error values are examined, it is seen that  $\alpha$  and Stratified  $\alpha$  have values lower than Angoff-Feldt and Feldt-Raju in almost all conditions. Besides, when Table 3 is examined, it is seen that  $\alpha$  and Stratified  $\alpha$  are closer to true reliability coefficients. Angoff-Feldt and Feldt-Raju give upper limits among these four coefficients when the ratio of dichotomous items is high, but the standard error values appear to give high values in these four coefficients. However, when Table 3 is examined, the values calculated with Angoff-Feldt and Feldt-Raju have given higher values than the true reliability value. A two way ANOVA was conducted to investigate the impacts of sample size and item ratio on the reliability coefficient. There was a significant main effect of sample size and item ratio, ( $F [2, 221] = 136,924$   $p < .001$ ,  $\eta^2 = .55$ ). There is a great effect ( $\eta^2 > .14$ ). Paired comparisons were made after the analysis with the Tukey method for the significant F values and the results were found to be significant.

These increases and decreases in the reliability coefficient values depending on the item rate are lower in the sampling for 1000 and 2000 individuals than the sampling of 500 individuals. As the sample size increases for all the four reliability coefficients, the effect of the item ratio on the reliability estimate appears to decrease or tend to decrease. It is also seen that the difference between the standard error values for the average of the estimates for the four reliability coefficients and the increase in the rate of the polytomous items is more evident for the samples with 500 samples than for the samples with 1000 and 2000 individuals. When Table 3 was examined, it was seen that all reliability coefficients were close to each other due to the increase in sample size in

the 1: 1 item-type ratio. It is also seen that these values are close to the real reliability coefficient values. Therefore, as the sample size increases, it can be considered that these coefficients can be used interchangeably in 1:1 item type ratio.

As another result, Cronbach's  $\alpha$  and Stratified  $\alpha$  coefficient values are observed to be similar in all sample sizes and item ratios. Similarly, the Angoff-Feldt and Feldt-Raju reliability coefficients are close to each other or give the same estimates. In other words, Cronbach's  $\alpha$  and Stratified  $\alpha$ , Angoff-Feldt, and Feldt-Raju coefficients can be considered to work similarly. Also, when the standard error values are examined, it is seen that Cronbach's  $\alpha$  with Stratified  $\alpha$  and Angoff-Feldt with Feldt-Raju have similar values. While in all sample size and item type ratio Angoff-Feldt and Feldt-Raju give similar standard error values; Cronbach's  $\alpha$  and Stratified  $\alpha$  give more similar standard error values in large samples. Accordingly, it can be said that Angoff-Feldt and Feldt-Raju tend to work more similarly. This also indicates that the similar study trend of Angoff-Feldt and Feldt-Raju was not affected by sample size; however, the similar operating tendency of  $\alpha$  with Stratified  $\alpha$  was affected by sample size, indicating that this trend increased in large samples.

When Table 3 is examined, it can be seen that as the sample size increases, the difference between the highest and the lowest value obtained from the four reliability coefficients in all item ratios decreases. The decrease in the difference between the reliability values depending on the sample size can be interpreted as the difference will decrease gradually when larger samples are used. Besides, it is seen that the difference between the standard error values decreases as the sample size increases for the four reliability coefficients. This situation has been evaluated that differences from true reliability values will decrease depending on the sample size increase in the 2:1 and 1:1 item type ratio.

### Discussion, Conclusion and Recommendations

As expected, in this study, it is seen that there is a relationship between sample size and reliability estimates. Similar results have been obtained with Gay (1987). Cronbach's  $\alpha$ , Angoff-Feldt, and Feldt-Raju reliability coefficients tend to give high estimates as sample size increases. Also, as the sample size increases, the standard error decreases. This indicates that the possibility of approaching the true reliability value increases. Lord and Novick (1968) also found that the reliability coefficient and error variance values approach real values with the increase in the sample size.

Another conclusion of this study is that there is a relationship between the ratios of different item types in mixed-format tests and reliability estimates. A mixed ANOVA results showed that this effect was significant. Nunnally (1964) and Mehren and Lehmann (1973) also found that the polytomous and dichotomous item rates affect the reliability. Saen-AmnuAiphon, Tuksino, and Nichanong (2012) indicated that increasing the number of items that are dichotomously scored reduced the value of reliability Cronbach's  $\alpha$ . As a result of this study, Cronbach's  $\alpha$  and Stratified  $\alpha$  values increased with the increase in the number of items scored polytomously in all samples; Angoff-Feldt and Feldt-Raju values increased or tended to increase as the number of items scored dichotomously increased. In other words, in a mixed-format test with

dichotomous items,  $\alpha$  and Stratified  $\alpha$  values have the upper limit in these four coefficients when the number and ratio of the items scored polytomously are high; if there are a large number of items scored dichotomously, it gives the lower limit. This is also true for the Angoff-Feldt and Feldt-Raju coefficients.

Another conclusion reached in this study is that the changes in the observed reliability estimates are affected by the sample size, depending on the number and ratio of the items. A mixed ANOVA results showed that this effect was significant. The differences between the coefficients are more evident in the 500-person samples than in the 1000- and 2000-person samples. That is, as the sample size increases, the effect of the item ratio on the reliability estimates seems to decrease or tend to decrease. Charter (1999) also found that as the sample size increased, the difference between the different reliability coefficients decreased.

In this study, it was seen that some of the reliability coefficients tend to run similarly and their estimates are also similar to each other. In all sample sizes and item ratios, Cronbach's  $\alpha$  and Stratified  $\alpha$  run similarly. This is also true for the relationship between Angoff-Feldt and Feldt-Raju coefficients. The conclusion that Angoff-Feldt and Feldt-Raju coefficients tend to run in a similar way is consistent with the findings of Warrens (2016). Warrens (2016) found that different coefficients may tend to work similarly, and also, if the larger standard deviation is less than 30% and if the difference between the lengths is at most 0.20, than the differences between the values is less than 0.07. Osburn (2000) and Feldt and Charter (2003) were also showed that the different coefficient produces very similar values in a variety of situations using simulated data.

There are studies on how Cronbach's  $\alpha$  and Stratified  $\alpha$  tend to give the same results (Cronbach, Schöneman & McKie, 1965; Cronbach & Shavelson, 2004; Osburn, 2000). These studies show that the use of Stratified  $\alpha$  is more appropriate in a mixed-format test involving different item types. Because the coefficient  $\alpha$  estimate reliability is lower than as it is. Similarly, there are other studies that show that the Cronbach's  $\alpha$  coefficient generally gives lower estimates than the other reliability coefficients (Feldt, 2002; Guttman, 1945; Raykov & ShROUT, 2002; Sijtsma, 2009). As a result, the related literature shows that Cronbach's  $\alpha$  tends to estimate lower than Stratified  $\alpha$ .

Like the above-mentioned sources, in this study, a similar result with the literature was observed in the sample of 500 individuals. For samples larger than 500, Cronbach's  $\alpha$  and Stratified  $\alpha$  coefficient values either give the same value or differentiate after the three digits. It has been assessed that this may be related to sample size. Accordingly, it is predicted that when the sample size reaches a certain value, Cronbach's  $\alpha$  and Stratified  $\alpha$  values will be fixed by giving the same value.

According to the results of this study, as the sample size increases, the difference between the highest value and the lowest value obtained from four reliability values in all item ratios decreases. Depending on the sample size, the gradual decrease in the differences between the reliability values indicates that the difference will gradually decrease when larger samples are used and that four reliability values will give similar results after a certain sample size. This is also supported by the tendency to decrease

in standard error values and its approach to zero. This can be interpreted as the reliability that can be predicted more accurately with the increase in the sample size.

In the light of the findings and conclusions obtained in this study, to obtain more reliable results, it may be conceivable to use Cronbach's  $\alpha$  and Stratified  $\alpha$ , if the number of items polytomously scored is higher. However, when the literature is examined, it is seen that there are some studies indicating that choosing an internal consistency estimation technique should not decide which procedure provides the highest coefficient (Qualls, 1995). On the other hand, the coefficients Angoff-Feldt and Feldt-Raju can be used when the number of items scored dichotomously is higher. In smaller samples (500 individuals or less), it can be considered to increase the number of items scored polytomously. The Cronbach's  $\alpha$ , Stratified  $\alpha$ , Angoff-Feldt, and Feldt-Raju reliability coefficients can be used in larger samples (2000 individuals and over) since they give the same values for calculating reliability values for a mixed-format test with a 1:1 item ratio. And also, it was seen that all coefficient values were near to the true reliability coefficient.

When the Cronbach's alpha coefficient is low from the other reliability coefficients, the Angoff-Feldt coefficient gives or tends to give a high value from the other reliability coefficients. Feldt and Charter (2003) suggested that when the use of the Cronbach's  $\alpha$  coefficient is not appropriate, the use of the Angoff-Feldt coefficient is a higher and more accurate estimation. It can be understood in Feldt and Brennan (1989) that the Angoff-Feldt coefficient would be more accurate than Cronbach's  $\alpha$  coefficient in a mixed-format test, which consists of different types of items. However, when findings evaluated with standard error values, standard error values are higher in cases where Angoff-Feldt values higher than Cronbach's  $\alpha$ . However, when the true reliability coefficient was examined, it was seen that coefficient alpha is near the true reliability coefficient.

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### Karma Testlerde İç Tutarlılık Kestirimlerinin Farklı Benzetim Koşullarında İncelenmesi

#### Atf:

- Gurdil Ege, H., & Demir, E. (2020). Examining of internal consistency coefficients in mixed-format tests in different simulation conditions. *Eurasian Journal of Educational Research*, 87, 101-118. DOI: 10.14689/ejer.2020.87.5

#### Özet

*Problem Durumu:* Alanyazın incelendiğinde karma testlerde güvenilirlik üzerine yapılan az sayıda araştırma olduğu görülmüştür. Bu araştırmalarda farklı madde tipleri farklı oranlarda kullanılmıştır. Ancak madde tipi oranlarının ve örneklem büyüklüğünün birlikte güvenilirlik üzerindeki etkisini inceleyerek bu yöntemlerin karşılaştırıldığı bir araştırmaya rastlanmamıştır. Karma testlerde kullanılacak madde tipleri ve bunların sayısı, ayrıca güvenilirlik kestirimleri için gerekli örneklem büyüklüğü, önemli tartışma ve sorun alanları arasındadır. Bu bağlamda; karma testlerde iç tutarlılık anlamında güvenilirlik hesaplamalarında kullanılan katsayıların, karma testlerin yapısını belirleyen önemli değişkenler olarak farklı madde tipi oranı ve örneklem büyüklüğü dikkate alındığında, bu katsayıların nasıl değiştiği, ideal/ daha uygun katsayıların hangileri olduğu bu araştırmanın problem durumunu oluşturmaktadır.

*Araştırmanın Amacı:* Bu araştırmanın araştırmada, karma testlerde örneklem büyüklüğü (500, 1000 ve 2000) ve kullanılan madde tiplerinin oranı (2:1; 1:1 ve 1:2) değişimlendiğinde;  $\alpha$ , Tabakalı  $\alpha$ , Angoff-Feldt ve Feldt-Raju güvenilirlik katsayılarının nasıl değiştiğinin incelenmesi ve bu güvenilirlik katsayıları arasındaki betimsel ilişkinin ortaya konması amaçlanmıştır.

*Araştırmanın Yöntemi:* Araştırma için belirlenen koşullara uygun veri üretmek için; WinGen program kullanılmıştır. Araştırma kapsamında oluşturulan koşullarda madde tipi sayısı, very türetmede kullanılan model, toplam madde sayısı, yanıt kategori sayısı, toplam puan alma yöntemi, madde ayırcılığı ve madde güclüğü sabit tutulurken; örneklem büyüklüğü ve madde tipi oranı için değişimler yapılmıştır.

Sabit tutulan ve üzerinde deęişimleme yapılan deęişkenler için ilgili alanyazın dikkate alınmıştır. Theta, her bir örneklem büyüklüğü için; ortalaması 0.00 ve standart sapmaları 1.00 olan normal dağılıma uygun olacak şekilde üretilmiştir. İki kategorili puanlanan maddeler İki Parametrelili Lojistik Model'le, çok kategorili puanlanan maddeler Kısmi Puan Modeli ile üretilmiştir. Örneklem sayısı (500, 1000 ve 2000) ve madde oranları (2:1, 1:1 ve 1:2) olacak şekilde deęişimlenmiş ve ilk beş adım bu koşulların her biri için tekrarlanmıştır. Veri üretiminde 25 tekrar(replikasyon) yapılmıştır. Böylelikle,  $3 \times 3 = 9$  farklı deneysel koşul için  $9 \times 25 = 225$  farklı veri seti üretilmiştir. Elde edilen vey setlerine ait her bir koşul ve tekrar için  $\alpha$ , Tabakalı  $\alpha$ , Angoff-Feldt ve Feldt-Raju deęerleri hesaplanmış ve tabolaştırılmıştır. Bu tablo deęerleri, ortalama ve standart hatalar dikkate alınarak betimsel düzeyde deęerlendirilmiş ve yorumlanmıştır.

*Araştırmanın Bulguları:* Tüm madde oranlarında örneklem büyüklüğü arttıkça tüm güvenilirlik kestirim deęerlerinin de arttığı belirlenmiştir. Tüm örneklemde iki kategorili puanlanan madde sayısı arttıkça  $\alpha$  ve Tabakalı  $\alpha$  güvenilirlik katsayı deęerleri; çok kategorili puanlanan madde sayısı arttıkça ise Angoff-Feldt ve Feldt-Raju güvenilirlik katsayı deęerleri azalmaktadır.  $\alpha$  ve Tabakalı  $\alpha$  güvenilirlik katsayı deęerleri tüm örneklem büyüklükleri ve tüm madde oranlarında hemen hemen aynı deęeri vermekteyken, 500 kişilik örneklemde madde oranları deęişimine göre güvenilirlik katsayı deęerleri arasındaki farkın daha belirgin olduğu görülmüştür. Diğer bir bulgu olarak, iki madde tipi içeren bir karma testte iki kategorili puanlanan madde sayısı çok kategorili puanlanan madde sayısından daha fazla olduğunda  $\alpha$  ve Tabakalı  $\alpha$  güvenilirlik katsayı deęerlerinin bu dört güvenilirlik katsayısı içerisinde alt sınırı, aksi durumda üst sınırı verdiği görülmüştür.

*Araştırmanın Sonuçları ve Önerileri:* Örneklem büyüklüğü 500'ün üzerinde olduğunda  $\alpha$  ve Tabakalı  $\alpha$  güvenilirlik katsayı deęerlerinin benzer sonuçlar verdiği, diğer katsayıların kısmen farklılaştığı görülmüştür. Örneklem büyüklüğü 1000'in üzerinde olduğunda ise  $\alpha$ , Tabakalı  $\alpha$ , Angoff-Feldt ve Feldt-Raju deęerleri arasındaki farkın azaldığı görülmüştür. Görece küçük örneklemde ( $n=500$ ) kısmi farklılıklar görülmekle birlikte büyük örneklemde ( $n \geq 1000$ ), farklı güvenilirlik katsayılarının benzer deęerler verdiği, örneklem büyüklüğü arttıkça madde oranının güvenilirlik kestirimleri üzerindeki etkisinin de düştüğü ya da düşme eğiliminde olduğu sonucuna ulaşılmıştır. Bu araştırmada elde edilen bulgular ve sonuçlar doğrultusunda bu alanda uygulama yapacaklara daha güvenilir sonuçlar elde edebilmek için çok kategorili puanlanan madde sayısı daha fazlaysa  $\alpha$  ve Tabakalı  $\alpha$ ; iki kategorili puanlanan madde sayısı fazlaysa Angoff-Feldt ve Feldt-Raju güvenilirlik katsayıları kullanmaları önerilebilir. Küçük örneklemde ( $n \leq 500$ ) yapılacak test uygulamalarında  $\alpha$  ve Tabakalı  $\alpha$  güvenilirlik katsayısı kullanılacaksa, testin güvenilirlik düzeyini arttırmak için çok kategorili puanlanan maddelerin sayısı arttırılabilir. Büyük örneklemde ( $n \geq 1000$ ) ise (2:1, 1:1, 1:2) madde oranlarından elde edilen güvenilirlik deęerleri birbirine çok yakın oldukları için bu madde oranlarından herhangi biri kullanılabilir. Büyük örneklemde ( $n \geq 1000$ ), özellikle 1:1 madde oranından oluşan bir karma test için güvenilirlik deęeri hesaplanmasında aynı deęerleri verdiği için  $\alpha$ , Tabakalı  $\alpha$ , Angoff-Feldt ve Feldt-Raju güvenilirlik katsayıları kullanılabilir. 500 kişiden

büyük örneklerde birbirleriyle hemen hemen aynı değerleri verdikleri için  $\alpha$  yerine Tabakalı  $\alpha$ ; Angoff-Feldt yerine Feldt-Raju güvenirlik katsayısı kullanılabilir.

*Anahtar Sözcükler:* Karma test, güvenirlik, tabakalı  $\alpha$ , angof-feldt, feldt-raju



## Status of Teaching Profession from the Perspective of the Teachers

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### ABSTRACT

**Purpose:** The status of the teaching profession is essential because it can affect teachers' perspective on the profession, motivation levels, and professional disciplines. This study aims to investigate which direction the status of the teaching profession has changed from past to present, factors affecting the change in the status, and what can be done to increase the status of the teaching profession.

**Methods:** A total of 54 voluntary teachers from 18

districts in Trabzon province participated in this study. In light of the conceptual framework, a semi-structured interview form was used to collect data. Data were resolved and interpreted by content analysis.

**Findings:** In this research, all teachers affirmed that the status of the teaching profession has changed from past to present negatively. Teachers expressed the factors that affect this change most, the policies followed by the system, the value of teachers in society, the loss of prestige and the low income of teachers. Teachers' opinions on what can be done to increase the status of the teaching profession, most of all, the Ministry of National Education (MoNE) values the teacher, teachers' working and personal rights to improve, teachers self-development statements are prominent.

**Implications for Research and Practice:** The findings obtained in this study suggest that teachers should conduct a wider range of research and take measures to improve their status levels using different methods.

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## Introduction

Profession concept which determines our social position is defined as “work based on knowledge and skills acquired through a certain education system, which is determined by the rules for producing useful goods, serving people and earning money in exchange” in the Turkish language institution dictionary (TDK, 2018).

The teaching profession deserves to be defined as a profession because it is a primary profession that plays a role in teaching cognitive, dynamic subtleties of other professions (Turer, 2006). As teaching in Turkey requires receiving formal vocational training, expertise, professional culture, preference and control for starting the profession and as it contains fundamental values and ethical principles, it is considered as a profession (Celep et al., 2004).

Although there are many changes in education, the importance of the teacher in the education process has not changed. Teaching, social, cultural, technological dimensions, seeking particular expertise, knowledge, and skills in the field, requiring academic work and professional performance, are a field of professional status (Alkan, 2000). The notion of status for teaching is defined in the document titled “Teachers' status recommendation” published by the International Labour Organization (ILO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) as “includes the given position and the working conditions, wages and other financial benefits identified for them in comparison with other professions”. In this document, the fifth article of the central principle is asserted as follows: "the status of teachers should be relevant to the needs of education, considering the aims and objectives to be achieved in the field of education; to achieve these aims and objectives, teachers should be entitled to a fair status and the profession of teaching should get respect from the society" (Gulmez, 2010, p. 38).

The high value of social status for a profession also increases the perception of prestige for that profession. Professional prestige, which is expressed as a "generalized subjective respect attitude," plays an essential role in shaping the attitudes and perceptions of individuals concerning their profession. The profession's high status in the social structure of the people, the importance of their profession and the degree of meaning can be useful and can increase their professional satisfaction and dedication to the profession (Kusluvan & Kusluvan, 2000, p.262).

As a result of the rapid increase in knowledge in the world and the changes in lifestyle, technology and life perspectives, the teaching profession has gained a different dimension in a social structure (Azar, 2011). In Turkey, exciting results have been obtained in research on the status of the teaching profession. The research conducted by the Turkish Statistical Institute in 2014 entitled “The status of working life and professions in Turkey,” teaching profession took place in fourth place after a medical doctor, University professor, and judge. However, in many studies, the results are varied from the literature. In Karaman et al.'s (2013) study, teachers stated that the status of the profession is lower than those of other professions that require



a bachelor's degree. In a study carried out by the Turkish Education Association-TEDMEM (2014, p. 2), teachers and administrators carried out a negative assessment of the social status of teaching as a profession. In the research conducted by Unsal and Bagceci (2016), they emphasized the significance of teachers concerning society but pointed out that they could not see the value and respect they deserve. Such negative evaluations for teachers' professional esteem also discussed in research conducted in 2015. In this research, teachers were asked about the most disturbing issues in their professional lives. Accordingly, one-third of the teachers expressed the lack of professional esteem as the most disturbing issue (Education and Science Workers' Union- Eđitim-Sen, 2015). In a study conducted by Yurdakul et al. (2016), it is stated that although three-fifths of teachers define teaching as one of the most respected professions, more than two-thirds of teachers (65.7%) said that the social status of teachers decreases day by day. Within the framework of the Eurydice report (2013), one of the critical problems facing education systems is the low status of the teaching profession.

The higher the status of teachers and their working conditions, the better the country's development and well-being. Therefore, it is needed to give the teacher the necessary value in social structure; to be better educated and to solve their difficulties and problems so that they can do their jobs better (Habaci et al., 2013).

Teachers need to perceive their work as a situation that develops and strengthens their professional identities gives them the opportunity to show leadership behavior and includes social responsibility (Collay, 2006). Valuing teachers and providing support for leadership roles is of great importance concerning the educational change (Gabriel, 2005). Although they are based on different conceptual frameworks, the common points of various scientific studies that approach the teaching profession and teachers from various perspectives and bring them to the research agenda are that they allow teachers to express their own experiences with their own expressions based on reality, that is, to draw the voice of the teachers into the focus of scientific research (Esen, 2005). Thus, it is important to examine the status of the teaching profession from the perspective of teachers in the quest for quality in education.

The present research aims to reveal the factors that affect the status of the teaching profession and what can be done to increase the status of the profession from the perspective of teachers. In this way, it is aimed to give an idea about what can be done to increase the status and contribute to the production of more effective and efficient education policies. Thus, the following questions were asked to the teachers, and they were asked to answer the questions in the scope of system, individual, society and so on.

1. The status of the teaching profession has changed from past to present in which direction? Why? What are the factors that affect the status?
2. What can be done about increasing the status of the teaching profession?

## Method

### Research Design

In this study, a qualitative research method was used to define, analyze and provide in-depth information to interpret the behavior and beliefs of individuals or groups (Creswell, 2002). This research was designed as a case study in the context of qualitative research. The aim of the case studies is to reveal the experiences, perceptions and meanings of the individuals related to a case (Yildirim & Simsek, 2016).

### Research Sample

The study group was chosen based on the maximum variety sampling, one of the purposive sampling techniques, to illustrate the different dimensions of the problem and to provide various views (Yildirim & Simsek, 2016). Demographic distribution is shown in Table 1.

**Table 1**

*Demographic Characteristics of the Study Group*

School type	Gender	Seniority	Level of Education	Branch
Primary School	7F, 11M	Range	f	Classroom Teaching: 18
		1-5 Y.	3	
		6-10 Y.	5	
		11-15 Y.	7	
		16-20 Y.	2	
20+ Y.	1			
Secondary School	8F, 10M	1-5 Y.	3	Bachelor's Degree: 15
		6-10 Y.	9	Master's Degree: 3
		11-15 Y.	4	
		16-20 Y.	1	
		20+ Y.	1	
High School	8F, 10M	1-5 Y.	9	Bachelor's Degree: 10
		6-10 Y.	4	Master's Degree: 8
		11-15 Y.	2	
		16-20 Y.	1	
		20+ Y.	2	
				Informatics 1 English1 Sciences 1 Counselling 1 Turkish 1 Religious C.1 Mathematics 3 Technology 1 History 2 Music 2 English 1 Geography 1 Informatics 1 Philosophy 1 Sociology 1

F=Female M= Male

Following this purpose, the study group consisted of 54 teachers from 18 districts, including Trabzon province capital, who were voluntary, randomly selected teachers who worked at primary school, secondary school and high school level. In the determination of the study group, firstly, a randomly chosen school principal at a primary school, secondary school and high school level was reached in each district, and then a volunteer teacher from each school was reached through them. The teachers who participated in the pilot application did not participate in the main application.

### *Research Instruments and Procedures*

Following the literature study, a semi-structured interview form consisting of open-ended questions, which was based on people's experience, which examined perceptions, ideas, feelings, and knowledge and provided answers in depth (Patton, 2015). Two questions were prepared to understand teacher status from the perspective of teachers and pilot applications were carried out with eleven teachers. Since there was no problem with the application results, an interview form was created with two questions and demographic information. After that, the form was ready to be applied by receiving a consultation from a field expert.

During the data collection process, primary schools, secondary schools, and high schools were listed in all districts of Trabzon province, and the purpose of the survey was discussed with the administrators of the schools selected randomly. Through administrators, teachers were reached from every school that was voluntary to participate in this research. After sharing information about the purpose of this research with teachers, it is assured that the data will be reliable, that the information will be kept confidential, and that the identities of the participants will be kept confidential and that the names of their or their institutions will not be mentioned in any part of this research. Face to face interviews with duration of 15-20 minutes were conducted with teachers; interview questions that consisted of two questions and demographical information were submitted to them. All of the participants' views were classified by considering the district and school levels and all of the views were recorded electronically.

### *Data Analysis*

The data obtained as a result of the research were analyzed using the content analysis method. With this analysis, the data were identified by deeper processing, and the facts declared by the data were tried to be revealed (Yıldırım & Şimşek, 2016). As the first step in this process, the data were encoded, and then the associated codes were assembled, and themes were created, and then these themes were tried to be explained (Buyukozturk et al., 2016).

The validity of qualitative research means that what is wanted to be measured is accurately revealed through the measurement tool and that it is being examined neutrally. In brief, it signifies the accuracy of the research results (Yildirim & Simsek, 2016). To ensure internal validity, the teachers' views on the status of the teaching profession were coded, and codes were supported with direct quotations. The researcher continuously tested the relevance and integrity of the findings. The notions constituting the themes were evaluated with each other and with other themes to ensure the coherence of the findings. Then, it was tested whether or not they created a meaningful whole. The details of the research process were explained to ensure external validity. The results were compared with the field literature, and the results were interpreted, and real situations in the application were tried to be reached (Ozdemir et al., 2015). To ensure reliability in this research, an expert in educational administration and qualitative research has been asked to provide a critical evaluation of the processes, from the determination of the research pattern to the analysis of the

collected data and the writing of the results to the researcher (Streubert & Carpenter, 2011). Also, to ensure reliability, the demographic characteristics of the participants were presented in a table to identify the individuals who created the data source of the research. Besides, teachers who were willing to participate in this research were chosen to ensure the reliability of validity (Yildirim & Simsek, 2016). Furthermore, in this research, while trying to reveal the views of the participants about the status of the teaching profession, external reliability was tried to be ensured by displaying an objective manner as possible. To ensure the accurate classification of the themes, the literature, and expert judgment were used in this research. The results obtained from the expert judgment were compared with the themes and the articles under the theme created by the researcher. The reliability of this research was calculated using the expert and researcher evaluations with  $X 100$  if the number of consensus and disagreement were determined in the comparisons and the formula ( $\text{Reliability} = \frac{\text{Consensus}}{\text{Consensus} + \text{disagreement}}$ ), size, and range of Miles and Huberman (1994) were considered. As a result of the expert judgment survey, the factors affecting the status of the teaching profession were five items in the sub-problem and four items in the sub-problem that can be done to increase the status of the teaching profession. In the reliability study, which is explicit to this research, 85% and 88% reliability were obtained, respectively. In cases where the alignment between the encoding scheme was 85% and above, it was assumed that the coveted level of reliability was obtained. In the presentation of the findings, participants' original statements were included to reinforce the themes.

## Results

### *Teachers' Views on the Status of the Teaching Profession and Factors Affecting the Status*

When asked which direction the status of the teaching profession changed from past to present, all 54 teachers stated their views as "decreased." Teachers' views on the factors affecting the status of the teaching profession were examined; "Factors affecting the status of teaching profession" are classified as the MEB-system (16 themes), society (5 themes), teachers (9 themes), education faculties (2 themes), media (1 theme) and politicians (1 theme). When we looked at the distribution of views, in the MEB-system category, the policies-system being followed ( $f=34$ ) had the highest frequency, while in the society section, loss of reputation and social value ( $f=24$ ) had the highest second frequency. Then, the highest frequency ranking continues again from the MEB-System category; low income ( $f=22$ ), deemed worthless by the system ( $f=19$ ). Teachers' views on factors affecting teaching status are displayed in Table 2.

**Table 2***Factors Affecting the Status of the Teaching Profession*

Themes	F	%
<b>The Ministry of National Education (MEB)-System</b>		
1 Policies being followed	34	63
2 Low income	22	41
3 Deemed worthless by the system	19	35
4 Spoiled student profile	15	28
5 Parent profile created by the system	13	24
6 Assignment problems	10	19
7 Perception of "Inadequate teacher"	9	17
8 Perception of "Teacher for the exam"	7	13
9 Teachers decisions not being taken into account	4	7
10 Contract-paid teachers	4	7
11 Difficulties in working conditions	4	7
12 Non-branch assignments	3	6
13 Teacher complaints line	3	6
14 Teacher's isolation	3	6
15 System-based motivation loss	2	4
16 Selection of the teachers	1	2
<b>Society</b>		
17 Loss of reputation and social value	24	44
18 Easy access to information	8	15
19 Not a preferred profession	7	13
20 Formed "simple job" perception	5	9
21 Environmental pressures	4	7
<b>Teachers</b>		
22 Teachers cannot develop themselves	11	20
23 Do not value themselves and their profession	9	17
24 Do not do their job precisely	8	15
25 Loss of idealism	6	11
26 Spiritual dissatisfaction	4	7
27 Decrease of qualified teachers	4	7
28 Problem of adaptation to system change	2	4
29 Civil disobedience actions	2	4
30 Lack of organization of teachers	1	2
<b>Education faculty</b>		
31 Low scores	6	11
32 Poor quality education	5	9
<b>Media</b>		
33 Negative statements regarding the profession	9	17
<b>Politicians</b>		
34 Contradictory discourses of politicians	11	20

Some of the teachers' views on factors affecting the status of the teaching profession are presented in direct quotations below:

*"The main task falls to politicians and the Ministry of Education. If they bring a new opening to teaching as a profession whose authority has been increased, raised as status, and valued the perspective of society will change [...] Sanctions should be required on the student/parent who disrespects his/her teacher or uses a manner that exceeds the limit." (P 17)*

-“I think our teachers did not endear this profession very much to teacher candidates. Reading from the slide, giving additional homework or lecturing sloppy lessons, I think the quality is discarded in the background [...]The excess of teachers who cannot be assigned leads to unpreferable of the profession [...]” (P 18)

-“Teachers involved are always seen as the main reason for failure. This situation causes teachers to feel bored and discouraged. Teachers do not strive to develop themselves; they do not read books; they do not learn foreign languages. Social activity is close to zero [...] Educators who tired of life [...] How can such a teacher be respected? [...]” (P 20)

- “[...] As a result of the modification made in the system that can be seen ten years later, the system is changed by saying that it did not become helpful ten months later. This rapid and unplanned change creates the impression that the problem arises from the teachers because teachers cannot adjust to both the information and the physical infrastructure at the same pace.” (P 11)

### *Teachers' Views on What can be Done to Improve the Status of the Teaching Profession*

According to the teachers' views, “Views on what can be done to increase the status of teaching profession” is classified in MEB-system (20 themes), teachers (4 themes), society (3 themes), educational faculties (3 themes), politicians (2 themes) and media (1 theme) categories. When we look at the distribution of views, in MEB -System category, the state should give importance to MEB (f=25), in the teacher's category; teachers ' working and personal rights should be amended (f=23), teachers should control their fields, develop themselves (f=16). These views continued as follows: changes in the MEB-System category should be long-term and well-structured (f=15); teachers should be straight in the face of parents and students (f=14). Teachers' views on increasing the teaching status are displayed in Table 3.

**Table 3**

#### *Actions can be Done to Increase the Status of the Teaching Profession*

Themes	f	%
<b>The Ministry of National Education (MEB)-System</b>		
1 Value for the teacher	25	46
2 Improving personal rights	23	43
3 Structured amendments	15	28
4 Strengthen teaching	14	26
5 Fair assessment	12	22
6 Qualified teacher preference	10	19
7 To gain status	8	15
8 Add teachers to the decision process	7	13
9 Administrators of education	7	13
10 Supporting teacher development	6	11
11 Eliminating physical deficiencies in schools	6	11
12 Educated administrators	5	9
13 Increasing the scores of the Faculty of Education	4	7
14 Scientific decisions	4	7

Table 3 Continue

Themes	f	%
<b>The Ministry of National Education (MEB)-System</b>		
16 Re-vocational qualification	3	6
17 End of paid, contracted teaching	3	6
18 Less education faculty	2	4
19 Re-teacher high school	1	2
20 Teachers with a master's degree	1	2
<b>Politicians</b>		
21 Should not be too involved in education	9	17
22 Positive attitude	6	11
<b>Education Faculty</b>		
23 Qualified education	7	13
24 Application-oriented	2	4
25 Qualified instructors	1	2
<b>Society</b>		
26 Loss of value should be prevented.	8	15
27 Easy business perception" should be ended.	1	2
28 "Teacher is an expert" approach should be noticed.	1	2
<b>Teachers</b>		
29 Should develop himself/herself	16	30
30 He/she must respect his profession and his/herself	9	17
31 Must be an example	5	9
32 Should not be in politics	4	7
<b>Media</b>		
33 Positive news	6	11

Some of the views of teachers about what can be done to increase the status of the teaching profession are given in direct quotations. Some of these quotes are:

*-"MEB should make the teacher feel "valuable." If a ministry makes its employees valuable in the eyes of society, society considers this and reviews it and accepts it [...]" (P 7)*

*-"[...] Teachers should partake in decision-making mechanisms, spiritual and material satisfaction should be given, working conditions should be improved, social value perception should be increased, and studies should be carried out for teachers' personal development." (P 42).*

*-"The teacher must have a spirit that trusts himself more, that he knows the right way, that he does not fail, that he does not oppress [...]"(P 10).*

*-"In the Press-Publication, positive examples of teachers should be included. Teachers should stop discussions on working hours and society should be aware that working hours should be different from public officials under the responsibility of the profession [...]" (P 26)*

### Discussion, Conclusion and Recommendations

This study aimed to display the views of teachers working in different schools and different branches on the status of the teaching profession, factors affecting the status of the profession and what can be done to increase the status of the profession.

All 54 teachers in this study asserted that the status of the teaching profession had changed negatively from past to present. Similar to the research result, in many studies

in literature, the teaching profession is represented as a low-status profession compared to other professions (Karaman, 2013; Unsal & Bagceci, 2016; Eurydice Report 2013). In the study conducted by TEDMEM (2014), teachers stated that the respectability of the profession has decreased. In the metaphor study of Yildiz & Unlu (2014), 41 of the 93 teachers emphasized that the teaching profession has lost esteem and has become insignificant.

In this study, when the factors affecting the status of the teaching profession are evaluated from the perspective of teachers, the ranking of the factors affecting them was found as; MEB-System, individual attitudes of teachers, social components, education faculties, and media and politicians which are considered to be effective at the same level.

In the research conducted by Karaman et al. (2013) regarding the status and esteem of the teaching profession, similar views on these research data were obtained. In Karaman et al.'s research, teachers stated that contrary explanations were made by MEB about teachers, unenthusiastic teacher characters in television series, teachers who cannot be assigned, teacher candidates who have negative attitudes, regulations that confront teachers and students, problems, such as low salaries affect the status and esteem of the profession negatively. The research also stated that the contradictory statements of policymakers and superior practitioners regarding the respectability, status, and quality of teachers caused the deterioration of social status against teachers. Eđitim-Bir-Sen (2004, p. 208) expressed 90.7% of teachers who think that MEB does not care enough for the teacher in the research they conducted. Lankford et al. (2014) evaluated the difficulties experienced in teachers' training as the reason for the relatively low status of the teaching profession, factors such as students' mid-level achievement in international examinations, lack of qualified documents and lack of teacher competence. Similar to the results of the research, Akyuz (2001) suggest that the economic return of the profession is vital in determining the status of the teaching profession, Cohen (2012) refers to the low level of teacher status as government intervention in programs, and standard methods discourage teachers' intellectual abilities and diminish their assurance and value. In the study, the lack of knowledge of teachers' rights and the lack of organization of teachers were among the factors affecting the status. Helvacı and Simsek (2008) discussed the importance of the existence of a professional organization founded by teachers as a way of protecting the interests of the teaching profession, individual rights, and respectability in society. Also, they suggested that occupations with strong organizations could be used to determine the political and economic decisions of society. Also, they suggested that occupations with strong organizations could be used to determine the political and economic decisions of society.

Celikten, Sanal and Yeni (2005) indicate that the reputation and status of the teaching profession in Turkish society are far behind compared to some other professions. In the research, when the teachers' point of view to increase the status of the teaching profession are evaluated, the fields that need to be improved most are MEB-System, attitudes of teachers, social structure and education faculties at the same level, politicians and media.



As in the world, it is observed that the role and value of the state and society given to the teacher are essential in determining the representation of teachers in Turkey (Unal, 2005). In addition, Karamustafaoglu and Ozmen (2004) stated that in order for teacher candidates and social value judgments to be developed positively, individuals should be concerned about the future of the teaching profession, and the university quotas should be shifted to more predominantly which required teaching profession branches and the graduates of related fields should be assigned to the task. Therefore, it can be said that Ozturk (2010) indicated that teachers' living standards should be improved and steps should be taken to increase their social status and reputation. Similar to the results of the research, it is possible to say that the teachers' recommendations regarding the improvement of working conditions of Habaci et al. (2013) are consistent with the findings of the research and that the professional job perception of the teachers improved they put forward as a result of the researches of Unsal and Bageci (2016) is correct. These suggestions are that to take the views and thoughts of the teacher in each study about education, to avoid the concept of keeping the teacher responsible for all problems related to education, not to take the students from outside the profession, to give up the concept of "parents are right in every issue" and to provide essential contributions to teacher candidates in the education faculties and teachers develop themselves continuously.

In the research on the improvement of teacher status, teachers perform their developmental tasks and manage the field is one of the most emphasized expressions. In the studies carried out by Abazaoglu, Yildirim and Yildizhan (2016), it is argued that teachers should be creative, thinking, criticizing, questioning, researching, and on the other hand, learning to learn, masterminds knowledge, and having full knowledge of technology and using technology. In addition to these, they stated that teachers need to be sensitive to the environment, continually improving themselves, understanding people and society, having problem-solving skills, using an active learning environment and contributing to the multi-faceted development of society.

In addition to the research findings, Atanur Baskan, Aydin and Madden (2006) mentioned that a continuous evaluation of the teacher education system, questioning the process and continual improvement should be made to train teachers equipped with access and use of information.

In the research, it was found that teachers in the individual category should be self-respecting, idealistic, and valuing their profession, to increase the status of the profession. Yilman (2006) explained this situation by emphasizing the importance of teacher candidates primarily in terms of their emotional integration with the teaching profession and then the importance of their beliefs, attitudes, values, and thoughts in shaping their future. In the research report prepared by TEDMEM (2014), the question of how the social perception and status of the teaching profession is strengthened, and similar to the results of the research, it is stated that teachers should actively participate in decision-making processes and consider their views in educational policies. On the other hand, in the selection process of the profession, specific criteria should be sought. Personal and professional competencies should be considered. Besides, similar to the research, Azar (2011, p. 38) considers pedagogic formation certificate training

programs as a factor that reduces the status of the way of teaching by neglecting the qualifications of the nominated teacher.

In this study, the contradictory statements of politicians, the media and managers were expressed as a factor that reduced the status of teachers, and therefore the careful consideration of this issue was included in the recommendations to increase the status. Ozoglu et al. (2013) in their research, they also mentioned the impacts of many issues, such as media, news, programs, and series, on the social status of teachers. In the statements made by politicians and policymakers on the prestige and status of teachers in public opinion, they expressed that they influenced the social status of teachers.

As a result of the National Teacher Strategy Workshop organized by MEB, "Teacher Strategy Document 2017-2023" was prepared. In this document, to improve the perception of the teaching profession and to strengthen the status of the profession, to improve the working conditions of teachers, to take remedial measures according to differences between institutions and regions, to develop career and the rewarding system is included. In addition, although the "2023 Educational Vision Document" has not been implemented, many innovative plans are mentioned, such as the adoption of the "teacher profession law" and the provision of regulations in favour of teachers in many fields, from the definition of the profession to the rights of the individual, and the promotion of the development of teachers at master's degree level.

Teachers, who are also an essential factor in social development, are expected to be successful in their fields, pedagogically adequate, idealistic and aware of the value of their profession. Teachers' perceptions of their profession can influence their views and behaviors in the profession (Kasapoglu, 2016). It can be said that the social perception of the teaching profession is an essential component in the formation of individual perceptions of teachers about their profession. Increasing the status of the teaching profession will affect teachers' perception of themselves and their profession and motivate teachers to develop themselves and do better. Therefore, it can be said that to increase the quality of education, to increase the professional passion of teachers, it is necessary to take the required steps to increase the status of the teaching profession and to produce educational policies in this direction.

As a result of this research, it may be suggested to conduct a broader range of research with different methods regarding the status levels of teachers. Also, decision-makers may be advised to take measures to improve their status by evaluating the factors affecting the status within scientific criteria. Since increasing the status of the teaching profession may increase the motivation of teachers, it may be suggested to investigate the factors affecting the status of the profession properly, to take precautions in this direction and to create educational policies.

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## Öğretmenlerin Bakış Açısıyla Öğretmenlik Mesleğinin Statüsü

### Atf:

Kasapoglu, H. (2020). Status of teaching profession from the perspective of the teachers. *Eurasian Journal of Educational Research*, 87, 119-136. DOI: 10.14689/ejer.2020.87.6

### Özet

*Problem Durumu:* Meslek kavramı toplum içinde ünvan kazanmamızı sağlama ve toplumdaki önemine bağlı olarak statüyü belirlemenin yanı sıra, bireylerin psikolojik doyumunu ve dolayısıyla yaşam kalitesini etkilemektedir. Öğretmenlik mesleği, toplumsal gelişmede önemi olan, alanında teknik bilgi ve beceri, özel uzmanlık isteyen, akademik donanım ve mesleki etkililik gerektiren profesyonel statüde bir meslektir. Bir mesleğe ilişkin toplumsal statü düzeyi ne kadar yüksekse o mesleğe ilişkin prestij algısı o kadar yüksek olabilir. Mesleğe ilişkin prestij algısı, kişilerin mesleklerine ilişkin tutum ve davranışlarının şekillenmesinde önemli bir rol oynar. Bir mesleğin statü derecesinin yüksek oluşu, o meslek işgörenlerinin mesleklerine bakış açısını değiştirebilmekte yükledikleri anlam ölçüsünde mesleki doyumlarını ve mesleğe bağlılıklarını artırabilmektedir. Öğretmenlik mesleğinin ülkenin sosyal, kültürel ve teknolojik gelişmişliği ile de ilgisi olduğu düşünüldüğünde öğretmenlerin statüsü ve çalışma koşulları ne kadar yükseltilirse, ülkenin gelişmişlik düzeyinin de o kadar yükseleceği söylenebilir. Bu yüzden eğitimde kalite arayışlarında toplumsal yapıda öğretmene gereken değerin verilmesi, statüsünün yükseltilmesi için öğretmenlik mesleğinin statüsünü etkileyen etmenler ve statüyü arttırmak için yapılabileceklerin öğretmenlerin bakış açısıyla irdelenmesi önem taşımaktadır.

*Araştırmanın Amacı:* Bu çalışmada öğretmenlik mesleğinin statüsünü etkileyen etmenleri ve mesleğin statüsünü arttırmak için yapılabilecekleri öğretmenlerin bakış açısıyla ortaya koymak hedeflenmiştir. Bu şekilde öğretmen gözüyle öğretmenlik mesleğinin statüsünü etkileyen etmenleri ortaya koyarak, statüyü arttırmak konusunda yapılabileceklerle ilişkin fikir vermek ve daha etkili ve verimli eğitim politikalarının üretilmesine katkı sağlamak hedeflenmektedir.

*Araştırmanın Yöntemi:* Araştırmada davranış ve inançlara ilişkin derinlemesine bilgi sağlayan nitel araştırma yöntemi kullanılmıştır. Olgu bilim deseninde tasarlanan çalışmada çalışma grubu değişik görüşlere yer verebilmek için maksimum çeşitlilik örnekleme temel alınarak seçilmiştir. Bu doğrultuda Trabzon ili merkez dahil 18 ilçeden ilkokul, ortaokul ve lise düzeyinde görev yapan gönüllü, rastgele seçilmiş birer öğretmen olmak üzere toplam 54 öğretmen araştırmaya katılmıştır. Çalışma grubunun seçiminde öncelikle her ilçede ilkokul, ortaokul, lise düzeyinde rastgele seçilen birer okul müdürüne, onlar aracılığı ile her okuldan bir tane gönüllü öğretmene ulaşılmıştır. Araştırmanın verileri 11 öğretmenle pilot uygulaması gerçekleştirilen, demografik bilgileri de içeren yarı yapılandırılmış görüşme formu ile toplanmıştır. Araştırma sonucunda elde edilen veriler içerik analizi yöntemiyle analiz edilmiştir. Bu süreçte ilk adım olarak veriler kodlanmış, daha sonra birbiriyle ilişkili kodlar bir araya getirilerek temalar oluşturulmuş, sonra da bu temalar açıklanmaya çalışılmıştır. Araştırmada iç

geçerliliği sağlamak için; öğretmenlerin öğretmenlik mesleğinin statüsüne ilişkin görüşleri kodlanmış ayrıca doğrudan alıntılarla kodlar desteklenmiştir. Bulguların anlamlılığı ve bütünlüğü araştırmacı tarafından sürekli test edilmiştir. Bulguların tutarlılığını sağlamak için temaları oluşturan kavramların kendi aralarında ve diğer temalarla tutarlılığı değerlendirilmiş ve anlamlı bir bütün oluşturup oluşturmadığı test edilmiştir. Dış geçerliliği sağlamak için; araştırma sürecinin detayları açıklanmıştır. Alanında uzman bir kişiden, araştırma deseninin belirlenmesinden, toplanan verilerin analizine ve sonuçların yazımına kadar olan süreçleri eleştirel bir gözle değerlendirmesi ve araştırmacıya dönüt vermesi istenmiştir. Ayrıca güvenilirliği sağlamak adına katılımcılara dair demografik özellikler tablo halinde sunulmuştur. Araştırmada temaların doğru sınıflandırıldığından emin olmak için literatürden ve 1 uzman görüşünden yararlanılmıştır. Uzman görüşünden elde edilen sonuç ile araştırmacının oluşturduğu tema ve altında yer alan maddeler karşılaştırılmıştır. Araştırmanın güvenilirliği (Güvenirlilik=görüş birliği/görüş birliği + görüş ayrılığı) büyüklüğü ve aralığı da dikkate alınmak koşuluyla, uzman ve araştırmacı değerlendirmeleri x100 kullanılarak hesaplanmıştır. Uzman görüş incelemesi sonucunda, öğretmenlik mesleğinin statüsünü etkileyen etmenler alt probleminde 5 madde, öğretmenlik mesleğinin statüsünün artırılması için yapılabilecekler alt probleminde ise 4 madde farklı çıkmış, bu araştırmaya özgü olarak gerçekleştirilen güvenilirlik çalışmasında sırasıyla, %85 ve %88 oranında bir uzlaşma (güvenirlilik) sağlanmıştır. Bulguların sunumunda temaları güçlendirmek adına katılımcıların özgün ifadelerine de yer verilmiştir.

*Araştırmanın Bulguları:* Öğretmenlere öğretmenlik mesleğinin statüsünün geçmişten bugüne hangi yönde değiştiği sorulduğunda Öğretmenlerin tamamı "azaldı" şeklinde görüş belirtmiştir. Öğretmenlerin "öğretmenlik mesleğinin statüsünü etkileyen etmenlere" ilişkin görüşleri incelendiğinde görüşler, MEB-sistem, toplum, öğretmenler, eğitim fakülteleri, medya ve siyasiler şeklinde sınıflandırılmıştır. Görüşlerin dağılımına bakıldığında MEB-sistem kategorisinde, izlenen politikalar-sistem en yüksek frekansa sahipken toplumsal alanda toplumda değer, itibar kaybı en yüksek ikinci frekansa sahip görüş olarak öne çıkmaktadır. Sonrasında en yüksek frekans sıralaması tekrar MEB-sistem kategorisinden düşük gelir, sistemce değersiz görülmeye, şımartılmış öğrenci profili, sistemin oluşturduğu veli profili, şeklinde devam etmektedir. Öğretmenlerin "Öğretmenlik mesleğinin statüsünü arttırmak için yapılabilecekler" ilişkin görüşleri" incelendiğinde ise görüşler, MEB-sistem, öğretmenler, toplum, eğitim fakülteleri, siyasiler ve medya kategorilerinde sınıflandırılmıştır. Görüşlerin dağılımına bakıldığında MEB-sistem kategorisinde görüşler, MEB öğretmene değer vermedir, öğretmenlerin çalışma ve özlük hakları iyileştirilmelidir şeklinde iken öğretmenler kategorisinde öğretmenler kendini geliştirmelidir görüşü takip etmektedir. Bu görüşleri MEB-sistem kategorisinde değişiklikler uzun süreli ve iyi yapılandırılmış olmalıdır, öğretmenler, veli ve öğrenci karşısında güçlü kılınmalı, değerlendirme sistemi hakça olmalıdır, öğretmen seçiminde nitelik ve başarı aranmalıdır şeklinde devam etmektedir.

*Araştırma sonuç ve önerileri:* Araştırmada katılımcıların tamamı literatürdeki görüşlere benzer şekilde öğretmenlik mesleğinin statüsünün geçmişten bugüne olumsuz yönde

değiştiğini belirtmiştir. Öğretmenlik mesleğinin statüsünü etkileyen etmenler öğretmenlerin bakış açısıyla değerlendirildiğinde, etkileyen unsurların sıralaması MEB-sistem, öğretmenlerin bireysel tutumları, toplumsal unsurlar, eğitim fakülteleri ve aynı düzeyde etkili olarak değerlendirilen medya ve siyasiler şeklinde bulunmuştur. Görüşlerin dağılımına bakıldığında izlenen politikalar-sistem en yüksek, toplumda değer, itibar kaybı ikinci en yüksek frekansa sahip görüş olarak öne çıkmaktadır. Düşük gelir, sistemce değersiz görülme, şımartılmış öğrenci profili, sistemin oluşturduğu veli profili, öğretmenlerin atanma problemleri, öğretmen kategorisinde öğretmenlerin kendini geliştirememesi, siyasiler kategorisinde siyasilerin olumsuz söylemleri görüşlerinde önemli bir yoğunluk olduğu söylenebilir. Araştırmada, öğretmenlik mesleğinin statüsünü arttırmak için yapılabilecekler öğretmenlerin bakış açısıyla değerlendirildiğinde, en çok düzeltilmesi gereken alanlar, MEB-sistem, öğretmenlerin tutumları, aynı düzeyde toplumsal yapı ve eğitim fakülteleri, siyasiler ve medya şeklinde sıralanmıştır. Görüşlerin dağılımına bakıldığında MEB-sistem kategorisinde, MEB öğretmene değer vermemelidir, öğretmenlerin çalışma ve özlük hakları iyileştirilmelidir şeklinde iken öğretmen kategorisinde öğretmenler kendini geliştirmelidir en yüksek frekansa sahip görüşler olarak öne çıkmaktadır. Uzun süreli ve yapılandırılmış değişiklikler yapmak, öğretmenleri veli ve öğrenciye karşı güçlendirmek, adil ödüllendirme, değerlendirme sistemi kurmak görüşleri de yüksek frekansa sahip görüşler olarak öne çıkmaktadır. Öğretmenlerin mesleklerine ilişkin bireysel algılarının oluşmasında öğretmenlik mesleğine ilişkin toplumsal algı önem taşır. Öğretmenlik mesleğinin statüsünün artırılması, öğretmenlerin kendilerine ve mesleklerine ilişkin algısını etkileyecek, öğretmenleri kendini geliştirme ve işini daha iyi yapma konusunda motive edebilecektir. Bu nedenle, eğitimde kaliteyi artırma ile ilgili yapılan düzenlemelerde öncelikle öğretmenlerin mesleki tutkusunu arttırmak için öğretmenlik mesleğinin statüsünü arttırmak adına gerekli adımların atılması ve bu yönde eğitim politikalarının üretilmesi gerektiği söylenebilir. Araştırma sonucunda öğretmenlerin statü düzeylerine ilişkin farklı yöntemlerle, daha geniş çaplı araştırmalar yapılması ve karar vericilerin statüyü etkileyen etkenleri bilimsel ölçütler içinde değerlendirerek statüyü artırıcı önlemler almaları önerilebilir.

*Anahtar Sözcükler:* Öğretmenlik mesleği, öğretmen statüsü, statü, öğretmenlerin bakış açısı, öğretmen





## Analysis of Human Performance in the Solution of Traveling Salesman Problem\*

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### ABSTRACT

**Purpose:** Traveling Salesman Problem (TSP) that can be extended and modified in various ways, is a practical and realistic type of problem and forms the basis for the visual and spatial solution of many optimization problems. In this study, 15, 25 and 35 nodes Travelling Salesman Problems were solved by secondary school, high school and undergraduate students in order to examine human performance in the solution of TSP. In addition to this assessment, whether gender and education level had an impact on the quality of the solution was analyzed.

**Research Methods:** The categorical comparisons of solutions, male-female, and educational level were examined with the help of nonparametric statistical methods. In addition, for the three levels of education, the Kruskal-Wallis Test was applied to determine whether the difference between the education levels was significant. On the other hand, the performance of human solutions was compared with the heuristic methods found in the literature.

**Findings:** As a result, it was seen that the gender difference was not statistically significant for all problems. On the other hand, it was determined that the education level had a significant effect on the solutions. It can be concluded for the given problems that the human solutions produced as good results as the solutions obtained with other heuristic methods in the literature.

**Implications for Research and Practice:** The findings of the study confirm previous studies. By examining the effect of the factors that affect optimization strategies, it is possible to produce human-based TSP heuristic solutions that surpass all existing heuristic algorithms.

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## Introduction

In the field of optimization, the performance of the developed methods is tested by solving classical and best-known problems. The Traveling Salesman Problem (TSP), one of the most studied optimization problems in the world, is an important classical optimization problem that is traditionally difficult to solve, although it seems to be a very simple problem (Jati, 2011, p. 393). In general, the main purpose of the problem is to find the shortest route for the salesman to visit a number of cities only once and return to the city where he lives. From a theoretical point of view, TSP is the problem of finding the shortest Hamilton cycle or round in an undirected finite network without multiple edges and cycles (Potvin, 1996, p. 339). This network is called  $G=(N, E)$  where the shortest Hamilton cycle is searched. In this network,  $N$  refers to a set of cities, and  $E$  refers to a set of paths that have a certain length that concatenates these cities (nodes) (Míča, 2015, p. 161). It consists of a network connection to each other of all nodes within the network. The aim is to find the shortest path to be followed while moving all the nodes back to the starting point.

After mathematical modeling by Dantzig et al. (1954), TSP has been an inspiration for modeling a number of integrated optimization problems such as order picking (Ratliff & Rosenthal, 1983), crew scheduling (Hoffman & Padberg, 1993), the assembly of printed circuit boards (Burke et al., 1999), path planning (Yu et al., 2002), and vehicle routing (Kim et al., 2010; Mazzeo & Irene, 2004) problems (Sahin & Karagül, 2019, p. 106). The time required for the most efficient algorithm to solve the TSP is an exponential function of the number of nodes in the problem. Therefore, it is one of the problems of NP-Hard class (Best & Simon, 2000, p.42). While small size problems can be solved easily with the help of analytical models, it is very difficult to solve large-scale problems within an acceptable period of time. With the Concorde software using the Lin-Kernighan-Helsgaun algorithm, it took 22 years to find the optimal results for Germany's 15.112 cities (Joines et al., 2017, p. 214).

In cases where the problem size is large, metaheuristic methods such as tabu search (Fiechter, 1994; Gendreau et al. 1998), genetic algorithm (Aytekin & Kalaycı, 2010; Chowdhury et al. 2013; Freisleben & Merz, 1996; Zhao et al. 2009), simulated annealing (Malek et al. 1989; Wang et al., 2013), ant colony optimization algorithm (Alaykırın & Engin, 2005; Dikmen et al. 2014; Montgomery & Randall, 2003; Mavrovouniotis & Yang, 2013; Stützle & Hoss, 1997), particle swarm optimization (Dorigo & Gambardella, 1997; Wang et al., 2003), harmony search (Karagül et al. 2016), fluid genetic algorithm (Şahin & Karagül, 2019), and kangaroo algorithm (Erdem & Keskindurk, 2010) are used as a solution method to solve the problem in acceptable times.

Optimization studies can also be used for the analysis of human abilities in the context of problem-solving. In addition, decision making, engine control, and detection can also be modeled as optimization tasks. It can be said that using optimization tasks can be an effective way of examining human cognition in general and problem-solving in particular. Insight problems can be seen as a special kind of non-routine problem in which the problem solver is not familiar with the solution procedure. Verbal, mathematical, and spatial types of insight problems are included

in the literature (Dow & Mayer, 2004, p.389). Another feature of the TSP is that it is a problem used for analyzing problem-solving performances of human subjects. From this point of view, it is obvious that the TSP can be used as a problem of spatial insight. Despite the computational complexity of TSP, previous studies show that human solvers produce near-optimal solutions for this problem within acceptable times (Dry & Fontaine, 2014, p. 84).

Macgregor and Ormerod (1996) found that human solvers found solutions better than other heuristics, and closer to the optimal for traveling salesman problems consisting of 10 and 20 cities. After this pioneering study, a lot of studies have been carried out in this field. Ormerod and Chronicle (1999) presented strong evidence that human TSP solution performance is based on global perceptual processing of the problem array. Best and Simon (2000) collected data by tracking the mouse and individual movements to analyze human performance in the solution of the TSP. The simulation and the data obtained suggest a solution method that includes a fast-global approximation followed by a local exact solution. Graham et al. (2000) compared the TSP solution performance of human subjects with heuristics methods and the solution performance of a new algorithm. The performance of the proposed new algorithm produced very similar results to the solution performance of the subjects.

Cutini et al. (2005) presented a computational model including the bottom-up and top-down effects, symbolizing human performance observed during the execution of a variant of the TSP task. Macgregor et al. (2006) compared the convex hull, the nearest neighbor and crossing avoidance heuristics and human performance in terms of path length, the overlap between solutions, and the number of crossings in solving open versions of the TSP. It is the convex hull method which shows the most similarity with the human solutions among the heuristic methods. Kong and Schunn (2007) investigated the relative role of global and local computing in solving the TSP. Within the scope of the study, an experiment was performed to measure the importance of global knowledge and possible constraints of global information processing in search. Haxhimusa et al. (2011) conducted two psychophysical experiments in which subjects solved TSP problems on the real and simulated ground, as well as a 3D volume. The results showed that the performance of the subjects and the performance on the computer screen were quite similar. Liew (2012) likened to social insect behavior and suggested convex layers to TSP based on the claim that the knowledge of uneducated people could help the TSP. In order to prove this idea, tour improvement algorithms were used in convex layers to find the most suitable tour for the 13-cities problem.

Blaser and Wilber (2012) compared the performance of the figural version of the TSP with navigation version of the same task. It was determined that there was no general difference in performance between figural and navigational task modes, as the number of nodes increased and performance decreased, while the NN strategy developed the most appropriate way. Dry et al. (2012) analyzed the spatial distribution factor of the human performance stimuli related to the TSP and the Minimum Spanning Tree Problem. The results of this study showed that the participants produced better quality solutions when the stimuli were highly clustered and highly regular. Dry and Fontaine (2014) presented participants with four different sets of TSP

stimulants with relative solution challenges and asked them to indicate which of the four stimuli they would prefer to solve. The results showed that easy-to-dissolve stimuli were chosen at a higher frequency than those that were difficult-to-solve. Kyritsis et al. (2018) developed the cost-functionality within the nearest neighbor algorithm for heuristic scanning based on human processing. The results obtained show that the relation between the node to node and the distance from node-to-center can be used to closely model the average human performance in a series of ETSP (Euclidean TSP) graphs.

When the studies conducted to date are examined, it is seen that the subjects are more interested in their mental characteristics and problem-solving abilities, and the effect of characteristics such as education level, age and gender on problem solving performance is not investigated. The problem addressed in the study is also used for the analysis of the mental performance of students. Three randomly generated TSP datasets with 15, 25 and 35 nodes were used to evaluate students' problem-solving performances at different educational level and gender situations and the results were statistically analyzed. The aim of the research was to find answers to the following questions:

1. Does gender have an impact on problem-solving skills?
2. Does the level of education have an impact on problem-solving skills?
3. Are human solutions as effective as other heuristics?

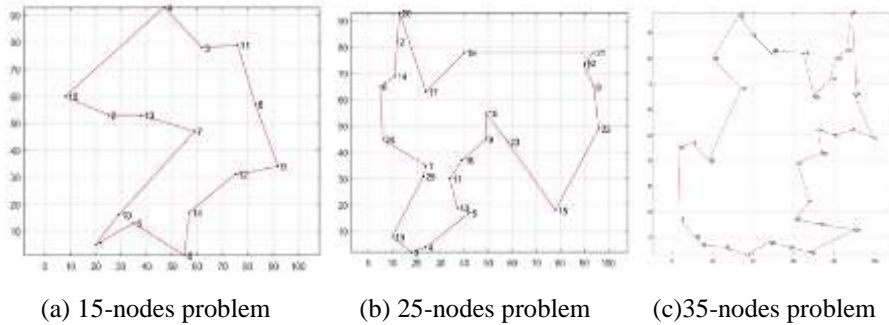
## Method

### *Research Design*

In this study, statistical comparisons were made with the data belonging to human solutions of TSP problems with 15, 25 and 35 nodes, respectively. The problems were solved by secondary school (SS), high school (HS), and undergraduate (UG) students. The categorical comparisons of solutions, male-female, and educational level were examined with the help of nonparametric statistical methods. The Mann-Whitney U test was used to determine whether the difference between genders was significant. In addition, for the three levels of education, the Kruskal-Wallis Test was applied to determine whether the difference between the education levels was significant.

### *Research Sample*

For the solution of the data sets used, a tool which shows the position of the nodes on the paper for three problems was preferred. The graphical views of the problems are shown in Figure 1. A total of 320 volunteer students who did not have any prior knowledge of the TSP gave valid answers to the problems. The distribution of genders was 164 males and 156 females and, details are shown in Table 1. In the studies conducted to date, data obtained from 81 subjects were used (Macgregor & Ormerod, 1996; Vickers et al. 2003 etc.).



**Figure 1:** Graphical Representation of Problems

**Table 1.**

*Distribution of Students by Gender and Education Level*

Gender	SS	HS	UG	Total
Female (F)	58	77	21	156
Male (M)	64	58	42	164
<b>Total</b>	122	135	63	

*Research Instruments and Procedures*

Three different TSP data sets were used in the study. The details of the problems used in the study are shown in Table 2 and Figure 1, respectively. The problems were designed as a network to enable students to respond to problem sets. Descriptive statistics related to the answers are shown in Table 3.

**Table 2.**

*Characteristics of Problems*

Problem	Number of nodes	Optimal solution
P1N15	15	340
P1N25	25	411
P1N35	35	462

Table 3.

*Descriptive Statistics of the Solutions*

Item	Pr.-Lev.-Gen.	Vars	n	mean	sd	median	trimmed	mad	min	max	range	skew	kurtosis	se
1	PIN15-HS-FM	1	77	374.52	69.57	350.00	358.71	13.34	340.00	780.00	440.00	3.78	16.25	7.93
2	PIN15-HS-M	1	58	394.45	84.79	363.00	378.35	34.10	340.00	780.00	440.00	3.25	11.90	11.13
3	PIN15-SS-FM	1	58	379.03	65.08	361.50	366.81	31.88	340.00	780.00	440.00	4.27	22.52	8.55
4	PIN15-SS-M	1	64	374.69	79.79	349.50	356.71	13.34	340.00	780.00	440.00	4.18	17.99	9.97
5	PIN15-UG-FM	1	21	389.14	99.38	348.00	366.29	11.86	340.00	780.00	440.00	2.90	8.48	21.69
6	PIN15-UG-M	1	42	363.26	69.05	346.50	349.32	9.64	340.00	780.00	440.00	5.25	28.64	10.65
7	PIN25-HS-FM	1	77	466.82	90.07	458.00	453.57	44.48	412.00	1170.00	758.00	6.22	45.39	10.26
8	PIN25-HS-M	1	58	479.03	112.58	454.50	457.27	41.51	411.00	1170.00	759.00	4.44	22.83	14.78
9	PIN25-SS-FM	1	58	665.59	329.22	477.00	639.33	80.06	411.00	1170.00	759.00	0.86	-1.25	43.23
10	PIN25-SS-M	1	64	705.17	340.29	477.50	684.23	69.68	416.00	1170.00	754.00	0.62	-1.61	42.54
11	PIN25-UG-FM	1	21	436.14	22.54	434.00	433.47	23.72	411.00	488.00	77.00	0.84	-0.53	4.92
12	PIN15-UG-M	1	39	440.28	22.90	436.00	438.27	25.20	412.00	503.00	91.00	0.75	-0.12	3.67
13	PIN35-HS-FM	1	77	553.52	177.74	512.00	521.57	34.10	462.00	1949.00	1487.00	6.40	46.54	20.26
14	PIN35-HS-M	1	58	566.93	198.85	522.00	532.10	48.93	462.00	1949.00	1487.00	5.86	37.37	26.11
15	PIN35-SS-FM	1	58	667.43	441.71	509.50	553.96	38.55	472.00	1949.00	1477.00	2.48	4.35	58.00
16	PIN35-SS-M	1	64	672.88	452.76	504.00	548.17	25.20	475.00	1949.00	1474.00	2.40	3.92	56.59
17	PIN35-UG-FM	1	20	502.20	37.85	491.00	495.50	17.05	462.00	611.00	149.00	1.56	1.54	8.46
18	PIN35-UG-M	1	40	502.28	38.37	487.00	494.81	18.53	466.00	630.00	164.00	1.67	2.14	6.07
19	PIN15-HS-FM	2	77	15.23	3.26	16.00	15.76	1.48	0.00	18.00	18.00	-3.92	15.72	0.37
20	PIN15-HS-M	2	58	16.14	1.36	16.00	16.25	1.48	11.00	18.00	7.00	-1.28	2.83	0.18
21	PIN15-SS-FM	2	58	12.17	1.77	12.00	12.33	0.00	0.00	14.00	14.00	-5.53	35.80	0.23
22	PIN15-SS-M	2	64	12.58	0.77	12.00	12.48	0.00	12.00	14.00	2.00	0.86	-0.82	0.10
23	PIN15-UG-FM	2	21	18.81	4.45	20.00	19.53	1.48	0.00	23.00	23.00	-3.54	12.32	0.97
24	PIN15-UG-M	2	42	21.02	4.41	20.00	21.15	2.97	0.00	29.00	29.00	-2.18	9.91	0.68
25	PIN25-HS-FM	2	77	15.23	3.26	16.00	15.76	1.48	0.00	18.00	18.00	-3.92	15.72	0.37
26	PIN25-HS-M	2	58	16.14	1.36	16.00	16.25	1.48	11.00	18.00	7.00	-1.28	2.83	0.18
27	PIN25-SS-FM	2	58	12.17	1.77	12.00	12.33	0.00	0.00	14.00	14.00	-5.53	35.80	0.23
28	PIN25-SS-M	2	64	12.58	0.77	12.00	12.48	0.00	12.00	14.00	2.00	0.86	-0.82	0.10
29	PIN25-UG-FM	2	21	18.81	4.45	20.00	19.53	1.48	0.00	23.00	23.00	-3.54	12.32	0.97
30	PIN25-UG-M	2	39	20.82	4.48	20.00	20.97	2.97	0.00	29.00	29.00	-2.16	9.62	0.72
31	PIN35-HS-FM	2	77	15.23	3.26	16.00	15.76	1.48	0.00	18.00	18.00	-3.92	15.72	0.37
32	PIN35-HS-M	2	58	16.14	1.36	16.00	16.25	1.48	11.00	18.00	7.00	-1.28	2.83	0.18
33	PIN35-SS-FM	2	58	12.17	1.77	12.00	12.33	0.00	0.00	14.00	14.00	-5.53	35.80	0.23
34	PIN35-SS-M	2	64	12.58	0.77	12.00	12.48	0.00	12.00	14.00	2.00	0.86	-0.82	0.10
35	PIN35-UG-FM	2	20	19.75	1.12	20.00	19.56	1.48	18.00	23.00	5.00	1.33	1.77	0.25
36	PIN35-UG-M	2	40	20.95	4.50	20.00	21.06	2.97	0.00	29.00	29.00	-2.12	9.40	0.71

Because, as can be seen from the Figure 2, the distributions of the solution times are skewed to the right. This creates a problem of not being suitable for normal distribution. Therefore, it will not be possible to test the results with parametric hypothesis tests. For this reason, nonparametric hypothesis tests were used for testing hypotheses. In non-parametric hypothesis tests, the mass parameters to be tested do not have to conform to a distribution but are assumed to be distributed continuously. In addition, these methods allow easy calculation and fast results. In the statistical analyzes, R-Project program was performed with "psych" package. Histogram graphs were generated using the "ggplot2" package.

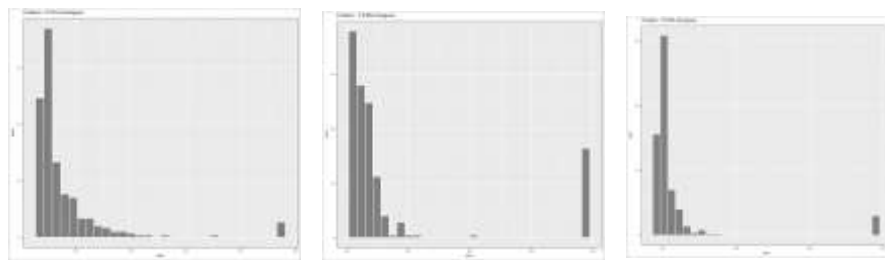


Figure 2: Solutions of Students (by Gender)

## Results

### Differences between Genders

The first analysis was performed on the basis of genders. The data do not conform to the normal distribution. For this reason, the non-parametric Mann-Whitney-Wilcoxon Test was used for the analysis. The hypothesis and the alternative hypothesis are as follows;

$H_0$ : The difference between the genders is not important.

$H_a$ : The difference between the genders is important

The results of the test are shown in Table 4. The level of education was not taken into account when analyzing by gender for this test. According to the analysis without considering the level of education, it is seen that gender has no effect on the quality of the solution.

Table 4.

Test Statistics by Gender

Problem	W.stat	p.Value	Results
P1N15	12581	0.79855	$H_0$ cannot be rejected.
P1N25	13145.5	0.47128	$H_0$ cannot be rejected.
P1N35	12404.5	0.85408	$H_0$ cannot be rejected.

*Comparison of Genders on the Basis of Education Level*

For each education level, the average of the gender-based solution was compared separately. For these comparisons, the training groups were tested with the Mann-Whitney U Test. The following hypothesis was used to test whether there is a gender difference for each level of education.

$H_0$ : The difference between the genders for each level of education is not significant.

$H_a$ : The difference between the genders for each level of education is significant.

**Table 5.**

*Test Statistics Based on Educational Level*

Level	Problem	W.stat	p.Value	Results
<b>Secondary School</b>	P1N15	1614	0.21473	$H_0$ cannot be rejected.
	P1N25	2028	0.37131	$H_0$ cannot be rejected.
	P1N35	1859	0.98977	$H_0$ cannot be rejected.
<b>High School</b>	P1N15	2724	0.02891	$H_0$ can be rejected.
	P1N25	2268.5	0.87635	$H_0$ cannot be rejected.
	P1N35	2494.5	0.24588	$H_0$ cannot be rejected.
<b>Undergraduate</b>	P1N15	389	0.44672	$H_0$ cannot be rejected.
	P1N25	465.5	0.3891	$H_0$ cannot be rejected.
	P1N35	386	0.83224	$H_0$ cannot be rejected.

When the results in Table 5 are analyzed, it is seen that gender had no effect on the solution for middle school and undergraduate students. On the other hand, it can be mentioned that there was an effect of gender at the high school level for only 15 node TSP. The details of the solutions' statistical analysis results for each level of education are presented in Table 6. For instance, as a result of the solutions made with the P1N15 data set, the average solution of males was 374.7 and the average of the women was 379.



**Table 6.**  
 Detail of the Statistics for Each Educational Level

Level	Groups	n	mean	sd	median	trimmed	mad	min	max	range	skew	kurtosis	se
Secondary School	P1N15 (M)	64	374.7	79.79	349.5	356.71	13.3	340	780	440	4.18	17.99	9.97
	P1N15 (F)	58	379.0	65.08	361.5	366.81	31.9	340	780	440	4.27	22.52	8.55
	P1N25 (M)	64	705.2	340.3	477.5	684.23	69.7	416	1170	754	0.62	-1.61	42.5
	P1N25 (F)	58	665.6	329.2	477	639.33	80.1	411	1170	759	0.86	-1.25	43.2
	P1N35 (M)	64	672.9	452.8	504	548.17	25.2	475	1949	1474	2.4	3.92	56.6
	P1N35 (F)	58	667.4	441.7	509.5	553.96	38.6	472	1949	1477	2.48	4.35	58
High School	P1N15 (M)	58	394.5	84.79	363	378.35	34.1	340	780	440	3.25	11.9	11.1
	P1N15 (FM)	77	374.5	69.57	350	358.71	13.3	340	780	440	3.78	16.25	7.93
	P1N25 (M)	58	479.0	112.6	454.5	457.27	41.5	411	1170	759	4.44	22.83	14.8
	P1N25 (FM)	77	466.8	90.07	458	453.57	44.5	412	1170	758	6.22	45.39	10.3
	P1N35 (M)	58	566.9	198.9	522	532.1	48.9	462	1949	1487	5.86	37.37	26.1
	P1N35 (FM)	77	553.5	177.7	512	521.57	34.1	462	1949	1487	6.4	46.54	20.3
Undergraduate	P1N15 (M)	42	363.3	69.05	346.5	349.32	9.64	340	780	440	5.25	28.64	10.7
	P1N15 (FM)	21	389.1	99.38	348	366.29	11.9	340	780	440	2.9	8.48	21.7
	P1N25 (M)	39	440.3	22.9	436	438.27	25.2	412	503	91	0.75	-0.12	3.67
	P1N25 (FM)	21	436.1	22.54	434	433.47	23.7	411	488	77	0.84	-0.53	4.92
	P1N35 (M)	40	502.3	38.37	487	494.81	18.5	466	630	164	1.67	2.14	6.07
	P1N35 (FM)	20	502.2	37.85	491	495.5	17.1	462	611	149	1.56	1.54	8.46

Another analysis of the solutions obtained relates to the amount of deviation from the optimal solution values. Table 7 shows the deviation values for all problems. The deviation amounts were divided into 4 groups. For example, when the solutions of the secondary school students were examined for the first data set, it was found that 54.1% of the answers deviated from 0% to 5% of the optimal solution. The deviation values in the table are summarized in Figure 4. As can be seen from the table and figure, undergraduate students found the solution with the smallest deviation from the optimal.

**Table 7.**  
 Deviation of the Solutions from the Optimal Solution

Problem	Education level	0%-5%	5%-10%	10%-15%	>15%
P1N15	Secondary School (SS)	54.10%	16.40%	9.00%	20.50%
P1N15	High School (HS)	54.80%	14.80%	3.70%	26.70%
P1N15	Undergraduate (UG)	71.40%	6.30%	7.90%	14.30%
P1N25	Secondary School	20.50%	10.70%	16.40%	52.50%
P1N25	High School	31.10%	14.10%	23.70%	31.10%
P1N25	Undergraduate	46.70%	25.00%	21.70%	6.70%
P1N35	Secondary School	18.00%	36.90%	14.80%	30.30%
P1N35	High School	15.60%	28.10%	18.50%	37.80%
P1N35	Undergraduate	46.70%	28.30%	8.30%	16.70%

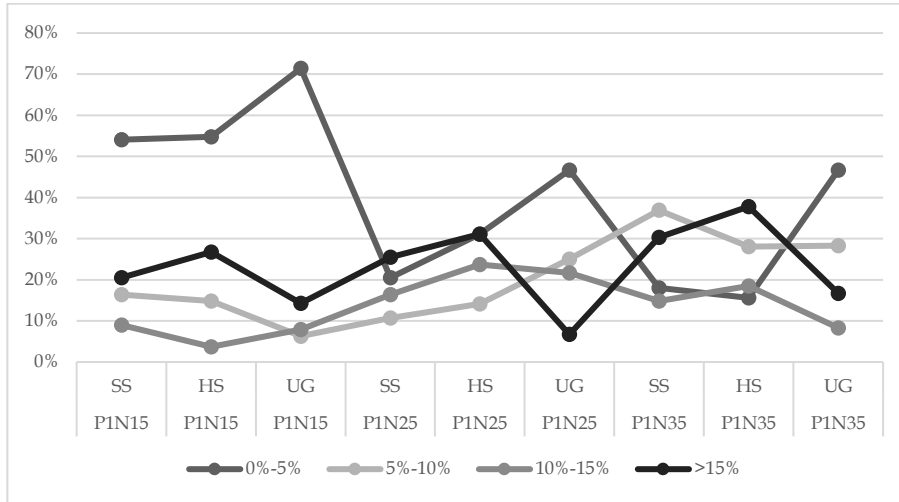


Figure 3: Comparing the Solutions According to the Level of Education and Gender

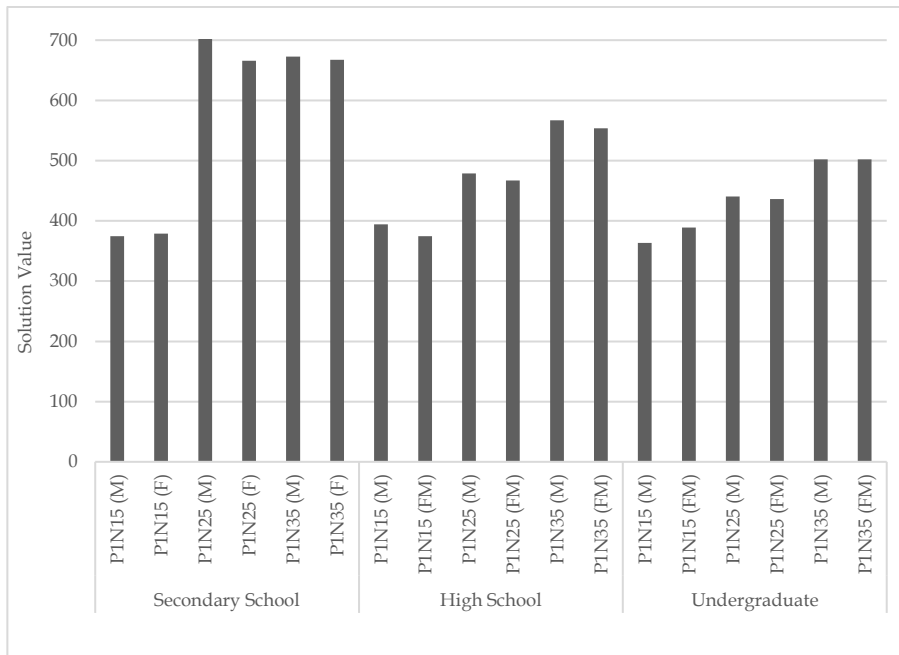


Figure 4: Solutions of Students (by Gender)

*Analysis of the Difference between Education Groups*

In this section, the effect of education level on the quality of solutions was analyzed. The hypothesis that the level of education has no effect on the quality of the

solution has been tested with the Kruskal-Wallis test. Kruskal-Wallis test was used for non-parametric statistical methods to control the significance of the difference between the education groups. Accordingly, it was concluded that the difference between education levels was significant. The test statistics are shown in Table 8.

**Table 8.**  
*Test Results*

Problem	Chisq	Df	p.value	Result
P1N15	9.12	2	0.01	H <sub>0</sub> can be rejected.
P1N25	45.14	2	0.00	H <sub>0</sub> can be rejected.
P1N35	23.36	2	0.00	H <sub>0</sub> can be rejected.

The significance level of the difference between education levels is shown in Table 9. As can be seen from Table 9, it was determined that there was no difference between the solutions of secondary and high school students in terms of education level for all problems, and the difference between the educational level of the undergraduate and the other education levels was significant.

**Table 9.**  
*Significance Level of the Difference between Levels of Education*

Problem	Level	High School	Secondary School
P1N15	Secondary School	0.7616	-
	Undergraduate	0.0116	0.0646
P1N25	Secondary School	0.0000	-
	Undergraduate	0.0095	0.0000
P1N35	Secondary School	0.6049	-
	Undergraduate	0.0000	0.0005

*The Comparison of Human Performance with Different Heuristics*

In this section, the human solutions obtained are compared with the solutions obtained with the heuristic methods in the literature. For the comparison, the Convex Hull Insertion (CHI), the Nearest Neighbor (NN) and the Space-Filling Curve (SFC) methods were used. For the nearest Neighbor heuristic, two different approaches were used, where the beginning node was the first node (NN-1) and any node (NN-any). Logistics Engineering Matlab Toolbox (Kay, 2014) is used for these methods. Solutions obtained by heuristic methods and human solutions according to educational level are shown in Table 10.

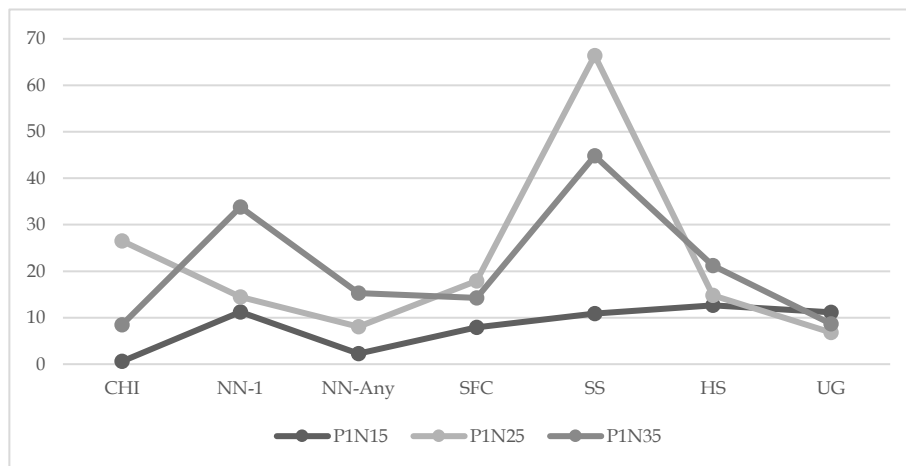
**Table 10.**  
*Comparison of Human Solutions with Heuristic Algorithms*

Data Set	Heuristic Methods					Average Solution Values		
	Optimal	CHI	NN-1	NN-Any	SFC	SS	HS	UG
P1N15	340	342.0	378.1	347.7	366.9	377	383	378
P1N25	411	519.9	470.5	444.2	484.6	684	472	439
P1N35	462	501.2	618.1	532.6	528.0	669	560	502

The deviations of the solution values from the optimal solution are shown in Table 11 and Figure 5. When the average deviation values were examined, it was seen that the deviation of the solutions provided by undergraduate students was lower than other students and heuristic methods. The highest deviation occurred in middle school students' solutions.

**Table 11.**  
*Deviation of the Solutions*

Data Set	CHI	NN-1	NN-Any	SFC	SS	HS	UG
P1N15	0.60	11.20	2.26	7.93	10.88	12.65	11.18
P1N25	26.50	14.47	8.07	17.90	66.42	14,84	6.81
P1N35	8.48	33.79	15.29	14.29	44.81	21.21	8.66
<b>Average</b>	11.86	19.82	8.54	13.37	40.70	16.23	8.88



**Figure 5:** Deviation of the Solutions

### Discussion, Conclusion and Recommendations

The analysis of human performance in the solution of optimization problems is a subject of intense interest from academics who have been working in the field of psychology over the past twenty-five years. The assessments prove that human subjects can produce good solutions even if they did not receive any training on the problem previously addressed, as in this study. However, the increase in the problem size leads to a decrease in the solution performance. At this point, although the solution performance decreases, the ability to produce good solutions to such a problem which is a very alternative solution in a short time shows that human beings have sufficient mental infrastructure for solving complex problems. From this point of view, the use of insight problems to explore human abilities and conduct research on cognitive processes will become more common.

The main purpose of this study was to analyze human performance in the solution of TSP problems. In previous studies (Mcgregor & Ormerod, 1996; Vickers et al., 2003 *etc.*), a small number of subjects were generally chosen among university students and did not evaluate whether different educational levels and gender had any effect on the solution. In this study, the effect of education level and gender was examined using the data of 320 subjects. From this point of view, analysis and comparisons were made for 4 different situations. First, it was evaluated whether the gender had an impact on the quality of the solution, regardless of the level of education. As a result of the non-parametric Mann-Whitney-Wilcoxon test which is applied because human solutions did not show a normal distribution, it has been determined that gender has no effect on solution performance (see Table 4). The second analysis was made to determine whether gender had an impact when considering the education levels. As a result of the analysis, it was determined that gender had an effect only among high school students for P1N15 data set and no such effect for others (See Table 5). The third comparison was made between educational levels. While there was no significant difference between the solutions of middle and high school students, the solutions of university students varied. It was concluded that the level of education affected the quality of the solution. The latest comparison was made between the solutions of heuristic methods in the literature and human solutions. The Convex Hull Insertion, the Nearest Neighbor (NN-1 and NN-Any) and the Space-Filling Curve methods were coded using Matlog Tool Box. The nearest neighbor was used in two different ways. The first version used was the NN-1 method, which started with the first node. The second version was the NN-Any method, which started from different nodes and provided the best solution as the final solution. When the average deviation from the optimal solution was examined, it was determined that university students produced very good solutions. These results also confirm the results of previous studies (Best & Simon, 2000; Haximusa et al. 2011; Macgregor & Ormerod, 1996; Ormerod & Chronicle, 1999; *etc.*). It is seen that human subjects are quite good at solving the traveling salesman problem. The ability of human subjects to solve the networked GSP is not affected by gender, but by education level. As the number of nodes increases, the impact of education on solution performance becomes more pronounced.

The present study was the first study conducted in Turkey in the relevant field. On the other hand, more subjects were studied compared to the previous studies. In future studies, it is considered that different insight problems can be applied to people for different gender and education level, and moreover, different school types can be included in the study. Developing healthy policies for the education system of the country can be ensured through the expansion of educational research. It is considered that these and similar studies can provide data that can guide education.

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## Gezgin Satıcı Probleminin Çözümünde İnsan Performansının Analizi

### Atf:

Karagul, K., Sahin, Y., Guner, N., & Oral, A. (2020). Analysis of human performance in the solution of traveling salesman problem. *Eurasian Journal of Educational Research*, 87, 137-156. DOI: 10.14689/ejer.2020.87.7

### Özet

*Problem Durumu:* Gezgin Satıcı Sorunu (GSP), bir dizi şehri ziyaret edecek satıcı tarafından kullanılacak en kısa rotayı belirleyen bir en uygun şekle sokma problemidir. Çeşitli şekillerde genişletilip değiştirilebilen GSP, pratik ve gerçekçi bir problem türü olmakla beraber birçok optimizasyon probleminin görsel ve mekânsal çözümünün temelini oluşturur. Optimizasyon alanında yoğun olarak çalışılan GSP insan yeteneklerinin problem çözüme bağlamında analizi için de kullanılmaktadır. Diğer taraftan bu problem, karar verme, motor kontrolü ve algılama çalışmaları için de içgörü (insight) problemi olarak modellenmektedir. İçgörü problemleri, problem çözücünün çözüm prosedürüne aşina olmadığı özel ve rutin olmayan problemlerdir. Literatürde sözlü, matematiksel ve mekânsal içgörü problemlerinin kullanıldığı çalışmalar mevcuttur. Çalışma kapsamında deneklerin çözmesi istenen GSP insan deneklerin problem çözüme performanslarını analiz etmek için kullanılan bir problemdir. Bu açıdan GSP'nin mekânsal bir içgörü problemi olarak kullanılabilmesi aşikârdır. GSP'nin hesaplama karmaşıklığına rağmen, önceki çalışmalar insan çözücülerin kabul edilebilir zamanlarda bu sorun için en uygun çözümlere yakın olduklarını göstermektedir (Dry ve Fontaine, 2014, s.84).

*Araştırmanın Amacı:* Çalışma kapsamında üç soruya cevap aranmaktadır. Birinci aşamada, eğitim seviyesi dikkate alınmadan cinsiyetin problem çözüme performansına bir etkisinin olup olmadığı araştırılmıştır. İkinci aşamada ise öğrencinin eğitim seviyesinin elde edilen çözüme etki edip etmediği analiz edilmiştir. Son olarak ise insan çözümlerinin bilimsel yazında bulunan ve GSP'nin çözümünde kullanılan sezgisel yöntemlerin çözümlerine kıyasla en iyi çözüme ne derece yaklaştığı belirlenmeye çalışılmıştır.

*Araştırmanın Yöntemi:* Çalışma kapsamında istatistiksel yöntemler ile sezgisel yöntemler kullanılmaktadır. İlk olarak farklı eğitim seviyelerinde bulunan öğrencilere 15, 25 ve 35 düğümlü GSP ağ şeklinde ifade edilerek çözümleri istenmiştir. Öğrencilerden alınan cevaplar kullanılarak eğitim seviyesinin ve cinsiyetin çözüm performansına etkisini analiz etmek için parametrik olmayan Mann-Whitney-Wilcoxon ve Mann-Whitney-U testleri kullanılmıştır. Elde edilen insan çözümlerinin kalitesinin belirlenebilmesi için sezgisel yöntemlerle elde edilen çözümler kullanılmıştır. GSP'nin çözümü için bilimsel yazında birçok sezgisel ve metasezgisel yöntem olmakla birlik, çalışma kapsamında Dış Bükey Örtü Ekleme (Convex Hull Insertion), En Yakın Komşu ve Uzay Doldurma Eğrisi (Space Filling Curve) yöntemleri ile 15, 25 ve 35 düğümlü problemler çözülmüştür.

*Araştırmanın Bulguları:* Çalışmanın ana amacı GSP'nin çözümünde insan performansının analiz edilmesidir. Bu noktadan hareketle 4 farklı durum için analiz

ve karşılaştırmalar yapılmıştır. İlk aşamada eğitim seviyesi ve cinsiyet farkının çözüm kalitesi üzerinde bir etkisinin olup olmadığı analiz edilmiştir. İnsan çözümlerinin normal dağılım göstermemesi nedeniyle parametrik olmayan Mann-Whitney-Wilcoxon testi uygulanmış ve eğitim seviyesi dikkate alınmadığı durumda cinsiyetin çözüm kalitesi üzerinde anlamlı bir etkiye sahip olmadığı sonucuna ulaşılmıştır (bakınız Tablo 4). İkinci durumda ise cinsiyetin etkisi eğitim seviyesi dikkate alınarak analiz edilmiş ve cinsiyetin sadece lise düzeyindeki öğrencilerin çözümleri üzerinde P1N15 veri seti için etkili olduğu, diğer veri setleri ve eğitim seviyeleri için herhangi bir etkisinin olmadığı belirlenmiştir (bakınız Tablo 5). Üçüncü analiz sadece eğitim seviyeleri dikkate alınarak yapılmış ve üniversite öğrencilerinin yapmış oldukları çözümlerin ortaokul ve lise seviyesindeki öğrencilere kıyasla anlamlı düzeyde farklılık gösterdiği belirlenmiştir. Buna göre eğitim seviyesi çözüm kalitesine etki etmektedir. Nihai ve son karşılaştırma ise sezgisel yöntemlerle elde edilen çözümler ve insan çözümleri arasında gerçekleştirilmiştir. Çalışma kapsamında kullanılan problemler Matlog Araç Kutusu (Kay, 2014) yardımıyla Dış Bükey Örtü Ekleme, En Yakın Komşu ve Uzay Doldurma Eğrisi yöntemleri ile çözülmüş ve elde edilen sonuçlar insan çözümleri ile kıyaslanmıştır. En Yakın Komşu yöntemi iki farklı versiyon olarak çalışmaya dahil edilmiştir. İlk versiyonda (NN-1) çözüme birinci düğümden başlanırken diğerinde (NN-Any) herhangi bir düğümden çözüme başlanabilmektedir. Her bir problem için optimal çözümden sapma değerlerinin ortalamaları dikkate alındığında lisans öğrencilerinin çözümlerinin oldukça iyi olduğu görülmektedir.

*Araştırmanın Sonuçları ve Öneriler:* Optimizasyon problemlerinin çözümünde insan performansının analizi, geçtiğimiz yirmi beş yıllık dönemde psikoloji alanında çalışmalar yapan akademisyenlerin yoğun şekilde ilgisi çeken bir konudur. Yapılan değerlendirmeler, bu çalışmada olduğu gibi daha önceden ele alınan problem ile ilgili bir eğitim almamış olsa bile insan deneklerin iyi çözümler üretebildiğini kanıtlar niteliktedir. Macgregor ve Ormerod (1996) tarafından yapılan ve 10 ile 20 düğümden oluşan problemde insan denekler iyi çözümler üretebilmiştir. Ancak yapılan bu çalışmada olduğu gibi problem boyutunun büyümesi çözüm performansında azalmayı da beraberinde getirmektedir. Bu noktada, böyle bir probleme kısa sürelerde iyi çözümler üretebilmesi insanoğlunun karmaşık problemlerin çözümünde yeterli zihinsel alt yapıya sahip olduğunu göstermektedir. Bu açıdan bakıldığında, insan yeteneklerini keşfetmek, bilişsel süreçlere ilişkin araştırmalar yapmak için içgörü problemlerinin kullanımı daha da yaygın hale gelecektir.

Yapılan kıyaslamalar neticesinde elde edilen sonuçlar geçmiş yıllarda yapılan çalışmaları (Macgregor ve Ormerod, 1996; Ormerod ve Chronicle, 1999; Best and Simon, 2000) doğrulamaktadır. İnsan deneklerin ağ şeklinde gösterilmiş GSP'yi çözme becerileri cinsiyetten etkilenmemekle beraber eğitim seviyesinden etkilenmektedir. Sunulan çalışma ilgili alanda Türkiye'de yapılan ilk çalışmadır. Gelecekte yapılacak çalışmalarda farklı içgörü problemlerinin de benzer şekilde farklı cinsiyet ve eğitim seviyesindeki kişilere uygulanabileceği, dahası farklı okul türlerinin çalışmaya dâhil edilebileceği değerlendirilmektedir.

*Anahtar Sözcükler:* Problem çözme, optimizasyon, bilişsel araştırmalar





## The Factors Predicting Pre-Service Teachers' Achievement in Teacher Training Classrooms

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### ABSTRACT

**Purpose:** This study aimed to predict the achievement of pre-service teachers majoring in education through some learner characteristics like gender, self-directed learning readiness dimensions, and course context (being in the flipped learning class and traditional teaching classes). **Research Methods:** This study employed a relational survey research design and involved 271 pre-service teachers who were selected according to the purposive sampling method. Data were collected by implementing an achievement test and Self-directed Learning Readiness Scale and analyzed through the Hierarchical Multiple Linear Regression procedure..

**Findings** The findings of the study showed that in the first model, gender and desire for learning predicted the achievement of pre-service teachers. The second model revealed that being in a flipped learning class predicted the academic achievement of pre-service teachers than being in any other classes taught according to traditional teaching principles

**Implications for Research and Practice:** It is suggested that pre-service teachers are provided with opportunities to apply what they have learned theoretically. Also, it may be suggested that instructors include various computer applications, software, games, and videos from YouTube to increase the pre-service teachers' desire to learn. Lastly, for further studies, it may be suggested to include different variables in predicting the achievement of pre-service teachers.

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## Introduction

Pre-service teacher training needs to be abreast with the demands of the twenty-first century. Due to the swift changes in social, political, and technological areas, most of the knowledge taught in schools becomes invalid in a very short time (Kreber, 1998). In this information age, it is important to select appropriate information among ever-increasing knowledge stack, decide appropriate strategies, and be able to manage the learning process. Moreover, politicians, administrators, employers, and concerned people or groups attribute more value to instruction conducted in higher education institutions and want to have clear evidence that students are learning actually (Berrett, 2012; Ziegelmeier & Topaz, 2015). Hence, investigating different instructional theories, methods, and procedures was seen as essential to detect better and permanent learning ways. With this in mind, universities make changes in terms of instructional materials and ways of teaching by addressing their students' needs (Maycock, Lambert & Bane, 2018). It was suggested that teaching methods for these students should shift from direct instruction and lecturing which results in surface learning to meaningful, cross-disciplinary and real life-related knowledge which results in deep learning through constructive active learning strategies by (Abeysekera & Dawson, 2015; Bergman & Sams, 2012; Phillips & Trainor, 2014).

In addition to these, many countries give special attention to courses involving technology in the training of pre-service teachers because they are the individuals who will educate students having different learning styles, motivation, and pre-requisite knowledge to be able to survive in modern society as being reflective, critical, self-directed learners and good at the use of technology. In this sense, flipped learning was proposed as an active teaching-learning approach to meet the learning needs of next-generation students (Baughman, Hassall & Xu, 2019; Castedo, Lopez, Chiquito, Navarro, Cabrera & Ortega, 2019; Maycock, Lambert & Bane, 2018; Ziegelmeier & Topaz, 2015).

### *Literature review*

Flipped learning requires teachers to move lecture part of teaching out of class and students complete pre-class activities individually at home in order to benefit from in-class tasks efficiently, and conduct activities involving discussions, case studies, problems and group work in class (Abeysekera & Dawson, 2015; Bergman & Sams, 2012; Castedo et al., 2019; Hao, 2016; Mason, Shuman & Cook, 2013; Maycock, 2019; Merlin-Knoblich & Camp, 2018; Shyr & Chen, 2017).

Flipped learning individualizes the instruction (Hamdan, McKnight, McKnight & Arfstrom, 2013), gives students the control of their learning (Hao, 2016) and the opportunity to manage their learning speed (Davies, Dean & Ball, 2013). While quick learners can move faster while watching the videos, slow learners can watch it over and over as needed until the concepts become clear (Fulton, 2012; Khanova, Roth, Rodgers & McLaughlin, 2015). In addition, learning with videos provides pre-service teachers with access to the course content independent of the space. Flipped learning is also useful for students who have enrolled in other courses and are absent from class (Bergmann & Sams, 2012; Enfield, 2013; Fulton, 2012; Lage Platt & Treglia, 2000). In

this way, they get the opportunity to compensate the courses by themselves. Foertsch, Moses, Strikwerda and Litzkow (2002) stated that in flipped learning, engineering students were able to watch video lectures at a time that was most conducive to their learning and best met their schedule. In this way, students could enjoy watching difficult content whenever they were more attentive and focused. Furthermore, flipped learning is proper to teach course material with different teaching methods and involve students with various learning styles (Lage et al., 2000; Mason et al., 2013). Similarly, Zappe, Leicht, Messner, Litzinger and Lee (2009) stated that flipped learning may be beneficial for students who learn in different ways like visual, audial, verbal, active, or reflective. In other words, learners control when, where, and how they want to learn the content, which leads to a stronger sense of autonomy (Castedo et al., 2019; Kim & Choi, 2018). Because of these benefits of flipped learning it was revealed that students obtained higher achievement scores and improved their learning in different undergraduate courses when they learned according to principles of flipped learning including human-computer interaction (Day & Foley, 2006), statistics (Wilson, 2013), introductory excel (Davies et al, 2013), mathematics (Fulton, 2012), and mechanical engineering program (Mason et al., 2013).

The pre-class activities part of flipped learning requires self-directed learning (SDL) skills of learners because of managing their time and learning process (Kim, Park & Joo, 2014). Knowles (1975) defined SDL as an active process where learners attempt to diagnose their own learning needs, decide appropriate learning goals, and identify resources for learning which may either human or material, choose and implement appropriate learning strategies, and evaluate learning outcomes. Guglielmino (1977) indicated the presence of properties for SDL as taking responsibility for one's learning, openness to learning opportunities, love of learning, being attentive and autonomous in the learning process and ability to use basic study and problem-solving skills. Khat (2015) added some other properties of SDL such as goal setting, time, procrastination management, assignment preparation, note-taking, reports, and paper writing and research capability, technical and online class readiness, and stress management.

The extent to which students make decisions about learning needs, content, methods, resources, pace, and assessment determines their degree of self-directedness (Corbeil, 2003; Zainuddin & Perera, 2018). With the advent of instruction through distance learning, hybrid and flipped learning, self-directed learning readiness (SDLR) gains recognition as a critical attribute (Corbeil, 2003). For instance, Altuger-Genc, Genc and Tatoglu (2017) stated that taking part in multidisciplinary projects such as coding and robotics requires the existence of self-directed learning which is especially important to improve the knowledge of students on their own and by asking the help of experts. Acquiring SDLR skill is so important in the educational process when instructors integrate information and communication technologies into the learning process intending to create student-centered educational environments.

In the literature, the results of many studies revealed a significant, positive relationship between students' self-directed learning abilities and their academic performances (Chou, 2012a; Chou, 2012b; Corbeil, 2003; John & Michael, 2018; Khat,

2015; Lai, 2011; Lai & Hwang, 2016; Kim, Park & Joo, 2014). On the other hand, Kim and Choi (2018) grouped students according to their SDLR scores as high and low SDLR group. They found a significantly higher completion rate in the high SDLR group; however, the high SDLR group and the low SDLR group did not differ significantly in their final exam scores. Similarly, although the result of the study conducted by Chou (2012a) revealed a positive correlation between engineering students' SDL abilities and online learning performances, engineering students with high and low SDLR did not differ significantly in gaining factual, conceptual, and principle/rule knowledge. Hence, one of the aims of this study was to investigate whether the SDLR of pre-service teachers predicted their achievement in flipped and traditional classroom environments.

O'Kell (1988) matched the type of instruction with SDLR levels and concluded that students who scored low in the SDLR scale preferred more teacher-led discussions, demonstrations, and lectures rather than projects and case studies. Hao (2016) found that students with lower SDLR have difficulty in catching up with the flipped class and thought that the job of instructors was to lecture, hence they found class tasks difficult to complete as also stated by Strayer (2007). Also, the study conducted by Maycock (2019) found that the traditional instruction group significantly outperformed the flipped learning group in the final exam, and Ziegelmeier and Topaz (2015) revealed insignificant differences in student learning in a multivariable calculus course. For this reason, this study intended to better understand the effect of a context like traditional instruction and flipping learning on learners' achievement.

In addition to SDLR levels of learners and the type of instruction, Hao (2016) identified gender as a factor that influences academic performance and it was stated that female students tended to have better verbal intelligence, higher agreeableness, stronger self-discipline, and adapted to a school environment more effectively. Similarly, in a study conducted by Verniers and Martinot (2015) these properties of female students were found predictive of success in fields such as social sciences, health, and literature more than science, technology, and engineering fields, while assertiveness and effort properties of male students were found as more predictive of success in the technological and engineering fields. It was also stated by Chen, Yang, and Hsiao (2015) that in the flipped learning environment, gender may be one of the important factors because the use of technology and the perceptions of both male and female learners may affect their achievement. Hence, this study also aimed to investigate whether the SDLR of pre-service teachers and their gender predicted their achievement in an educational course.

#### *The Purpose of the Study and Research Questions*

This study aimed to predict the achievement of pre-service teachers in an education course, Principles and Methods of Instruction (PMI) through some learner characteristics. In order to achieve this aim, the following research questions were proposed:



1. How well gender and sub-dimensions of the SDLR scale (self-management, desire for learning, self-control) predict the achievement of pre-service teachers in the PMI course?
2. After controlling for gender and sub-dimensions of the SDLR scale, how well being in the flipped class and traditional teaching classes predicts the achievement of pre-service teachers in the PMI course?

Achievement of learners is one of the most important variables that determine the effectiveness of instruction. In the literature, it was found that different variables such as motivation, attitude, self-efficacy, self-regulation, etc. were investigated in terms of predicting the achievement of learners in different courses (Lai & Hwang, 2016; Pajares, 2002; Pajares & Kranzler, 1995; Pintrich & De Groot, 1990; Valas & Slovik, 1993). However, variables such as gender, SDLR, and context variables which might be related to the achievement of pre-service teachers in a compulsory education course, PMI, were not investigated together. In this regard, the investigation of gender, SDLR scale and context (flipped or traditional classes) variables to predict the achievement of pre-service teachers was thought to contribute to literature related to pre-service teacher training.

## Method

### *Research Design*

This study employed a relational survey research design to describe the characteristics of a sample which has been drawn from a pre-determined population at just one point in time (Creswell, 2012; Fraenkel & Wallen, 2009; Gall, Gall & Borg, 2003).

### *Research Sample*

Data were collected from 271 willing senior pre-service teachers chosen according to the purposive sampling method, mainly the convenience sampling method, (Cohen, Manion & Morrison, 2007; Fraenkel & Wallen, 2009) studying at a public university located in the Aegean Region in Turkey. These participants were chosen from the willing pre-service teachers who took the PMI course in the spring semester of the 2018-2019 academic year. Among the 271 pre-service teachers, 195 (72%) of them were female and 76 (28%) of them were male, 27 (10%) of them from Flipped Elementary Education-Classroom Teaching Department; 48 (17.7%) of them from traditional Elementary Education-Classroom Teaching Department; 69 (25.5%) of them from Science Education Teaching Department; 81 (29.9%) of them from Turkish Language Education Department; and 46 (17%) of them from Elementary Education Mathematics Teaching Department.

### *Research Instruments and Procedures*

Data were collected by implementing an achievement test and a scale at the end of the semester. Before implementing the data collection instruments, the consent of pre-service teachers' was obtained, and they were assured that the data would be used

only for scientific purposes and would not be shared with anyone. Data collection instruments were explained below in detail.

#### PMI Course Achievement Test (AT)

Achievement test (AT) developed by Ozudogru and Aksu (2019) included 40 questions with mean item difficulty of .51, mean item discrimination index of .37, and the Kr-20 reliability coefficient of .78. The test included 39 multiple choice questions and one matching type question with five items.

#### Self-directed Learning Readiness Scale (SDLRS)

This scale was developed by Fisher, King and Tague (2001) and adapted to Turkish by Sahin and Erden (2009) to determine pre-service teachers' SDLR. This scale included three sub-factors: 'self-management' comprised of 13 items, 'desire for learning' comprised of 12 items, and 'self-control' comprised of 15 items. This is a 5-point Likert type scale (ranging from 1=completely disagree to 5=completely agree). The Cronbach's alpha internal consistency coefficient was found .87 for the self-management sub-dimension, .86 for the desire for learning sub-dimension, and .79 for the self-control sub-dimension.

This study was conducted in the PMI course in the spring semester of the 2018-2019 academic year. One of the sections of the Elementary Education-Classroom Teaching Department was taught according to flipped learning principles by providing videos developed by the researcher using Camtasia Studio 8 software. After recordings were completed, they were converted to interactive videos using H5p which is an open-source content collaboration framework based on JavaScript. All videos were developed by the writer as part of her dissertation by obtaining expert opinion. These videos are still in use in the PMI courses as educational technology taught by the researcher and will be used in the future.



**Figure 1.** Sample Interactive Video Screencast

Videos were divided into two, three, or four parts according to the subject by obtaining expert opinion. As shown in Figure 1, interactive videos included multiple-

choice, true/false, or matching type questions shown in purple and extra explanations and example videos shown in blue points. The content of the PMI course, the number of videos created for each subject, and their duration were shown in Table 1.

**Table 1**  
*Course Content and the Number of Videos*

Weeks	Subjects	Number of Videos	Duration of videos (minutes)	Number and type of questions included in videos
1	Orientation week	-	-	-
2	Basic educational concepts (education, teaching, learning, program, etc.)	1	9.21	-
3	Types of plans and importance of planning	1	13.53	-
4	Classification of objectives	1	8.35	2 MC
	Bloom's taxonomy	1	15.37	4 MC
5	Basic teaching principles	2	9.01-9.37	2 MC, 4 TQ
6	Gagne's theory on learning and instruction	1	10.57	4 TF, 1 MC, 1FB
	Keller's individualized instruction, Carroll's model of school learning, Bloom's mastery learning	1	15.28	3 MC
7	Constructivist learning theory and	1	9.56	2 TF, 3 MC
	Multiple intelligence theory	1	10.39	1 MC, 2 FB, 2 TF
8	Teaching Strategies- 1. Teaching through presentation	1	8.17	3 TF, 1 FB, 2 MC
	2. Discovery learning	1	5.24	2 TF, 2 MC
	3. Teaching through research and investigation	1	4.10	4 TF, 2 MC
9	4. Cooperative learning	1	6.48-10.34	2 TF, 1 MC - 1 TF, 4 MC
10	Teaching methods- 1. Lecturing,	1	6.46	2 TF, 2 MC
	2. Discussion	1	10.56	5 MC
	3. Case study, project-based learning, problem-based learning	1	10.11	5 MC
	4. Demonstration, individualized study	1	5.59	2 MC
11-12	Teaching techniques (question and answer, brainstorming, role-playing, concept mapping, different discussion techniques, etc.)	4	6.44-5.41- 6.31-8.01	3 MC, 1 TF - 2 TF, 2MC 2 MC, 3 TF - 3 MC

\*MC stands for multiple choice type questions, TF stands for true-false type questions, FB stands for fill in the blank type questions, TQ stands for pre-thinking questions.

After watching video lessons whenever and wherever they felt confident, pre-service teachers summarized what they learned from the content of the videos according to their learning styles in written form, and shared them on the Moodle system-Edmodo. The Course Management System, Moodle-Edmodo is an online networking application for teachers and students. It is a safer way to increase within-class communication and encourage peer-support and peer-learning both in the classroom and online. In this process, pre-service teachers planned their learning, managed their time and resources while preparing weekly summaries, completing class tasks, and writing questions to be asked in class which are in line with the basic properties of SDLR. Each video lesson included pop questions to test whether they learned the subject or not.

In the face to face part of the course, pre-service teachers took part in online question-answer game activities such as Kahoot or Socrative. In this way, they had the chance to monitor whether they learned the subject or not and asked their instructor about the questions they could not answer as in line with the properties of SDL. Finally, group work such as preparing sample lesson plans about multiple intelligence theory, Gagne's theory on learning and instruction, posters about the type of learning strategies, and their relation with theories and different teaching methods was completed in the class every week. Moreover, they conducted a micro-teaching activity by preparing a 15-minute lesson plan and presenting it to their peers in groups during the last two weeks while learning the types of teaching techniques. In this way, they practiced and observed how a teacher implements different teaching methods such as brainstorming, role-playing, circle, concept mapping, station, etc. During group studies conducted in class, pre-service teachers discussed with peers, gave feedback to each other, and evaluated both their progress and their group' as in line with the basic properties of SDL.

The pre-service teachers in the Elementary Education-Classroom Teaching Department (except flipped group), Science Education Teaching Department, Turkish Language Education, and Elementary Education Mathematics Teaching departments were taught according to the principles of traditional instruction. They were assigned homework from their course books to be read before class time. They gathered in the classroom to listen to the lectures of the instructor. The course subject was presented by the instructor using PowerPoint slides and the questions included in videos and plays were asked to these pre-service teachers during the lesson orally. Although the same assignments were completed in both groups, the traditional instruction group worked on assignments and tasks on their own, outside of the class. For instance, both traditional instruction and flipped learning groups prepared sample lesson plans according to multiple intelligence theory or conducted micro-teaching activities; however, traditional instruction group worked on assignments individually, outside the class.

#### *Data Analysis*

In order to predict the achievement of pre-service teachers in the Principles and Methods of Instruction (PMI) Course, the Hierarchical Multiple Linear Regression

(HMLR) procedures were employed (Tabachnick & Fidell, 2007). According to the theoretical background and related literature, variables which were included in this research have different importance levels in predicting the outcome variable (Field, 2009). In the first step, gender and sub-dimensions of the SDLR scale (self-management, desire for learning, self-control) were entered into the analysis, which comprised the 1<sup>st</sup> Model. In the second step, other variables which were dummy coded department variables were entered into the analysis, which comprised the 2<sup>nd</sup> Model.

In this study, foremost, preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, homoscedasticity, multicollinearity, and the influential observations (Field, 2009; Tabachnick and Fidell, 2007). Before the analyses, categorical predictor variables (department and gender) were transformed into a continuous variable by dummy coding. Since the department is a categorical predictor variable with five levels, it was dummy coded into four new variables, 'classroom vs flipped', 'science vs flipped', 'Turkish vs flipped', and 'math vs flipped' by selecting 'flipped learning' group as reference for each dummy variables because according to the literature, flipped learning increases learning (Berrett, 2012; Day & Foley, 2006; Enfield, 2013) and achievement (Davies et al, 2013; Fulton, 2012; Lai & Hwang, 2016; Mason et al., 2013; Wilson, 2013) of pre-service teachers more than traditional instruction, where classroom, science, Turkish and math stand for Elementary Education-Classroom Teaching Department, Science Education Teaching Department, Turkish Language Education Department, and Elementary Education Mathematics Teaching Departments, respectively. Also, gender was a categorical predictor variable with two levels, it was dummy coded into 'female vs male' variable by selecting 'male' as reference for 'female vs male' variable. Data analyses were conducted using SPSS 22 and the significance of the alpha level was selected at the cut-off value .05.

## Results

In this study, firstly, descriptive analysis results concerning the sub-dimensions of predictor variables, and the outcome variable were explained and shown in Table 2.

**Table 2**  
*Descriptive Statistics for Academic Achievement and Predictor Variables*

	Achievement		Self-Management		Desire for learning		Self-control	
	M	SD	M	SD	M	SD	M	SD
Flipped Classroom Teaching Department	82.85	6.15	53.26	7.41	62.52	9.51	40.93	7.15
Traditional Classroom Teaching Department	76.74	8.40	53.65	8.03	63.04	8.61	41.79	6.36
Traditional Science Education Teaching Department	65.90	7.84	49.25	9.77	56.48	10.34	38.35	7.08
Traditional Turkish Language Education Department	71.31	6.61	53.73	5.72	59.35	7.64	39.64	5.72
Traditional Elementary Mathematics Teaching Department	72.98	7.60	49.33	8.68	56.89	8.89	37.59	7.73

The descriptive analysis revealed the highest academic achievement ( $M = 82.85$ ,  $SD = 6.15$ ) for the Flipped Elementary Education-Classroom Teaching Department and the lowest academic achievement ( $M = 65.90$ ,  $SD = 7.84$ ) for Traditional Science Education Teaching Department as can be seen in Table 2. Although pre-service teachers obtained similar scores from self-management and self-control sub-dimensions of SDLR scale, the highest scores for the desire for learning ( $M = 59.17$ ,  $SD = 9.25$ ) belonged to Traditional Elementary Education-Classroom Teaching Department and lowest scores ( $M = 39.47$ ,  $SD = 6.81$ ) belonged to Traditional Science Teaching Department as shown in Table 2. After presenting the means and standard deviations of predictor and outcome variables, correlations among them were shown in Table 3.

**Table 3**

*The Correlations among Academic Achievement and Predictor Variables*

	Academic achievement	female vs male	self-management	desire for learning	self-control	class vs flipped	science vs flipped	turkish vs flipped	math vs flipped
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	1.00								
(2)	.19*	1.00							
(3)	.09	.12*	1.00						
(4)	.18*	.12*	.79*	1.00					
(5)	.14*	.17*	.76*	.77*	1.00				
(6)	.23*	.03	.11*	.20*	.16*	1.00			
(7)	-.42*	.06	-.18*	-.17*	-.10	-.27*	1.00		
(8)	-.08	-.11*	.16*	.01	.02	-.30*	-.38*	1.00	
(9)	.03	-.02	-.14*	-.11*	-.13*	-.21*	-.26*	-.30*	1.00

\*  $p < .05$

According to Table 3, the correlations among academic achievement and predictor variables changed between  $r = .03$  and  $r = -.42$ . While the highest correlation between the department dummy variable 'science vs flipped' and academic achievement was  $r = .42$ , the lowest relationship between the 'math vs flipped' and academic achievement was  $r = .03$ . In other words, being in the flipped group instead of the science education teaching department moderately related to higher achievement; however, being in the flipped group instead of the math teaching department did not significantly relate to achievement.

In this study, the outcome variable was the academic achievement, while the gender, factors of the SDLR scale, and department dummy variables were predictor

variables. In Table 4, it can be seen that predictors were entered into models to test whether the models were significantly better at predicting the outcome.

**Table 4**

*Summary of the Hierarchical Multiple Linear Regression Analyses for Variables Predicting the Academic Achievement*

Variables	B	SE B	$\beta$	t	Sr <sup>2</sup>	R <sup>2</sup>	$\Delta R^2$	$\Delta F$
Model 1:						.07*	.07*	4.91*
Constant	62.50	3.61		17.31*				
female vs male	3.31	1.19	.17	2.78*	.03			
self-management	-.19	.11	-.17	-1.64	-.01			
desire for learning	.25	.10	.26	2.41*	.02			
self-control	.06	.13	.05	.46	.00			
Model 2:						.36*	.29*	29.68*
Constant	79.26	3.53		22.47				
class vs flipped	-5.98	1.75	-.26	-3.42*	.03			
science vs flipped	-16.68	1.67	-.82	-9.96*	.24			
turkish vs flipped	-10.45	1.65	-.54	-6.36*	.10			
math vs flipped	-9.29	1.78	-.39	-5.22*	.07			

\* $p < .001$

When the F-ratios shown in Table 4 were checked, it was  $F(4, 266) = 4.91$  ( $p < .001$ ) for the Model 1 and  $F(8, 262) = 18.35$  ( $p < .001$ ) for the Model 2. These results revealed that both models were significant in predicting the outcome variable. The gender (female vs male) and sub-dimensions of SDLR scale (self-management, desire for learning, self-control) entered at Step 1, which comprised Model 1, explained 7% of the variance in academic achievement,  $F(4, 266) = 4.91$ ,  $p < .01$ . After the entry of the department dummy variables at step 2, which comprised Model 2, the total variance explained by the model as a whole was 36%,  $F(8, 262) = 18.35$ ,  $p < .001$ . In other words, the department dummy variables explained an additional 29% of the variance in the academic achievement, after controlling for gender (female vs male) and sub-dimensions of SDLR scale (self-management, desire for learning, self-control).  $\Delta R^2 = .29$  and  $\Delta F(8, 262) = 29.68$  ( $p < .001$ ). For this reason, it can be said that the first model significantly improved the ability to predict the pre-service teachers' achievement, but the second model was even better (Field, 2009).

When the t-statistics were checked to control whether the predictor variables contributed to the model significantly (Field, 2009), it can be seen in Table 4 that in the first model, gender  $t(266) = 2.78$ ,  $p < .001$  and desire for learning  $t(266) = 2.41$ ,  $p < .001$  significantly predicted the achievement of pre-service teachers. In the second model, class vs flipped  $t(262) = -3.42$ ,  $p < .001$ , science vs flipped  $t(262) = -9.96$ ,  $p < .001$ , Turkish vs flipped  $t(262) = -6.36$ ,  $p < .001$ , math vs flipped  $t(262) = -5.22$ ,  $p < .001$  were all significant predictors of the academic achievement. From the magnitude of the t statistics, it can be said that being in flipped learning had a higher effect on academic achievement than being in any other classes (Elementary Education-Classroom

Teaching Department, Science Education Teaching Department, Turkish Language Education, and Elementary Education Mathematics Teaching).

### **Discussion, Conclusion and Recommendations**

The purpose of this study was to predict the achievement of pre-service teachers in the PMI course through gender, dimensions of the SDLR (self-management, desire for learning and self-control), and context variables. The regression analysis results showed that gender predicted the achievement of pre-service teachers. In other words, it can be said that if more female students were included in the study, the achievement would be higher. The PMI course mostly requires reading and regular study activities. However, if this course were an engineering course requiring complex mathematical calculations and technical issues, male students might have obtained higher achievement scores as stated in the previous literature (Caprara et. al., 2011; Pajares, 2002; Pajares & Kranzler, 1995; Pajares & Miller, 1994). The findings of the studies conducted by Buccheri, Gurber and Bruhwiler (2011) and Frenzel, Pekrun and Goetz, (2007) confirmed the findings of this study that female students have lower interest in sciences and technology and higher interest in social sciences and language than male students even if they have the same competencies. However, Chen, Yang and Hsiao (2015) evaluated student feedback and gender differences to provide a holistic profile of this flipped mathematics course, and found that 'feelings' which contained the items relating to personal emotions such as confidence, fulfillment and proud during learning process predicted the final grades of males, while course design predicted the final grades in females. It can be concluded that the inclusion of more flipped courses may increase the learning performance of female students even in courses including mathematics because of including cooperative learning opportunities and low competence.

According to the findings of the study, SDLR of pre-service teachers did not predict their achievement in the PMI course except the desire for learning sub-dimension. The reason for this result might be that as stated by Fisher et al. (2001), SDLR exists along a continuum and is present in all individuals to some extent. The pre-service teachers both in traditional and flipped classes might have already been self-disciplined, responsible for their own decisions and actions, in control of their own lives, aware of their limitations, evaluate their performances, and find out the necessary information for them to some degree. Also, Deyo, Huynh, Rochester, Sturpe and Kiser (2011) found no significant relationship between academic performance and the SDLR of medical pharmacy students. It can be inferred that students may be capable of learning foundational knowledge regardless of their SDLR. Hence, all the dimensions of the SDLR scale might not be significant predictors of student achievement.

As for the result that the desire for learning dimension predicted the achievement of pre-service teachers, it can be said that pre-service teachers who are curious and enjoy learning new information, study and overcome challenges during the learning process, open to new ideas, learn from their mistakes, and prefer to set their own goals obtain higher achievement scores. The reason for this finding might be that pre-service teachers in both groups were expected to achieve at least knowledge and



understanding levels according to Bloom's taxonomy before they come to the class through weekly readings or videos as stated by Bergmann and Sams (2012). Due to coming to class prepared, they might be more willing to conduct different activities in the face to face part of the class which might have affected the scores at the 'desire for learning' dimension of the SDLR scale.

Moreover, Song and Hill (2007) stated that learners may exhibit different levels of self-direction in different learning situations. This study was conducted in the PMI course. Since pre-service teachers took pre-requisite educational sciences courses, their SDLR might have been already high to a certain degree for different educational sciences courses. In other words, learners might have a high level of SDLR in an area in which they are familiar, or in areas that are similar to a prior experience. For example, students who like Mathematics may also have a high level of SDLR for Physics but they may not possess the same amount of readiness for English (Fisher et al., 2001). In other words, it can be inferred that SDLR levels of pre-service teachers might change according to courses and departments. Hence, a similar study might be set in different courses to examine whether these variables predict the achievement of pre-service teachers.

Also, the findings of the study showed that being in flipped learning, Elementary Education-Classroom Teaching Department predicted the achievement of pre-service teachers than being in any other traditional classrooms (Elementary Education-Classroom Teaching Department, Science Education Teaching, Turkish Language Education and Elementary Education Mathematics Teaching) which is also revealed in the previous literature (Bergmann & Sams, 2012; Day & Foley, 2006; Kim & Choi, 2018; Khanova et al., 2015; Shyr & Chen, 2017; Wilson, 2013). The reason for this finding might be the tasks conducted during the flipped learning process. Pre-service teachers took part in different tasks such as discussions, games, and group studies, which might have increased their achievement in the course as also stated by Maycock (2019) and Merlin-Knoblich and Camp (2018). While pre-service teachers were conducting these tasks and taking place in group studies and plays, the instructor was able to monitor the flipped group's performance and comprehension. When a misunderstanding or any confusion was noticed, they were cleared up immediately as also revealed in the previous literature (Shyr & Chen, 2017; Ziegelmeier & Topaz, 2015). Moreover, pre-service teachers obtained immediate feedback from their peers as also stated by Baughman, Hassall and Xu (2019), which might have helped pre-service teachers to develop a sense of responsibility for their learning and increased achievement. It can be concluded that instead of traditional teaching methods, if instructors design their courses according to flipped learning principles, the achievement of pre-service teachers can increase.

The findings of this study have important instructional implications for researchers, instructors, and university administrators who are interested in developing higher education. The overall results of this study suggested that pre-service teachers' gender, learning desire, and flipped learning context were some of the important factors in predicting achievement in the PMI course. Hence, it is suggested that pre-service teachers may be provided with opportunities to apply what

they have learned theoretically. Also, it is suggested that instructors may include various computer applications, software, games, and videos from YouTube to increase the pre-service teachers' desire to learn. Furthermore, in this study, the achievement of pre-service teachers was assessed through class tasks and an achievement test which included multiple-choice and matching type questions. If the achievement of pre-service teachers was evaluated through an exam including open-ended questions requiring higher-order learning skills like analysis, synthesis, and evaluation, all dimensions of SDL might have predicted the achievement. For this reason, future research may assess the achievement of pre-service teachers through open-ended questions. Lastly, for further studies, it is suggested to include different variables such as cognitive load, motivation, and retention to predict the achievement of pre-service teachers.

One of the limitations of this study was that SDLR levels of pre-service teachers were not measured at the beginning of the study. Future studies might begin the research process by implementing the scale both at the beginning and at the end of the learning process. Besides, SDLR of pre-service teachers were measured by using a self-response measurement tool, a 5-point Likert type scale (5-strongly agree, 1-strongly disagree), and choosing from restricted response options might not have reflected the difference between the perceptions of pre-service teachers in flipped and traditional groups. The SDLR is a complex construct and it might not be easily revealed through items on questionnaires. Hence, it is suggested that further research should involve interviews including open-ended questions.

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### Öğretmen Eğitimi Sınıflarında Öğretmen Adaylarının Başarılarını Yordayan Değişkenler

#### Atf:

- Ozudogru, M. (2020). The factors predicting pre-service teachers' achievement in teacher training classrooms. *Eurasian Journal of Educational Research, 87*, 157-178. DOI: 10.14689/ejer.2020.87.8

#### Özet

*Problem Durumu:* Sosyal, politik ve teknolojik alanlarda çok hızlı gelişmelerin yaşandığı günümüzde bugün öğretilen bilgiler yarın geçersiz hale gelebilmektedir. Bu bilgi çağında, öğrencilerin sürekli artan bilgi yığını arasından uygun bilgileri seçmeleri, uygun stratejilere karar vermeleri ve kendi öğrenme süreçlerini yönetebilmeleri önemlidir. Bu özellikler derse gelip sadece öğretim elemanının anlattıklarını not alan diğer bir ifadeyle sadece geleneksel yöntemlerle öğrenen öğrenciler tarafından kazanılamayabilir. Gelecek nesilleri eğitecek öğretmen adaylarının kendi öğrenmeleri için sorumluluk almaları, farklı öğrenme fırsatlarına açık olmaları, araştırma ve öğrenmeyi sevmeleri, kendi öğrenme süreçlerini yönetebilmeleri ve problem çözme becerilerini kullanabilmeleri gibi öz-yönelimli öğrenme (ÖYÖ) becerilerine sahip olmaları önemli görülmektedir. Bunu bağlamda, pek çok üniversite bu gereksinimleri dikkate alarak, öğretim materyalleri ve öğretim yöntemleri konusunda değişiklikler yapmaktadır. Teknolojiyi ve sınıf içi aktif öğrenme görevlerini birleştiren ters-yüz öğrenme yaklaşımının öğrencilerin öğretme-

öğrenme sürecini desteklediğini belirten pek çok araştırma bulunmaktadır. Ters-yüz öğrenmenin bir parçası olan ders öncesi etkinlikler, öğrencilerin ÖYÖ becerilerinin önemini vurgulamaktadır. Ayrıca, uzaktan öğrenme, hibrid ve ters-yüz öğrenme yoluyla öğretimin gelişmesiyle birlikte, ÖYÖ kritik bir özellik olarak ortaya çıkmaktadır. Alanyazındaki pek çok araştırma sonuçları, öğrencilerin ÖYÖ becerileri ve başarıları arasında anlamlı ve pozitif bir ilişki olduğunu ortaya koymuştur fakat bazı araştırmalarda da yüksek veya düşük ÖYÖ hazırbulunuşluğu olan öğrencilerin final sınavlarında anlamlı bir farklılık bulunamamıştır. Dolayısıyla, bu çalışmanın amaçlarından biri, öğretmen adaylarının ÖYÖ'ye hazırbulunuşluğu, ters-yüz veya geleneksel sınıf ortamlarında öğrenmelerinin başarılarını yordayıp yordamadığını araştırmaktır. Ayrıca, alanyazında cinsiyet başarıyı etkileyen bir faktör olarak açıklanmıştır ve bu eğitim bilimleri dersinde öğrenci başarısını yordayan değişkenlere dahil edilmiştir.

Öğrencilerin başarısı, öğretimin etkinliğini belirleyen en önemli değişkenlerden biridir. Literatürde motivasyon, tutum, öz yeterlik, öz düzenleme vb. farklı değişkenlerin öğrencilerin farklı derslerdeki başarılarını yordayan araştırmalar bulunmaktadır fakat cinsiyet, öz yönelimli öğrenmeye hazırbulunuşluk (ÖYÖH) ve öğrenme ortamı değişkenleri bir öğretmenlik eğitimi dersinde birlikte incelenmemiştir. Bu bağlamda, çalışmanın hem alanyazına hem de öğretmen adaylarına yönelik yapılan çalışmalara katkıda sağlayacağı düşünülmektedir.

*Araştırmanın Amacı:* Bu çalışmanın amacı, öğretmen adaylarının başarılarının bir eğitim dersinde, Öğretim İlke ve Yöntemleri (ÖİY), cinsiyet, Öz yönelimli Öğrenmeye Hazır Bulunuşları ve ders ortamı (ters-yüz sınıf, geleneksel sınıf) gibi bazı değişkenler ile yordanmasıdır. Bu amaca ulaşmak için aşağıdaki araştırma soruları önerilmiştir:

1. ÖİY dersinde cinsiyet ve Öz yönelimli Öğrenmeye Hazır Bulunuşluk ölçeğinin alt boyutları (öz-yönetim, öğrenme isteği, öz-kontrol) öğretmen adaylarının başarılarını ne kadar iyi yordamaktadır?
2. ÖİY dersinde cinsiyet ve Öz yönelimli Öğrenmeye Hazır Bulunuşluk ölçeğinin alt boyutları kontrol edildikten sonra, ters-yüz öğrenme sınıfında veya geleneksel öğretim sınıflarında olmak, öğretmen adaylarının başarılarını ne kadar iyi yordamaktadır?

*Araştırmanın Yöntemi:* Bu çalışmanın tarama araştırmadır ve amaçlı örnekleme yöntemine göre belirlenen 271 öğretmen adayı araştırmaya dahil edilmiştir. Bu öğretmen adaylarında 195'i (% 72) kadın, 76'sı (% 28) erkek, 27'si (% 10) ters-yüz öğrenme Sınıf Öğretmenliği Bölümü'nde; 48'i (% 17.7) geleneksel Sınıf Öğretmenliği Bölümünde; 69'u (% 25,5) geleneksel Fen Bilgisi Öğretmenliği Bölümünde; 81'i (% 29,9) geleneksel Türkçe Öğretmenliği Bölümünde; 46'sı (% 17) geleneksel İlköğretim Matematik Öğretmenliği Bölümünde öğrenim görmektedir. Veriler başarı testi ve ÖYÖH ölçeği ile toplanmıştır. Başarı testi (AT), ortalama madde güçlüğü .51, madde ayırt edicilik indeksi .37 ve Kr-20 güvenilirlik katsayısı .78 olan 40 soru içermektedir. ÖYÖH ölçeği, Fisher vd. (2001) tarafından geliştirilmiş ve Türkçeye Sahin ve Erden (2009) tarafından uyarlanmıştır. Ölçek üç alt faktörden oluşmaktadır: 13 maddeden oluşan 'öz-yönetim', 12 maddeden oluşan 'öğrenme isteği' ve 15 maddeden oluşan



'öz-kontrol'. Ölçeğin Cronbach alfa iç tutarlılık katsayısı öz-yönetim alt boyutu için .87, öğrenme isteği alt boyut için .86 ve öz-kontrol alt boyutu için .79 olarak bulunmuştur.

Bu çalışma ÖİY dersinde 2018-2019 bahar döneminde Türkiye'de Ege Bölgesi'nde bulunan bir devlet üniversitesinde gerçekleştirilmiştir. Sınıf Öğretmenliği Anabilim Dalı bölümlerinden biri dersi ters-yüz öğrenme ilkelerine göre öğrenmiştir. Bu gruptaki öğretmen adaylarına araştırmacı tarafından Camtasia Studio 8 yazılımı kullanılarak geliştirilen videolar gönderilmiştir. Dersten önce öğretmen adaylarının video dersleri izlemeleri ve videoların içeriğinden öğrendiklerini, kendi öğrenme stillerine göre yazılı olarak özetlemeleri beklenmiştir. Bu süreçte öğretmen adayları öz-yönetimli öğrenmenin temel özellikleri ile uyumlu olarak öğrenmelerini planlamış, zamanlarını ve kaynaklarını yönetmişlerdir.

Dersin yüz-yüze kısmında, öğretmen adayları çevrimiçi soru-cevap aktivitesi olan Kahoot veya Socrative uygulamalarında yer almışlardır. Bu oyunlarda öğretmen adayları konuyu öğrenip öğrenemediklerini gözlemlemiş ve öğretim elemanına cevaplayamadıkları soruları sorabilmişlerdir. Ayrıca, farklı teorilerin uygulanması hakkında örnek ders planları ve posterler hazırlama ile farklı öğretim tekniklerinin uygulanmasını içeren mikro öğretim etkinlikleri yapılmıştır.

Geleneksel öğretim ilkelerine göre öğrenim gören öğretmen adaylarına ders konusunu kitaplardan okumaları için ödev olarak verilmiştir. Sınıf içinde ders konusu öğretim elemanı tarafından PowerPoint slaytları kullanılarak sunulmuştur ve derste sözel olarak ters-yüz öğrenme grubundaki öğretmen adaylarına video derslerde ve oyunlarda sorulan sorular sözlü olarak sorulmuştur. Aynı ödevler her iki grupta da tamamlanmasına rağmen, geleneksel öğretim grubundaki öğretmen adayları ödevleri sınıf dışında kendi başlarına tamamlamışlardır.

Veriler Hiyerarşik Çoklu Doğrusal Regresyon (HMLR) analizi ile incelenmiştir. İlk adımda, cinsiyet ve ÖYÖH ölçeğinin alt boyutları (öz-yönetim, öğrenme isteği, öz-kontrol) değişkenleri analize girmiştir. İkinci adımda, kodlanmış bölüm değişkenleri analize girmiştir. Analizler öncesinde varsayımlar kontrol edilmiştir ve kategorik yordayıcı değişkenler (bölüm ve cinsiyet) yapay kodlama ile sürekli değişkenlere dönüştürülmüştür.

*Araştırmanın Bulguları:* Çalışmanın bulguları, ilk modelde, cinsiyet ve öz-yönelimli öğrenmeye hazırbulunuşluk ölçeğinin alt boyutu olan öğrenme isteğinin öğretmen adaylarının ders başarısını yordadığını göstermiştir. İkinci model, ters-yüz öğrenme sınıfında olmanın, öğretmen adaylarının akademik başarısını, geleneksel öğretim ilkelerine göre öğretilen diğer bölümlere göre anlamlı olarak yordadığını ortaya koymuştur. İstatistiklerin büyüklüğünden, ters-yüz öğrenme sınıfında olmanın akademik başarıyı diğer sınıflarda (Sınıf Öğretmenliği, Fen Bilgisi Öğretmenliği, Türkçe Öğretmenliği ve İlköğretim Matematik Öğretmenliği) olmaktan daha fazla etkilediği belirlenmiştir.

*Araştırmanın Sonuçları ve Öneriler:* Bu çalışmanın bulguları, yükseköğrenimi geliştirmek isteyen araştırmacılar, eğitimciler ve üniversite yöneticileri için önemli

sonular ortaya koymaktadır. Bu alıřmanın genel sonuları ğretmen adaylarının cinsiyetinin, ğrenme isteėinin ve ters-yüz ğrenme ortamının ÖİY dersinde başarıyı yordamada önemli faktörlerden bazıları olduėunu göstermiştir. Bu nedenle, ğretmen adaylarına teorik olarak ğrendikleri konuları uygulama fırsatı verilmesi önerilmektedir. Ayrıca, ğretmen adaylarının ğrenme isteklerini arttırmak için ğretim elemanlarının eřitli bilgisayar uygulamaları, yazılımlar, oyunlar yanında YouTube videolarını derslerinde kullanmaları önerilmektedir. Son olarak öz-yönelimli ğrenme karmařık bir yapıdır ve ölek maddeleri yoluyla tam olarak belirlenemeyebilir. Bu nedenle, gelecekteki arařtırmalarda açık uçlu sorular içeren görüşmelere yer verilmesi gerektiėi önerilmektedir.

*Anahtar Sözcükler:* Akademik başarı, geleneksel ğrenme, ğretmen adayları, öz-yönelimli ğrenme, ters-yüz ğrenme yaklaşımı.



## University Students' Expectations about the Elective Music Course

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### ABSTRACT

**Purpose:** This study aimed to elicit the course-related expectations of students studying in different faculties at Ankara University who took an elective music course. More specifically, the students' reasons for enrolling in the music course, their expectations about the objectives, the teaching processes and evaluation process of this course, and whether these expectations were differed according to the presence/absence of previous amateur music education were investigated.

**Research Methods:** In this descriptive research, the data were collected using a questionnaire form developed by the researcher. This research was conducted with 552 students. For the data analysis, frequency-percentage values were calculated using the Mann-Whitney U and chi-square tests.

**Findings:** The greatest expectation of the students from the course aims was to recognize the different genres of music. The genres of music that the participants would most preferred to see in the course content was Turkish Folk Music. The most preferred evaluation process of the course was tests with multiple-choice questions. The students' reasons for choosing music as an elective course, their expectations concerning the teaching processes of the course, and their views on the opening of new courses differed according to whether or not they had received any amateur music education before attending university.

**Implications for Research and Practice:** In line with the results, it can be suggested that courses with different content related to various areas of music should be made available. Curriculum development studies can be undertaken for these courses, and their potential effects on students can be investigated.

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## Introduction

Our era has been witnessing a rapid process of change and progress. In this context, individuals are expected to adapt to the changing and developing characteristics of the era. Accordingly, it would not be correct to consider that one-way education can lead individuals to success in every subject. Education systems are of great importance since they are essential to raising individuals who are aware of all kinds of development, which is required for comprehensive progress. According to Varis, "as a result of rapid technological developments, students need to be educated not in a single field, but as multi-faceted individuals equipped with various skills to adapt to the rapid development of today's societies" (as cited in Kaya & Ustun, 2013, pp. 16-17).

The importance of universities in formal education, which is effective in the development of individuals, cannot be denied. Scott emphasized the important role of universities in the scientific, economic, technological, social and cultural development of societies and how they facilitated the transition between different social layers as a dynamic institution providing scientific and technical knowledge and professional skills to improve social and individual quality of life (as cited in Sahin, Zoraloglu & Firat, 2011).

Undoubtedly, the education given in universities is generally specifically designed for a particular profession. However, individuals in developed countries should no longer merely gain professional knowledge; they should also be intellectually equipped for their future. In this context, elective courses in universities offer individuals opportunities to develop in various ways. Elective courses in fields, such as art and sports, can provide students with different perspectives and open new paths to personal development.

It is not possible that every individual who attends university has an equal level of knowledge or awareness concerning every subject since they may not have been given equal opportunities during previous learning experiences. However, these deficiencies can be overcome in university, which, for many people, constitutes the last stage of formal education.

Elective courses related to various fields can be considered as one of the ways that help university students become familiar with different areas and experiment with them, as well as better developing themselves. "Elective courses help students develop skills in different areas, as well as providing more extensive information in their fields of interest" (Demir & Ok, 1996, p. 121).

According to the main principles included in the original version of the Higher Education Law No. 2547, dated 1981, during the education period in higher education institutions not only the courses on Atatürk's principles and history of the Turkish revolution, the Turkish language, and foreign languages but also those concerning physical education and fine arts education should be planned and implemented as compulsory courses (as cited in Cakır İlhan, 1993, pp. 4-5). However, the related article in this law was revised in 1991 as follows: In higher education institutions, Atatürk's

principles and history of Turkish revolution, Turkish language, and foreign languages are compulsory courses. In addition, either physical education or fine arts education is provided as an elective course. All these courses are planned and implemented in a minimum of two semesters (as cited in Cakır İlhan, 1993, p. 6). In this context, elective music courses given at various universities are applied as a branch of fine arts courses.

According to Gurgan (1986, p. 15), "as a result of different interpretations arising from the lack of clarity in the content of the music course, it is observed that instructors in higher education institutions and the institutions themselves plan and implement this course by adopting different approaches and methods". Another reason for this approach may be that the physical equipment of each university is different. For example, overcrowded classrooms and the lack of necessary environment and equipment for music courses can lead the instructor only to present theoretical information.

"The lack of resources of the universities (such as computers, internet, books and audiovisual equipment), the lack of research in this field, the inability of the course to reach a modern teaching method, the course being mostly taught using traditional methods without technological support, the elective music course being allocated a broad program, space and time in some universities while not even being offered in others indicate that there are various problems in the implementation of this course" (Karakoc, 2015, p. 7).

Various studies have been conducted about the elective music courses taught at universities (Gurgan, 1986; Kaya & Ustun, 2013; Karakoc, 2015; Em, Yondem & Ece, 2018; Caglayan, Bahtiyar Karadeniz & Sari, 2018). Gurgan (1986) conducted research with students enrolled in three different universities to examine the fine arts music course program offered at universities and to make suggestions for the further development of this program. In a study conducted with students attending Nevsehir University, Kaya and Ustun (2013) investigated the participants' interest, desire, appreciation, knowledge, skills, views and thoughts concerning music course. Karakoc (2015) aimed to examine music teaching processes according to the views of the instructor and students. The research was carried out with students and faculty members in various universities in Ankara. Em, Yondem and Ece (2018) conducted a study in Bolu Abant İzzet Baysal University to elicit the music course-related views of the students enrolled in this course and instructors teaching this course to contribute to the improvement of the efficiency and efficacy of the course. For this purpose, the authors explored the students' expectations and attainments, positive and negative views of the course, and interest and desire concerning the course, as well as the problematic situations experienced by instructors in the implementation of the course. The research conducted by Caglayan, Bahtiyar Karadeniz and Sari (2018) was undertaken in Ordu University Vocational School to investigate the students' interests, desires, knowledge, and skills. Lastly, Liu (2006) examined and compared the teaching materials used in the elective music course attended by engineering students.

The current study aimed to ascertain the expectations of students attending Ankara University related to the elective music course. In line with this purpose, the following research questions were constructed:

1. What are the students' reasons for enrolling in the music course; their expectations concerning the course objectives, content, teaching processes, and evaluation process; and their views on the opening of new music courses with different content?
2. Do a) the reasons why students chose the music course, and b) the students' expectations concerning the course objectives, teaching processes, and evaluation of the course, and c) students' expectations concerning the opening of different music courses with varying content differ according to whether they had previously received amateur music education?
3. Do the students' expectations regarding the content of the course differ according to whether they had previously received amateur music education and whether they could play instrument?

## Method

### *Research Design*

This study was based on a descriptive research design since this study aimed to describe a given situation as precisely and carefully as possible (Buyukozturk, Kılıc Cakmak, Akgun, Karadeniz & Demirel, 2010). This research was conducted to identify the students' expectations of the elective music course taught at universities.

### *Research Sample*

The sample of this study consisted of the students enrolled in the elective music course at Ankara University during the fall semester of the 2018-2019 academic year. A total of 552 students from various faculties and vocational schools participated in this research.

Of the participant students, 15% of the students that participated in this research were enrolled in the Faculty of Law, 16.8% in the Faculty of Political Sciences, 21.7% in the Faculty of Languages, History and Geography, 6.2% in the Vocational School of Justice, 5.4% in the Faculty of Communication, 5.4% in the Faculty of Health Sciences, 2.4% in the Vocational School of Health Services, 6.9% in the Faculty of Engineering, 4.2% in the Faculty of Science, 15.6% in the Faculty of Sport Sciences, and 0.4% in the Faculty of Agriculture.

The majority of the participant students (86.1%) were in their first year at university. This was an expected result considering that the elective music course is often included in the first year curricula of faculties.

### *Research Instruments and Procedures*

A questionnaire was prepared to collect the necessary data. First, a literature review was undertaken to construct items in line with the purpose of this research. More items were added after receiving opinions from three educational sciences

experts and one music education expert. Using this first version of the form, a pilot application was conducted to investigate whether the students understood the items and to examine their response times. Based on the data from the pilot application, the questionnaire was finalized. The questionnaire consisted of close-ended questions that aimed to elicit information on the demographic characteristics of the students; whether they had previously received amateur music education; their ability to play instruments; their reasons for choosing music as an elective course; their expectations of the objectives, teaching process and evaluation process of the course; and their views concerning the opening of other music courses with different content.

### *Data Analysis*

As a result of the questionnaire applied to the students attending the music course as an elective course, the frequency and percentage values were obtained for the analysis of the data to identify the students' expectations about various aspects of the course. The Mann-Whitney U and chi-square independence tests were conducted to compare the responses of the participants to the questionnaire according to whether they had previously received amateur music education and whether they were able to play a musical instrument. SPSS software v. 21.0 was used for data analysis.

## **Results**

In this section, the results obtained from the analysis of the collected data are presented in relation to the research questions.

### *Results concerning the First Research Question*

The first research question aimed to identify the students' reasons for choosing the music course, determine their expectations of the objectives, content, teaching process and evaluation process of the course, and elicit their views concerning the opening of other music courses with different content.

#### *Students' Reasons for Choosing the Music Course*

Approximately 34% of the participants stated that they chose music as an elective course because they were interested in music. Approximately 21% of the participants reported that they enrolled in this course because they wanted to improve themselves. In addition, 12.4% considered the music course to be easy, 12.4% had no alternative as an elective course, and 11.2% found the course hours suitable. When the current findings are considered in general, it is noteworthy that approximately 54% of the students deliberately chose the course with the motivation to learn, while more than 40% enrolled for reasons indicating low learning expectancies, such as the absence of an alternative course or the suitable course hours.

#### *Students' Expectations of the Objectives of the Music Course*

More than half of the participants (57%) expected to be able to recognize different genres of music after attending the music course. This was followed by 24.1% of the participants that wished to learn to play an instrument, 10.4% that wanted to perform rhythmic exercises in a group, and 8.2% that wanted to learn to sing. The remaining

0.4% of the participants selected the 'other' category. When the findings were examined in general, it was determined that 57% of the participants expected the objectives of the course to be theoretical and 43% focused on the practical aspects of the course.

#### *Students' Expectations of the Content of the Music Course*

The genres of music that the participants would mostly/always preferred to see in the course content were Turkish Folk (45.1%), Turkish Art (41.4%), Rock (36.6%), Classical Western (35.3), Pop (30.9%), Jazz (29.7%), Contemporary Turkish (26.5%), Arabesque (20.9%), and Rap (3.4%). The remaining 1.2% of the participants selected the 'other' category for the preferred music genres.

According to the total of never/seldom preferences, the responses of the participants were as follows: 48.9% of the participants arabesque, 35.4% Pop, 29% Jazz, approximately 28% Rock, approximately 27% Contemporary Turkish, 24% Classical Western, 18.1% Turkish Folk, 17.4% Turkish Art, 0.2% Rap, and 0.2% other genres.

When the findings were examined in general, the music genre that the participants most wanted to be included in the course content was Turkish Folk, while Arabesque music was chosen by the least number of participants.

Concerning the applied subjects, they mostly/always wanted to see in the course content, more than half of the participants (63.6%) chose topics related to rhythm training, 60.2% instrument training, and 55.8% voice training.

#### *Students' Expectations of the Teaching Process of the Course*

Concerning the teaching process, approximately 26% of the participants expected the instructor to perform some of the appropriate musical works included in the curriculum, 21% wanted to attend concerts featuring the musical works discussed in the course, 15.5% wanted to conduct activities related to musical performance, 15% preferred to watch videos about the performance of the musical works discussed in the course, and 10% expected to listen to the related CDs. Furthermore, approximately 7% of the participants expected to watch documentaries or films on the topics covered by the course, 2.5% wanted to write about their emotions and thoughts about the musical works discussed in the course, 2.2% wanted the instructor to only verbally present the course content, and 1.4% expected to be asked to make presentations about the course content to the other students.

#### *Students' Expectations of the Evaluation Process of the Course*

Results showed that approximately 60% of the participants' expectations of the course evaluation process were paper-and-pencil tests consisting of multiple-choice questions, 13% preferred the assessment of performance-oriented activities, 9.3% and 9.1% expected to be assigned homework in groups and individually, respectively, 3.5% expected the evaluation to be undertaken through tests containing open-ended questions, 2.7% wanted to make presentations, 1.8% favored self-assessment, and 0.8% preferred peer assessment.



*Students' Views concerning the Opening of Music Courses with Different Content*

Of the participant students, 78.2% stated that they would like to see the availability of more music courses with different content, while 21.8% did not think this was necessary.

Of the 426 participants that wanted more music courses with different content to be made available, 32% stated their course preference as solfeggio, 59.6% as voice training, 80% as instrument training, 28% as choral training, 20.4% as the history of Classical Western music, 26.7% as the history of Turkish music, 15.4% as the history of jazz, and 25.8% as the history of rock and pop music. In this question, the participants were allowed to mark more than one option.

*Results Concerning the Second Research Question*

The second research question of this study aimed to determine the students' reasons for choosing music as an elective course, their expectations of the objectives, teaching processes and evaluation processes of the course and expectations concerning the opening of different music courses with varying content differed according to whether they had previously received amateur music education.

*Students' Reasons for Enrolling in the Music Course according to whether they had Previously Received Amateur Music Education*

Table 1 shows the cross-table and chi-square results concerning the students' reasons for choosing the music course according to the presence/absence of previous amateur music education.

**Table 1***Effects of Previous Amateur Education on the Students' Choice of Music as an Elective Course*

		Reasons behind the students' choice								$\chi^2$	
		Interested in music		Willing to improve self		Easy		No alternative		Total	
		f	%	f	%	f	%	f	%	f	%
<b>Previous music education</b>											
Yes		83	64.8	22	17.2	10	7.8	13	10.2	128	100
No		90	32.6	83	30.1	53	19.2	50	18.1	404	100

Among the students that had previously received amateur music education, the reasons for enrolling in the elective music course were being interested in music for 65%, self-improvement for 17.2%, thinking that the course is easy for 8%, and having no alternative for 10.2%, while the students that had not received amateur music

education before university chose these options at the rates of 32.6%, 30.1%, 19.2% and 18.1%, respectively (Table 1). The differences in the observed values between the two groups were found to be statistically significant ( $\chi^2_{(3)} = 37.633$ ,  $p < 0.05$ ). According to these findings, most students with previous amateur music education chose the music course because they were more interested in music than those without this history, whereas the latter tended to make this decision on the basis of improving themselves.

*Students' Expectations of the Course Objectives according to the Presence/Absence of Previous Amateur Music Education*

Table 2 presents the cross-table and chi-square results of whether previous amateur music education affected the top three course objective expectations of the students.

**Table 2**

*Effects of Previous Amateur Education on the Students' Expectations of the Course Objectives*

	Views on the course objectives						Total		$\chi^2$
	Recognizing different genres		Learning to play musical instruments		Performing rhythmic exercises				$\chi^2 = 4.743$
									sd = 2
<b>Previous music education</b>	f	%	f	%	f	%	f	%	p = 0.093
Yes	84	57.1	48	32.7	15	10.2	147	100	
No	215	64.8	77	23.2	40	12	332	100	

The examination of Table 2 reveals that 57.1% of the students who received music education and 65% of those without a history of such education chose the option 'recognizing different genres of music' as the course's objective. In addition, 'learning to play musical instruments' was the expectation of 32.7% and 23.2% of the students with and without previous music education, respectively. The differences between the observed percentages of the groups were not statistically significant ( $\chi^2_{(2)} = 4.743$ ,  $p > 0.05$ ).

*Students' Expectations of the Teaching Process according to the Presence/Absence of Previous Amateur Music Education*

In Table 3, the cross-table and chi-square results of whether or not previous amateur music education affected the students' top three expectations of the teaching process of the music course are given.

**Table 3**

*Effects of Previous Amateur Education on the Students' Expectations of the Teaching Process in the Course*

	Views on the teaching process						Total		$\chi^2$
	Instructor performance		Attending concerts		Performance-based practice		f	%	
<b>Previous music education</b>	f	%	f	%	f	%	f	%	$\chi^2 = 10.004$ sd = 2 p = 0.007
Yes	43	38.7	29	26.1	39	35.1	111	100	
No	89	43.4	76	37.1	40	19.5	205	100	

38.7% of those that had previously received music education and 43.4% of those without previous music education considered that as part of the teaching process, the instructors should perform appropriate examples of the musical works discussed in the course. In addition, attending concerts featuring the performance of musical works covered by the course program was chosen by 26.1% and 37.1% of the students with and without previous music education, respectively. These results indicate that the students with previous music education favored instructor performance and out-of-school concert activities in the teaching process at a higher rate than those without such education. Furthermore, it was determined that musical performance-based activities were expected by 35.1% of the students with previous music education and 19.5% of those without such education. The differences between the two groups concerning the observed percentages were statistically significant ( $\chi^2_{(2)} = 10.004$ ,  $p < 0.05$ ). Thus, it can be stated that the students that had previously received music education were more willing to engage in practice related to their own musical performance during the music course.

*Students' Expectations of the Evaluation Process according to the Presence/Absence of Previous Amateur Music Education*

Table 4 presents the cross-table and chi-square results of whether previous amateur music education affected the students' top three expectations of the evaluation process in the music course.

**Table 4**

*Effects of Previous Amateur Music Education on the Students' Expectations of the Evaluation Process in the Course*

	Views on the evaluation process						Total		$\chi^2$
	Multiple-choice		Homework (in groups)		Performance assessment		f	%	
<b>Previous music education</b>	f	%	f	%	f	%	f	%	$\chi^2 = 3.919$ sd = 2 p = 0.141
Yes	93	72.7	8	6.3	27	21.1	128	100	
No	214	76.7	26	9.3	39	14	279	100	

The results given in Table 4 reveal that 72.7% of the students with previous music education and 76.7% of those without previous music education preferred multiple-choice tests for the evaluation process of the course. In addition, 6.3% of the former and 9.3% of the latter expected to be assigned homework in groups, while the performance-based assessment was favored by 21.1% and 14%, respectively. There was no statistically significant difference between the two groups concerning the observed percentages ( $\chi^2_{(2)} = 3.919$ ,  $p > 0.05$ ).

*Students' Views on the Opening of other Music Courses according to the Presence/Absence of Previous Amateur Music Education*

Tables 5 to 7 present the cross-table and chi-square test results of the top three music courses that the students wanted to be opened according to whether or not they had previously received amateur music education.

**Table 5**

*Effects of Previous Amateur Music Education on the Students' Choice of Solfeggio as a New Course*

	Views on other music courses with different content						$\chi^2$
	Solfeggio Training				Total		
	Yes		No		f	%	
<b>Previous music education</b>	f	%	f	%	f	%	$\chi^2 = 7.298$ sd = 1 p = 0.007
Yes	56	31.8	120	68.2	176	100	
No	79	21.2	294	78.8	549	100	

Approximately 32% of the participants that had previously received amateur music education wanted to see the availability of a course on solfeggio. Of the students without amateur music education, only 21.2% wanted this course to be opened. The differences between the two groups concerning the observed values were statistically

significant ( $\chi^2_{(1)} = 7.298$ ,  $p < 0.05$ ). According to these findings, it can be stated that the participants who had previous amateur music education wanted solfeggio courses more than the other group.

**Table 6**

*Effects of Previous Amateur Music Education on the Students' Choice of Voice Training as a New Course*

Previous music education	Views on other music courses with different content						$\chi^2$
	Voice Training				Total		
	Yes		No		f	%	$\chi^2 = 9.238$ sd = 1 p = 0.002
f	%	f	%	f	%		
Yes	98	55.7	78	44.3	176	100	
No	156	41.8	217	58.2	373	100	

As shown in Table 6, 55.7% of the participants with previous amateur music education and approximately 42% of the participants without such education were in favor of the idea of a course on voice training being opened, while this was not deemed necessary by the remaining 44.3% and 58.2% of the former and latter groups, respectively. The differences in the observed values of the two groups were statistically significant ( $\chi^2_{(1)} = 9.238$   $p < 0.05$ ). Accordingly, it was interpreted that the students that had previously received amateur music education wanted to have the option of a voice training course more than those without such background.

**Table 7**

*Effects of Previous Amateur Music Education on the Students' Choice of Instrument Training as a New Course*

Previous music education	Views on other music courses with different content						$\chi^2$
	Instrument Training				Total		
	Yes		No		f	%	$\chi^2 = 6.879$ sd = 1 p = 0.009
f	%	f	%	f	%		
Yes	122	69.3	54	30.7	176	100	
No	215	57.6	158	42.4	373	100	

Table 7 reveals that 69.3% and 57.6% of the participants with and without previous music education considered that a new course focusing on how to play musical instruments should be made available, whereas this was not one of the preferences for the remaining 30.7 and 42.4%, respectively. A statistically significant difference was

noted between the observed values of the two groups ( $\chi^2_{(1)} = 6.879$   $p < 0.05$ ). In this context, the findings suggest that the participants that had previously received amateur music education wanted the option to enroll in a course where they could learn to play a musical instrument more than those without previous music education.

#### *Results concerning the Third Research Question*

The third research question aimed to investigate whether the students' expectations of the applied course content differed according to the presence/absence of amateur music education or their ability to play a musical instrument.

Tables 8 and 9 present the cross-table and chi-square results of the students' expectations of the applied course content in relation to whether they had previously received music education, and they were able to play a musical instrument, respectively.

**Table 8**

*Effects of Previous Amateur Music Education on the Students' Expectations of the Applied Course Content*

		N	Mean rank	Rank sum	U	p	r
<b>Instrument Training</b>	<b>Yes</b>	173	299.46	51806.5	26216.5	0.001	0.14
	<b>No</b>	364	254.52	92646.5			
<b>Voice Training</b>	<b>Yes</b>	165	294.74	48632	24793	0.001	0.14
	<b>No</b>	362	249.99	90496			
<b>Rhythm Training</b>	<b>Yes</b>	168	295.38	49623	25053	0.001	0.14
	<b>No</b>	360	250.09	90033			

When Table 8 is examined, it is seen that the students that had previously received amateur music education had a higher mean rank (299.46) in relation to their expectations of instrument training being included in the content of the music course compared to those that did not have such education (mean rank: 254.52). The two groups significantly differed concerning the mean ranks ( $U = 26216.5$ ,  $p < 0.01$ ). These results suggest that amateur music education had a significant effect on the students' preference for musical instrument training being included in the content of the music course. However, the calculated effect size value ( $r = 0.14$ ) showed that a low-level effect.

In a similar vein, the students with amateur music education had a higher mean rank related to their preference of voice and rhythm training to be included in the course content compared to those without such education, and there was a statistically significant difference between the two values ( $U = 24793$ ,  $p < 0.01$ ;  $U = 25053$ ,  $p < 0.01$ ). The calculated effect size revealed that having amateur music education had a low

impact on the students' preference for voice or instrument training to be included in the course content ( $r = 0.14$ ).

**Table 9**

*Effects of the Students' Ability to Play Instruments on their Expectations of the Applied Course Content*

		N	Mean rank	Rank sum	U	p	r
<b>Instrument training</b>	<b>Yes</b>	170	294.72	50102	27333	0.011	0.11
	<b>No</b>	370	259.37	95968			
<b>Voice training</b>	<b>Yes</b>	165	276.08	45552.5	28367.5	0.266	-
	<b>No</b>	365	260.72	95162.5			
<b>Rhythm training</b>	<b>Yes</b>	166	291.92	48459.5	25991.5	0.006	0.12
	<b>No</b>	365	254.21	92786.5			

The students that were able to play a musical instrument had a statistically significantly higher mean rank concerning their preference of the course content including instrument and rhythm training compared to those that were not able to play a musical instrument ( $U = 27333$ ,  $p < 0.05$ ;  $U = 25991.5$ ,  $p < 0.01$ ). However, the effect sizes calculated indicated that the students' ability to play a musical instrument only had a low impact on their level of preferences of instrument and rhythm training ( $r = 0.11$ ;  $r = 0.12$ ).

Lastly, concerning the inclusion of voice training in the course content, there was no statistically significant difference in the mean rank values of the two groups ( $U = 28367.5$ ,  $p > 0.05$ ).

### Discussion, Conclusion and Recommendations

The top three reasons given by the students for choosing the music course were their interest in music, willingness to improve themselves, the easy nature of the course, and lack of an alternative. In a study conducted by Em, Yondem and Ece (2018), it was reported that the students chose this course largely due to their interest. In another study, Gurgan (1986) determined that the majority of students chose this course to acquire general information about music.

In the current study, the students' expectations of the course objective were mostly being able to recognize different genres of music, followed by learning how to play musical instruments, performing rhythmic exercises, and singing. In previous research, Kaya and Ustun (2013) found that the majority of the students thought that the elective music course was oriented toward practice. Similarly, some of the students in the study by Gurgan (1986) suggested that the course program should be prepared with an emphasis on playing instruments in addition to the introduction of general information on music.

The three genres that the students expected to be included in the music course were Turkish Folk Music, Turkish Art music, and Rock music. In the study of Gurgan (1986), some of the students provided suggestions, such as 'listening to examples of all kinds of music in the class' and 'going to concerts'. The expectations of the students in our sample concerning the applied course content were rhythm, instrument and voice training in the order of preference.

Among the activities that the students wanted to be included in the teaching process of the course, the three most preferred were the instructors giving musical performance/concerts of some of the appropriate musical works discussed in the course, attending out-of-school concerts featuring the performance of musical works covered by the course program, and engaging in activities based on musical performance. In the research conducted by Em, Yondem and Ece (2018), the activities that the students expected from this course were mostly identified as instrumental concerts, seminars on musical instruments, student-centered activities (such as concerts), instrument training in-class hours, music activities undertaken by the music department, music seminars, simple song training (accompanied by play), mini-concerts given by the instructor of the course, collective singing in the class, voice exercises in the class, and music contests.

In this study, the top three preferences of the students about the evaluation process of the course were tests consisting of multiple-choice questions, assessment of practice based on musical performance applications, and homework to be assigned in groups.

The majority of the students were in favor of the opening of new music courses with different content. The students in favor of the availability of other music courses with different content mostly preferred to receive instrument, voice and solfeggio training. Similarly, on the completion of their research eliciting student views, Em, Yondem and Ece (2018) concluded that the music course could be improved concerning various aspects. This is also consistent with the study of Gurgan (1986), who referred to the presence of students that proposed to prepare and implement individualized programs within the music course curriculum according to the different talent and desire groups and to extend the course to cover different branches of music.

The students' reasons for enrolling in the music course differed according to whether or not they had received pre-university amateur music education, and the students that had such background chose this course because they were more interested in music compared to those without previous music education who mostly considered this course as an opportunity to improve themselves. However, in this research, the students' expectations of the course objective did not differ according to the presence/absence of previous amateur music education.

Having received pre-university amateur music education had a significant effect on the students' preferences related to the inclusion of instrument, voice and rhythm training in the applied course content. However, this effect was at a low level. Furthermore, being able to play a musical instrument had a significant, albeit low-level, effect on the students' preference regarding the inclusion of instrument and



rhythm training in the course content. However, no statistically significant difference was found in the students' preferences regarding voice training in relation to their ability to play a musical instrument.

The results of the present study indicated that the students with pre-university amateur music education preferred to conduct more performance-based activities as part of the teaching process of the course in contrast to the students without music education background, who mostly stated that they would like to see the instructors perform musical works or to attend concerts during the teaching process. However, the students' expectations of the evaluation process of the course did not significantly differ according to whether they had received amateur music education. Lastly, the findings showed that the students with amateur music education wanted to see the availability of courses on solfeggio, instrument and voice training at a higher rate than the other group.

The following recommendations are made to encourage students' permanent learning in light of the findings obtained in this study: During the music course, in addition to verbal instruction, students can be engaged in activities related to musical performance. Of the musical works included in the course program, some of those that are appropriate can be performed by the instructor. The students and the instructor could attend music concerts as a class. Various videos, documentaries and films on the musical works, depending on availability, could be presented during class hours. Furthermore, music courses can be diversified, and courses can be opened for different theoretical and practice topics of music. The physical infrastructure required for applied courses should be improved. Programs can be developed for different content music courses. Studies should be conducted to investigate the potential effects of opening such courses on students.

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## Üniversite Öğrencilerinin Seçmeli Müzik Dersine Yönelik Beklentileri

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### Özet

*Problem Durumu:* Üniversitelerde belli bir mesleğe yönelik eğitim verilmektedir. Ancak; gelişmiş ülkelerde bireylerden artık sadece mesleki bilgilere sahip değil; bununla beraber entelektüel olarak da donanımlı olmaları beklenmektedir. Üniversitelerdeki seçmeli dersler bireylere bu konuda olanaklar tanımaktadır. Sanat, spor gibi alanları içeren seçmeli dersler öğrencilere farklı bakış açıları kazandırabilir. Kendilerini geliştirebilmeleri konusunda farklı kapılar açabilir. Öğrencilerin derse yönelik beklentilerinin belirlenmesi ise dersin öğretim sürecine katkı sağlayabilir.

*Amaç:* Bu çalışmada, Ankara Üniversitesi'nde çeşitli fakültelerde okuyan ve seçmeli müzik dersi alan öğrencilerin; müzik dersini seçme nedenlerini, dersin amacına yönelik beklentilerini, dersin içeriğine yönelik beklentilerini, dersin öğretim sürecine yönelik beklentilerini, dersin değerlendirme sürecine yönelik beklentilerini, farklı içerikte müzik derslerinin açılmasına yönelik beklentilerini belirlemek; öğrencilerin dersi seçme nedenlerinin, öğrencilerin dersin amacına, öğretim sürecine, değerlendirme sürecine, farklı içeriklerdeki müzik derslerinin açılmasına yönelik beklentilerinin, amatör olarak müzik eğitimi alıp almama durumuna göre farklılaşım farklılaşmadığını belirlemek; öğrencilerin dersin içeriğine yönelik beklentilerinin, amatör müzik eğitimi alıp almama ve çalgı çalıp çalamama durumlarına göre farklılaşım farklılaşmadığını belirlemek amaçlanmıştır.

*Yöntem:* Araştırma, betimsel bir çalışmadır. Çalışma grubu Ankara Üniversitesi'nde çeşitli fakültelerde öğrenim gören 552 öğrenciden oluşmaktadır. Araştırmada gerekli verilerin toplanması için anket formu oluşturulmuştur. Verilerin analizinde, frekans, yüzde değerlerinden yararlanılmış, Man Whitney U ve ki kare bağımsızlık testleri hesaplanmıştır. Verilerin analizinde SPSS 21.0 yazılımından faydalanılmıştır.

*Bulgular:* Çeşitli fakültelerden öğrencilerin katılımı ile yapılan bu çalışmada, öğrencilerin, müzik dersini seçme sebepleri, dersin amacına yönelik beklentileri, dersin içeriğinde yer almasını istedikleri müzik türleri, dersin içeriğinde yer almasını istedikleri uygulamaya yönelik konular, öğretim sürecine yönelik tercih ettikleri etkinlikler, dersin değerlendirme sürecine yönelik beklentileri, farklı içerikte müzik derslerinin açılmasına yönelik beklentileri tespit edilmiştir.

Öğrencilerin dersi seçme nedenleri, dersin öğretim sürecine yönelik beklentileri, farklı içerikte derslerin açılmasına yönelik beklentileri üniversite öncesinde amatör müzik eğitimi alma durumlarına göre farklılaşmaktadır. Öğrencilerin dersin amacına yönelik beklentileri, değerlendirme sürecine yönelik beklentileri müzik eğitimi alma durumuna göre farklılaşmamaktadır.

Öğrencilerin dersin içeriğinde yer almasını istedikleri uygulamaya yönelik konularda çalgı eğitimi, ses eğitimi, ritim eğitimi tercihlerinde, amatör müzik eğitimi alma durumları anlamlı bir etkiye sahiptir. Ancak, bu durumun düşük bir etkiye sahip olduğu belirlenmiştir. Öğrencilerin çalgı eğitimi ve ritim eğitimi tercihlerinde çalgı çalabilme durumları anlamlı bir etkiye sahiptir. Ancak, bu durumun düşük bir etkiye sahip olduğu belirlenmiştir. Çalgı çalabilen öğrencilerin seçmeli müzik dersinin içeriğinde ses eğitimi olmasını istemelerine yönelik fark ise anlamlı değildir.

*Sonuç ve Öneriler:* Öğrenciler, müzik dersini seçmelerinin sebeplerini en çok ilk üç sırada, ilgi duymaları, müzik konusunda kendilerini geliştirmek istemeleri, dersin kolay olduğunu düşünme ve seçecek başka ders olmaması olarak belirtmişlerdir. Em, Yöndem ve Ece'nin (2018) çalışmasında öğrencilerin dersi tercih etme sebeplerinin büyük ölçüde ilgilerinden dolayı kaynaklandığı belirtilmiştir. Gürkan'ın (1986) araştırmasında öğrencilerin büyük kısmının dersi, müzik hakkında genel bilgi edinmek amacıyla seçtiği belirlenmiştir.

Öğrencilerin dersin amacına yönelik beklentileri, sırasıyla müzik türlerini tanımak, çalgı çalabilmek, ritim uygulaması yapabilmek, şarkı söyleyebilmektir. Kaya ve Üstün'ün (2013) araştırmasında öğrencilerin büyük çoğunluğu seçmeli müzik derslerinin uygulamaya yönelik olması görüşündedir. Gürkan'ın (1986) araştırmasında öğrencilerin bir kısmı, programların, genel müzik bilgisi yanında enstrüman çalma ağırlıklı olacak şekilde hazırlanmasını önermişlerdir.

Öğrencilerin dersin içeriğinde yer almasını en çok oranla bekledikleri üç müzik türü Türk Halk Müziği, Türk Sanat Müziği ve Rock Müziği'dir. Gürkan'ın (1986) araştırmasında öğrencilerin bir kısmı "bütün müzik türlerinden örnekler dinletilmeli ve konserlere gidilmeli" şeklinde önerilerde bulunmuştur. Öğrencilerin uygulamalı konulara yönelik beklentileri ise en çok tercih edilme sırasına göre ritim eğitimi, çalgı eğitimi, ses eğitimine yönelik konulardır.

Öğrencilerin dersin öğretim sürecinde yer almasını istedikleri etkinliklerden en çok tercih ettikleri üç etkinlik sırasıyla derste ele alınan eserlerden uygun olanlarının öğretim elemanı tarafından çalınması/müzik dinletilerinin yapılması; derste ele alınan eserlerin bulunduğu konserlere gidilmesi; derste öğrencilere müzikal performansa dayalı uygulamalar yaptırılması etkinlikleridir. Em, Yöndem ve Ece'nin (2018), araştırmasında, öğrencilerin derste bekledikleri etkinlikler büyük ölçüde, "Dersin öğrencileri tarafından yapılan enstrümantal konserler, enstrüman tanıtım seminerleri, öğrenci merkezli etkinlikler (öğrenci konseri, dinletisi vb.), derste enstrüman eğitimi, müzik bölümü tarafından yapılan konser etkinlikleri, müzik seminerleri, basit şarkı eğitimi (oyun eşliğinde), dersin öğretmeni tarafından yapılan mini konser, derste toplu şarkı söyleme, derste ses egzersizi yapma, müzik yarışmaları" gibi görüşler olarak tespit edilmiştir.

Öğrencilerin dersin değerlendirme sürecine yönelik beklentileri en çok tercih ettikleri seçenekler ilk üç sırada, çoktan seçmeli soruların olduğu testler; müzikal performansa yönelik uygulamaların değerlendirilmesi, grup çalışması olarak sınıf dışında yapılacak ödevlerdir.

Öğrencilerin büyük bir kısmı farklı içerikte müzik derslerinin açılmasından yanadır. Farklı içeriklerde dersler açılmasını isteyen öğrenciler çoğunlukla, çalgı eğitimi, ses eğitimi ve solfej derslerinin açılmasını tercih etmişlerdir. Em, Yöndem ve Ece'nin (2018) araştırmasında "Öğrencilerin görüşlerine göre müzik dersinin farklı açılardan geliştirilebilir olduğu düşünülmektedir" ifadesi yer almaktadır. Gürkan'ın (1986) araştırmasında müzik ders programı içinde, ayrı yetenek ve istek gruplarına göre ayrı ayrı programların hazırlanıp uygulanması ve dersin sadece bir dala bağlı kalmayıp müziğin farklı kollarını da içine alıp genişletilmesi önerilerinde bulunan öğrenciler olmuştur.

Öğrencilerin ders seçme nedenleri, üniversite öncesinde amatör olarak müzik eğitimi almalarına göre farklılaşmakta olup, eğitim alan öğrencilerin almayanlara göre daha çok ilgi duydukları için, almayanların alanlara göre daha çok kendilerini geliştirmek için dersi seçtikleri tespit edilmiştir. Öğrencilerin dersin amacına yönelik beklentilerinin amatör olarak müzik eğitimi alma durumlarına göre farklılaşmadığı saptanmıştır.

Öğrencilerin dersin içeriğinde yer almasını istedikleri uygulamaya yönelik konularda çalgı eğitimi, ses eğitimi, ritim eğitimi tercihlerinde, amatör müzik eğitimi alma durumları anlamlı bir etkiye sahiptir. Ancak, bu durumun düşük bir etkiye sahip olduğu belirlenmiştir. Öğrencilerin çalgı eğitimi ve ritim eğitimi tercihlerinde çalgı çalabilme durumları anlamlı bir etkiye sahiptir. Ancak, bu durumun düşük bir etkiye sahip olduğu belirlenmiştir. Çalgı çalabilen öğrencilerin seçmeli müzik dersinin içeriğinde ses eğitimi olmasını istemelerine yönelik fark ise anlamlı değildir.

Üniversite öncesinde amatör müzik eğitimi alan öğrencilerin almayanlara kıyasla dersin öğretim sürecinde öğrencilere performansa dayalı uygulamalar yaptırılmasını daha çok tercih ettikleri; amatör müzik eğitimi almayan öğrencilerin alanlara kıyasla öğretim sürecinde öğretim elemanının müzikal performans göstermesini ve ilgili konserlere gidilmesini daha çok tercih ettikleri belirlenmiştir.

Öğrencilerin dersin değerlendirme sürecine yönelik beklentilerinin amatör olarak müzik eğitimi alma durumlarına göre farklılaşmadığı tespit edilmiştir. Amatör müzik eğitimi alan öğrencilerin almayanlara göre, solfej, çalgı eğitimi ve ses eğitimi derslerinin olmasını daha çok istedikleri saptanmıştır.

Çıkan sonuçlar doğrultusunda müziğin farklı alanları ile ilgili, farklı içeriklerde dersler açılması önerilebilir. Söz konusu dersler için program geliştirme çalışmaları yapılabilir. Derslerin öğrenciler üzerindeki etkilerini inceleyen çalışmalar yapılabilir.

*Anahtar Kelimeler:* Müzik dersi, üniversite öğrencileri, seçmeli dersler, amatör müzik eğitimi.





## Effect of Extreme and Acquiescence Response Style in TIMSS 2015\*

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### ABSTRACT

**Purpose:** Cross-cultural comparisons based on ordinal Likert-type rating scales have been threatened by response style which is systematic tendencies to respond to items regardless of the item content. So, this study aimed to investigate the effect of extreme response style and acquiescence response style on TIMSS 2015 data.

**Method:** The sample of this descriptive study

included eighth grade students of the countries Japan, Korea, Taipei, Turkey, Oman and Jordan. Students' responses to scale regarding value on mathematics were used. To examine the impact of response styles, partial credit model and partial credit model with response style were analyzed. Also, the estimates obtained from these models were compared

**Findings:** It was found that response styles existed in TIMSS 2015 data. Furthermore, the number of the students selecting the extreme categories were found to be lower than that of the students selecting relatively middle response categories. Additionally, item thresholds of the extreme categories were found to be distorted leading to biased determination of item response curves.

**Implications for Research and Practice:** The presence of the response style in the large-scale assessment which guides policy makers in their regulations in the educational systems and gives information to teachers in their practices lead researchers to examine and control the effect of them.

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## Introduction

Political and social scientific awareness of the globalizing world has shaped the trends of the topics addressed in the research studies. More precisely, they have boosted the cross-cultural studies to focus on non-cognitive constructs in recent decades thanks to their ability to predict not only cognitive ability but also educational and organizational outcomes (Hough & Dilchert, 2010). Also, focusing on non-cognitive variables in education and organizational research might give a chance to better predict the achievement in these areas and help to understand these variables in cultural contexts. Especially in education, there is an increased interest of cross-cultural studies in examining non-cognitive factors and their relationships with educational achievement outcomes (Richardson, Abraham & Bond, 2012). Despite many advantages, assessment of non-cognitive constructs such as value and attitude have a number of handicaps that are not the case for cognitive ability assessment. One of them is that test scores obtained from assessment of non-cognitive constructs may be susceptible to the influence of response styles (McGrath, Mitchell, Kim & Hough, 2010). The primary approach used to measure non-cognitive characteristics is to provide a set of statements with a sequential list of descriptors to respondents to determine their level of agreement (Likert, 1932). However, using the list of descriptors has been reported to be vulnerable to response style bias such as extreme response style (ERS), acquiescence response style (ARS), and mid-point response style, etc. (Van Herk, Poortinga & Verhallen, 2004). They threaten the validity of the scores obtained from the scales measuring non-cognitive constructs (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). In cross cultural research, the most commonly encountered response styles affect the associations between a construct and the substantive trait of interest are ARS and ERS (Fischer, 2004). ARS is the tendency to provide positive response to the items without considering their content (Van Herk, Poortinga & Verhallen, 2004). It is also called as "agreement tendency" (Greenleaf, 1992). On the other hand, ERS is the tendency to select extreme end points of response categories such as "strongly agree/disagree" (Chun, Campbell & Yoo, 1974). Specifically, differences in ERS could distort differences in the group means. It also affects item correlations and increases or decreases reliability regarding the internal consistency. Moreover, ERS affects the level of correlations between measures, and thus the results obtained from factor or cluster analyses. On the other hand, ARS usually causes the mean of the item to be estimated more or less than its' true score (Fischer, Fontaine, van de Vijver & van Hemert, 2009), leading to biased results. These biased scores may lead to Type I or Type II error, resulting in erroneous conclusions (Hutton, 2017). Since both attitudes and the response style can differ from one culture to another, obtaining the difference among these attitudes can either present the actual cultural differences in attitudes of the interest or in response style (Eid, Langeheine & Diener, 2003). Therefore, to reveal the real situation which exist in the different cultures, the impact of response styles should be examined.

In the literature, there is no single accepted method addressing response style threat although there is a consensus that they adversely affect the measurement of attitudes. This division in approaches may prevent applied researchers investigating



the degree to which measurement issues distort their findings and controlling for such biases systematically. In this regard, this paper comes up with several important arguments to use Item Response Theory (IRT) approach for detecting ERS and ARS in culturally diverse groups which allows for adjustment for response styles. To make social researchers more familiar with the issue of detecting response style, Tutz, Schauberger and Berger (2018) proposed a Partial Credit model with response style (PCMRS) which allows for adjustment for response style behavior. Usefulness in differentiating the substantive trait and response style and being easy to implement in respective software make this model readily available to researchers.

#### *Alternative Approaches*

In general, in the literature, two different approaches exist for handling the response styles. In the first one, items that are uncorrelated with the items measuring the substantive characteristic are (Greenleaf, 1992; Weijters, Geuens & Schillewaert, 2010) added to scale to detect the response styles. In the second one, the scale's own items which were originally intended to measure the substantive characteristics are used. In other words, in this approach there are no extra items added to the scale. A disadvantage of them is that "they are generally little to rectify the effects of response style on resulting scores once detected" (Bolt & Johnson, 2009, p.337). In other words, they do not allow researchers to obtain response style-adjusted scores of the individuals.

In addition to different approaches detecting response styles, various statistical techniques were used to examine them. The most primitive one is to determine several descriptive statistics (Reynolds & Smith, 2010). This approach is simple when compared to the other approach. However, descriptive statistics are not sufficiently explanatory enough since this technique cannot distinguish the response styles from the trait of interest. Therefore, it is difficult to determine whether the responses of the individuals reflect the response style, the actual characteristic to be measured, or both.

Other than primitive techniques, there are also more novel techniques which were introduced in the framework of Structural Equation Modeling (SEM) or IRT. In the first technique, confirmatory factor analysis (CFA) was performed to detect response styles. In CFA, response styles were usually considered as continuous latent variables (Billiet & McClendon, 2000). Instead of using CFA, latent class analysis can be used to determine subgroups of individuals who show different behaviors in terms of choosing the response categories. However, at this time the response styles were handled as categorical variables (Moors, 2010). In the second technique, several studies used a multidimensional nominal response model to determine and adjust the effect of ERS (Bolt & Johnson, 2009). Moreover, PCM, one of the polytomous IRT models, was adapted as mixture models to determine latent groups of different response styles (e.g., Austin, Deary & Egan, 2006). In mixture models, it was supposed that respondents belong to distinct latent classes. While some of the classes may represent response styles, some of them may represent the substantive trait. In this case, from one class to other class item response models fitting within different classes can change. A problem of performing them is that the number of classes is not known in

advance. Therefore, how to interpret the model within classes is a problematic issue. Even if the number of classes is determined, it is still hard to explain the difference between classes. Also, explanation of the trait represented by a class can be more complicated since it may be a response style or another trait responsible for selection of item response categories. Additionally, response styles are considered as a discrete trait (Bolt & Johnson, 2009). However, in the psychology, response style is often considered as a continuous trait (e.g. Prediger, 1999). In this case alternative models will be more proper. Recently, item response tree (IRTtree) models were analyzed to investigate response styles (Böckenholt & Meiser, 2017; Ilgun Dibek, 2019). It is more flexible in terms of modelling item response data. Also, it provides the researcher to model different types of response styles separately. However, flexibility brings along additional difficulties. Constructing the correct tree is sometimes difficult because there may be many options. On the other hand, there is no such vague situation when PCMRS, which is based on IRT framework, is used to model response style of the individuals. Also, it enables to determine whether response style exists or not. Furthermore, if the response style exists in data set, PCMRS allow to determine how strong the response style is (Tutz, Schauburger & Berger, 2018). PCMRS is distinct from all these strategies. In PCMRS, a specific parameterization is used. More specifically, for each individual, an additional parameter that determine the tendency of the individual who select extreme or middle response categories is added into the model. The general advantage of the PCMRS model for ERS and ARS lies in its simplicity of calculation and usefulness in clarifying several essential questions of these response styles, especially the amount of variance in person parameters that the response styles accounted for as well as the effect of them on estimates of item parameters (Tutz et al., 2018). As opposed to mixture models, this model provides the researchers to handle the response style as a continuous trait. Also, in this model, parameters regarding ability and response style can be simultaneously estimated, which helps to determine to the relationship between them. This approach can be used with not only partial credit model but also with ordinal latent trait models (Tutz et al., 2018). In fact, PCMRS can be seen as an extended version of PCM. To explain the association between PCM and PCMRS, after the basic PCM is briefly explained, PCMRS that includes response style parameters explicitly is considered.

#### *The Partial Credit Model*

Masters (1982) introduced the PCM. Suppose that the response of person  $p$  on one specific item  $i$  is given by  $Y_{pi} \in \{0, 1, \dots, k\}$ . In PCM, the probability of selecting the response category " $r$ " is as follows:

$$P(Y_{pi} = r) = \frac{\exp(\sum_{l=1}^r \theta_p - \delta_{il})}{\sum_{s=0}^k (\sum_{l=1}^s \theta_p - \delta_{il})}, \quad r = 1, \dots, k,$$

In this equation,  $\theta_p$  denotes the person parameter regarding substantive trait and  $(\delta_{i1}, \dots, \delta_{ik})$  denotes item parameters of item  $i$ . If one considers adjacent categories  $(r - 1, r)$ , PCM model can be presented as

$$\log \left( \frac{P(Y_{pi}=r)}{P(Y_{pi}=r-1)} \right) = \theta_p - \delta_{ir}, \quad r=1, \dots, k.$$

*The Partial Credit Model with Response Style*

Let the categories  $0, \dots, k$  denote the graded response categories of an item. The number of response categories that the item has can be even or odd:

*odd number of response categories.* If there is an odd number of response categories, then  $k$  is even, and assume that  $m$  represents the mid-point of the response categories (i.e.  $m=k/2$ ). In PCM, the predictor, when selecting between categories  $r-1$  and  $r$ , is denoted by  $\eta_{pir} = \theta_p - \delta_{ir}$ . The parameter  $\delta_{ir}$  identifies the choice between categories  $r-1$  and  $r$ . ARS and ERS are modeled by adjusting the thresholds  $\delta_{ir}$ . To detect the effect of response style, one more person parameter  $\gamma_p$  is added in the predictor. This parameter moves the thresholds of categories representing agreement and disagreement in opposite directions. In this case, PCMRS can be formulated as (Tutz, Schaubberger & Berger, 2018):

$$\log \left( \frac{P(Y_{pi}=r)}{P(Y_{pi}=r-1)} \right) = \theta_p + \gamma_p - \delta_{ir}, r = 1, \dots, m$$

$$\log \left( \frac{P(Y_{pi}=r)}{P(Y_{pi}=r-1)} \right) = \theta_p - \gamma_p - \delta_{ir}, r = m+1, \dots, k$$

In PCMRS, the predictor, when selecting between categories  $r-1$  and  $r$ , is as follows:

$$\eta_{pir} = \theta_p + \text{sgn}(m - r + 0.5)\gamma_p - \delta_{ir}, r = 1, \dots, k$$

where  $\text{sgn}(\cdot)$  represents the sign function. When " $x$ " takes value greater than "0" the  $\text{sgn}(x)$  takes a value of "1", and when  $x$  takes value greater than "0", the  $\text{sgn}(x)$  takes a value of "-1". Lastly, if  $x=0$ , then  $\text{sgn}(x) = 0$ . In this case, the response categories are divided into three categories. These categories are categories indicating the disagreement, the neutral category and categories indicating the agreement of the participants.

*even number of response categories.* If the number of categories is even, then  $k$  is odd. In this case, the response categories are divided into the disagreement and agreement categories at the point  $m = [k/2] + 1$ . So, the related PCMRS addressing the tendency of choosing middle and extreme categories can be formulated as follows:

$$\log \left( \frac{P(Y_{pi}=r)}{P(Y_{pi}=r-1)} \right) = \theta_p + \gamma_p - \delta_{ir}, r = 1, \dots, m-1$$

$$\log \left( \frac{P(Y_{pi}=r)}{P(Y_{pi}=r-1)} \right) = \theta_p - \delta_{ir}, r = m$$

$$\log \left( \frac{P(Y_{pi}=r)}{P(Y_{pi}=r-1)} \right) = \theta_p - \gamma_p - \delta_{ir}, r = m+1, \dots, k$$

For this case, the predictor can be defined as  $\eta_{pir} = \theta_p + \text{sgn}(m-r)\gamma_p - \delta_{ir}$ ,  $r=1, \dots, k$ .

To sum up, it is clearly understood that PCMRS model allows researchers to determine the effect of ERS and ARS simultaneously and it can be used for both even numbered and odd numbered response categories, as well. This paper is built on the study of Tutz, et.al.,(2018). The present study makde contributions to the related literature in many ways. Firstly, it provided the reader with a general picture of alternative approaches for detecting ARS and ERS in survey data. Moreover, in this study, in addition to brief explanation of partial credit model (PCM), a detailed explanation of the PCMRS proposed by Tutz, Schauburger and Berger (2018) for determining and eliminating the effect of response style behavior in various cultures was given. Also, this study heeded the call of several authors such as Van de Vijver and Leung (2000) and Moors (2004), and empirically examined the role of response style which distorts the measurement of attitudes by focusing on the changes in item and person parameters. As a result, this study will contribute to see the actual situation of students from different countries, which helps the related policy makers of these countries to be aware of this problem and make suitable changes in their education system. In this context, the research questions that this study sought to answer were as follows:

- i. Does the effect of response styles exist in TIMSS 2015 data?
- ii. How do the response styles affect the variability in person parameters of the countries participated in TIMSS 2015?
- iii. What is the percentage of students with different response styles in the countries participating in TIMSS 2015?
- iv. How do the response styles affect thresholds of the attitudinal items?
- v. How do item response curves differ with different amount of response style parameters?

## Method

### *Research Design*

This study is a descriptive research study regarding the detection of the effect of ERS and ARS among students and items (Johnson & Christensen, 2008). In descriptive research studies, there is no manipulation. They are conducted to provide the accurate characteristics of the individuals or the phenomenon.

### *Research Sample*

The eighth-grade students in the countries participated in TIMSS 2015 constituted the sample of this study. Students were selected by performing two-stage stratified sampling method. In the first stage, schools were randomly chosen in accordance with their proportion in the population. In the second stage, from each of these schools at

least one class was randomly chosen. All students in these classes were included in the study (LaRoche, Joncas & Foy, 2016). Population and sample of these countries are given in Table 1.

**Table 1**

*Population and Sample*

Country	Population		Sample	
	School	Student	School	Student
Japan	10406	1162528	147	4745
Korea	3007	587190	150	5309
Taipei	931	285714	190	5711
Turkey	15583	1298955	218	6079
Oman	669	55181	300	9105
Jordan	3108	145847	254	7861

As it is clear from Table 1, while number of schools in the sample changes from 147 to 300, the number of students in the sample changes from 4745 to 9105.

To determine which countries will be selected, students' scores on one of the affective constructs were included in this study considering the effect of response style on non-cognitive constructs. So, due to the association between value on mathematics and attitude toward mathematics, countries are ranked according to the percentage of students whose value on mathematics is high. In line with this criteria, three countries with the fairly highest attitude scores and three countries with the fairly lowest attitude scores were selected to determine whether the responses of the students reflect the response style or the actual score on value in mathematics. In total, six countries were selected. The percentages of the students who had a strong positive attitude toward mathematics are given in Table 2 (Mullis, Martin, Foy & Hooper, 2016).

**Table 2**

*Percentage of The Students Who Value Mathematics High*

Country	Students highly valued mathematics (%)
Japan	11
Korea	13
Taipei	10
<b>International Average</b>	42
Turkey	47
Oman	59
Jordan	65

As it is clear in Table 2, while the percentages of the students highly valued mathematics in Japan, Korea and Taipei are lower than that of the international average, the percentages of the students in Turkey, Oman and Jordan are higher than that of the international average. Also, it can be further stated that majority of the students in Jordan valued mathematics high.

#### *Research Instruments and Procedures*

The TIMSS 2015 student questionnaire dataset was used to conduct analysis. Related data set for each country was obtained from the official website (<https://timssandpirls.bc.edu/timss2015/international-database/>). This questionnaire includes items measuring students' demographic information, their home environment, school climate, and several affective constructs which are supposed to be related to mathematics achievement and science achievement. Specifically, in the present study, students' responses to items measuring valuing on mathematics were considered to examine the effect of ERS and ARS on them. Students valuing mathematics is related to their external motivation and it indicates the attitude towards the significance and benefits of mathematics (Wigfield & Eccles, 2000). All in all, students' levels of agreement with nine statements for this variable were measured. These statements have four response categories ranging from "strongly agree" to "strongly disagree".

The student questionnaire takes 15–30 minutes to complete. For the selected countries, the Cronbach alpha reliability coefficients of the scores obtained from students' valuing on mathematics scale ranged from .85 to .90. These scores are higher than 0.70, indicating that the reliability values are sufficient (Nunnally, 1978). Therefore, after the sufficient reliability coefficients were determined, further analyses were performed.

Since all samples of the countries were used (i.e there is no selection from sample) and imputation techniques may affect response categories (Mooi, Sarstedt, & Mooi-Rec, 2018) selected by students, the missing values in each data set were deleted instead of assigning a value. Also, in the same manner, since outliers may be the students displaying extreme response style, they were not removed from the sample, which is crucial and the main focus for this study. For the categories of attitudinal items, a reverse coding was done so that the higher values obtained from the scales would represent positive attitude toward mathematics.

#### *Data Analysis*

To determine whether the effect of response style exists in data set of the countries, a simple PCM and PCMRS that uses modified thresholds were fitted. In both models, marginal estimation was performed since the alternative estimation methods have several handicaps. For example, the joint likelihood estimation has to estimate many parameters, which causes estimates unstable. Also, it leads to asymptotically biased estimates (Tutz, Schauburger & Berger, 2018). Before conducting the analysis, assumptions of unidimensionality, local item independence, monotonicity, invariance of item and person parameters were tested (Hambleton & Swaminathan, 1985). More

precisely, when the scree plots for each country were examined, it was seen that there was a main factor, providing evidence of unidimensionality. Additionally, the local independence assumption was also met since the unidimensionality assumption was met as stated by Hambleton and Swaminathan (1985). Also, it was determined that the probability of selecting higher response categories of the item increases as the level of the individual's ability increases, that is, the option characteristic curves increase monotonically. To test invariance of the item parameters, item parameters were estimated by using two groups of students who were selected from the sample for each country and found similar to each other. To test the fact that person parameters are free from the items, the person parameters were estimated by using two different item sets and found to be similar to each other. All in all, all assumptions were met. Person parameters for the PCM and person and response style parameters for the PCMRS were assumed normally distributed. The estimated variance of the person parameters ( $\hat{\sigma}^2$ ) and the estimated covariance matrix

$$\hat{\Sigma} = \begin{pmatrix} \hat{\sigma}_{\theta}^2 & \hat{cov}_{\gamma,\theta} \\ \hat{cov}_{\gamma,\theta} & \hat{\sigma}_{\gamma}^2 \end{pmatrix}$$

between person and response style parameters were calculated by fitting the PCM and PCMRS to determine the presence of response styles in TIMSS 2015 data and the role of them in the variability of person parameters of the countries participated in TIMSS 2015. Additionally, by analyzing PCMRS model, for each student, the trait parameter ( $\gamma_p$ ) regarding response style were computed to determine the percentages of the students exhibiting ERS and ARS.

To determine the effect of response styles on item parameters and item response curves, scaled shifting of thresholds were used. Since the items used in this study has four response categories, individuals have to select either agreement or disagreement categories. In this case, for example, for item 1, the parameters  $\delta_{11}$ ,  $\delta_{12}$  and  $\delta_{13}$  determining the choice between categories 1 and 2, 2 and 3 and 3 and 4, respectively are modified as  $\hat{\delta}_{11} = \delta_{11} - \gamma_p$ ,  $\hat{\delta}_{12} = \delta_{12}$ , and  $\hat{\delta}_{13} = \delta_{13} + \gamma_p$ , where the parameters  $\delta_{ir}$  are estimated by PCM. The same modifications in item parameters were done for the other items. Item and person parameters were estimated using R package of "PCMRS" (Schauberger, 2018) and item response curves were plotted by using R packages of "dplyr" (Wickham, Francois, Henry & Muller, 2019), "mirt" (Chalmers, 2012) and "mirtCAT" (Chalmers, 2016). These parameters and curves obtained by using PCM and PCMRS were compared.

## Results

To determine whether the response style exist in TIMSS 2015 data and the influence of the response style on the variability in the person parameters of the countries, the estimated variance of the person parameters ( $\hat{\sigma}^2$ ) and the standard deviation of the response style parameters for the countries were determined by fitting PCM and PCMRS and obtaining ( $\hat{\Sigma}$ ). They were presented in Table 3:

**Table 3***Estimates Obtained from PCM and PCMSRS*

Countries	$\hat{\sigma}^2$	$\hat{\Sigma}$
Japan	1.73	$\begin{pmatrix} 1.47 & .13 \\ .13 & 3.24 \end{pmatrix}$
Korea	2.48	$\begin{pmatrix} 2.24 & -.09 \\ -.09 & 5.81 \end{pmatrix}$
Taipei	2.65	$\begin{pmatrix} 2.15 & .30 \\ .30 & 4.52 \end{pmatrix}$
Turkey	1.75	$\begin{pmatrix} 1.44 & .07 \\ .07 & 2.12 \end{pmatrix}$
Oman	1.65	$\begin{pmatrix} 1.17 & .06 \\ .06 & 1.80 \end{pmatrix}$
Jordan	2.49	$\begin{pmatrix} 1.64 & -.05 \\ -.05 & 2.67 \end{pmatrix}$

As it is shown in Table 3., the magnitude of the standard deviations of the response style for the countries Japan, Korea, Taipei, Turkey, Oman and Jordan ( $\hat{\sigma}_{\gamma(japan)} = 1.80$ ,  $\hat{\sigma}_{\gamma(korea)} = 2.41$ ,  $\hat{\sigma}_{\gamma(taipei)} = 2.13$ ,  $\hat{\sigma}_{\gamma(turkey)} = 1.46$ ,  $\hat{\sigma}_{\gamma(oman)} = 1.34$ ,  $\hat{\sigma}_{\gamma(jordan)} = 1.63$ , respectively) indicated that the presence of response styles in the data regarding students' value in mathematics should not be ignored for all countries. After the existence of the response styles in TIMSS 2015 was proved, the percentage of the students having extreme response style or acquiescence response style were examined. They were displayed in Table 4:

**Table 4***The Percentage of The Students Displaying Response Styles*

Countries	Students displaying ERS (%)	Students displaying ARS (%)	Students displaying none of ARS and ERS (%)
Japan	38.6	42.2	19.2
Korea	35.8	40.4	23.8
Taipei	32.7	40.9	23.3
Turkey	30.6	35.5	33.9
Oman	29.2	32.6	38.2
Jordan	34.9	36.8	28.3



As it can be understood from Table 4, the percentages of the students having ARS were fairly higher than that of the students having ERS for all countries. In other words, students in each country participated in TIMSS 2015 were less likely to choose extreme categories compared to other categories. In addition, the percentage of the students who do not have none of ARS and ERS ranged from 19.2 to 38.2.

When the effect of response styles on item parameters were examined, it was found that they distorted the estimates of item thresholds. In other words, the presence of response style led to biased estimation of item thresholds. Specifically, the estimates of the item parameters for item 1 were shown in Figure 1, separately for each country.

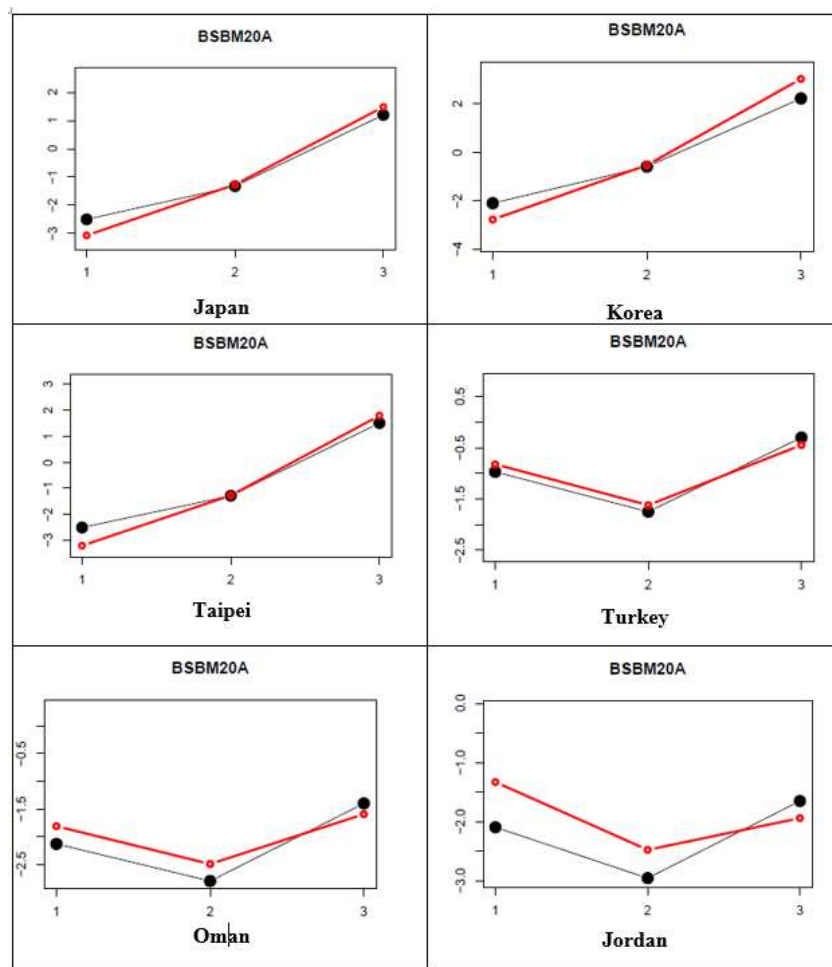


Figure 1. Estimates of thresholds for item 1 (code BSBM20A)

Since the items used in this study had four response categories, three thresholds were estimated. The red lines showed the estimates obtained from PCMRS and the black ones represented the estimates obtained from the PCM. As it is shown in Figure 1, for the first and the last threshold of the first item were obviously estimated differently by performing PCM and PCMRS for all countries, whereas the middle thresholds were fairly close to each other. In other words, it was found that when the effect of the response styles was neglected, the parameters of end points of response categories was observed to be distorted.

When the effect of different amount of response style traits ( $\gamma_p$ ) on item response curves were analyzed, it was found that the probabilities of selecting different item categories changed depending on the value of response style parameters of the students. As an example, the item response curves obtained from the responses of the Japanese and Turkish students to students' value in mathematics scale were given in Figure 2.

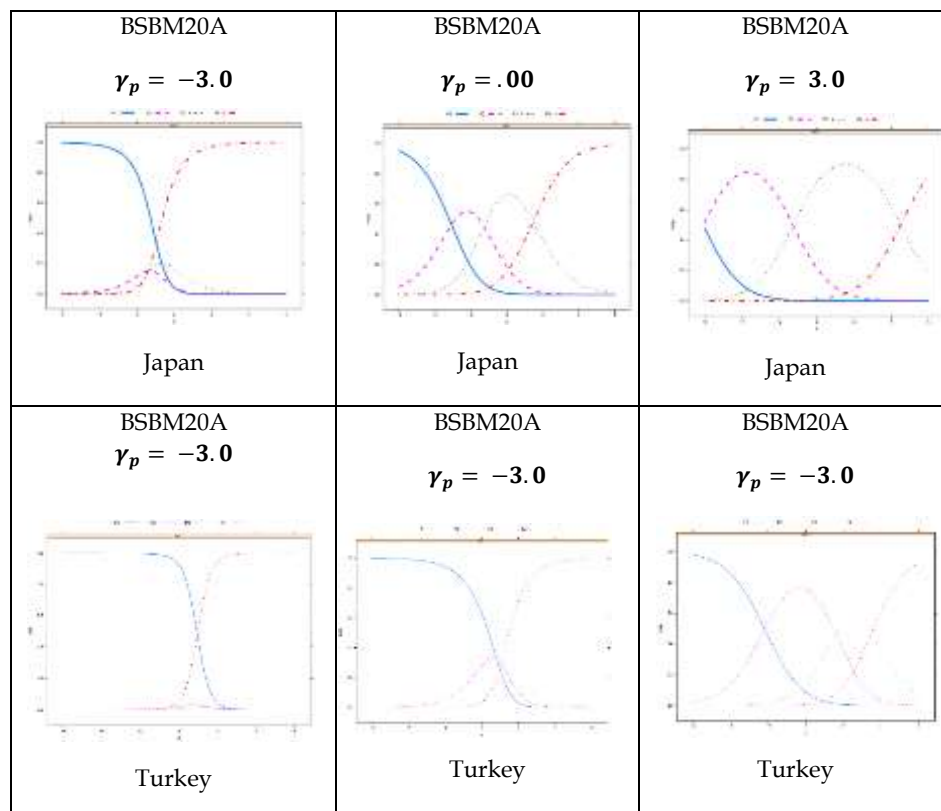


Figure 2. Item Response Curves of Item 1 (BSBM20A) with Different Gamma Parameters

It is clearly seen from Figure 2 that for both countries for  $\gamma_p = -3$ , the extreme categories of the item 1 (BSBM20A) were found to have higher probabilities than for  $\gamma_p = 0$ . The inverse was found for  $\gamma_p = 3$ . For example, if a Japanese student's trait regarding response style has negative value, it means that this student tended to choose more extreme categories compared to middle categories. Conversely, it was found that when the response style parameter of the Japanese student took positive value, this student was more likely to be affected by response styles ( $\gamma_p = 0$ ), it was found that the probabilities of choosing each category were fairly close to each other. The same pattern was also observed for the other countries and other items.

### Discussion, Conclusion and Recommendations

Response styles are one of the validity threats for assessment of non-cognitive constructs since they lead to biased interpretation of the differences found in international studies. Therefore, it is crucial to investigate the impact of response styles with an effective method. In this context, the current study examined the effect of ERS and ARS on students' valuing in mathematics by extending the use of a PCM model in the examination of response styles. To provide empirical evidence, both the effect of ERS and the ARS were investigated based on the responses to students' value in mathematics scale in TIMSS 2015 by including an additive parameter representing response style in PCM. To put it in different words, this study used PCMRS and calculated the estimated covariance matrix between person and response style parameters by fitting the PCM and PCMRS to determine the presence of response styles in TIMSS 2015 data.

The findings of this study replicate prior findings that response styles exist in data (Lu & Bolt, 2015). Also, it was concluded that response styles were one of the reasons of the variability in the person parameters of the selected countries participated in TIMSS 2015. The present study showed that when the effect of the response styles was not taken into consideration, variability of the person parameter regarding value on mathematics increased for each country. This finding is consistent with the study conducted by Tutz, Schauburger and Berger (2018) who investigated the effect of response styles on individuals' responses to items regarding tenseness. They found that the estimated variance of the person parameters decreased when they took into consideration the effect of response style. In this case, it can be stated that the reason for the decrease in variance within the individuals is the elimination of the difference in response style.

When the percentage of the students having ERS or ARS were examined, it was concluded that in each country the percentage of the students with ARS was higher than that of the students with ERS. This finding may result from several characteristics of the countries such as power distance, collectivism/individualism, and uncertainty avoidance (Harzing, 2006). When the cultural structures of the countries included in the current study are taken into consideration, it can be stated that the countries have a collectivistic structure according to the classification made by Hofstede (2001). Collectivistic countries prefer harmony, avoid confrontations and accept the opinions of the groups (Hofstede, 2001). They have a tendency of avoiding strong opinions.

Especially in East Asian countries, with the effect of teaching based on Confucianism, students keep themselves away from extreme decisions (Si & Cullen 1998). Therefore, societies dominated by collectivism tend to show middle or positive responses.

Concerning parameter estimation, it was concluded that response styles affected item parameters. Specifically, deviations were observed in threshold parameters at the endpoints. This effect may be associated with the variance of the latent trait regarding Japanese students' valuing on mathematics ( $\theta_{p(japan)}$ ). The variance of this person parameter for Japan decreased from 1.73 to 1.47 when the model took into consideration the response styles. Therefore, the variability in the population is related to the response style. This finding was supported by the study of Pelieninger and Heck (2018) who investigated the effect of several response styles indicated that response styles led to biased estimation of item parameters. They further emphasized that ARS causes the item difficulty parameters of the regular items to be underestimated and that of the reverse-coded items to be overestimated. The reason for this finding may be that due to the nature of the response styles, some students tended to select some of the response categories more which yielded to the accumulation of responses at certain response categories, regardless of the scale or items' content (Pearse, 2011). Therefore, this situation results in biased estimation of item parameters.

In parallel with the previous finding related to the effect of response style on item parameters, when the effect of response styles on item characteristics curves were examined, it was concluded that depending on the magnitude of the trait regarding response styles, item category selection of the students and thus the corresponding item characteristics curve changed. In line with this finding, Bolt and Johnson (2009) indicated that individuals having high level of ERS are more likely to choose the end points of response categories as opposed to individuals having low level of ERS. They further added that item characteristic curve invariance across groups, which is one of the assumptions of traditional unidimensional IRT models, cannot be established. This finding is related to the change in the item parameters in the presence of response style, which was proved in the previous finding.

This study provides important implications for researchers or practitioners who are willing to solve validity problems in large scale surveys. This study suggests that the investigation of the possible existence of response styles should be routine when comparing different countries in terms of the affective variables that they have. The evidences presented here is sufficient to alert researchers to the possible negative effects caused by the presence of ERS and ARS. Furthermore, the finding of the current study is informative for practitioners to determine the tendency of cultures when responding the surveys. As the PCMRS model taking into consideration of response style contamination produced less variability in person parameters regarding value in mathematics, it is reasonable to indicate that differences found in cross cultural comparisons may be due to response styles. In the similar manner, policymakers should take the role of response styles into consideration while making arrangements based on international comparison results. So, it is highly recommended that they should focus not only on the effectiveness of the education system but also on such response style effects.

This study is limited in several aspects. First, the items used in this study have only four response categories available to measure ERS and ARS. Therefore, this study could not detect the effect of MRS which requires mid-point. As it has been reported that different response formats affect the existence of response styles and lead to different response styles (Hui & Triandis, 1985), it is recommended that the effect of the same response styles can be re-examined by using different item formats. Secondly, this study examined the effects of response styles on only one affective construct, and further research can be conducted with several affective constructs such as confidence, interest, etc. and personality characteristics. To sum up, this study gives valuable information about the impact of response style factor in students' self-report in TIMSS.

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## Uç ve Kabullenici Tepki Stilinin TIMSS 2015'teki Etkisi

### Atf:

Ilgun Dibek, M. (2020). Effect of extreme and acquiescence response style in TIMSS 2015. *Eurasian Journal of Educational Research*, 87, 199-220. DOI: 10.14689/ejer.2020.87.10

### Özet

*Problem Durumu:* Globalleşen dünyada politik gelişmelerle birlikte bilimsel olmayan yapıların belirlenmesine odaklanılmıştır. Bu durumun nedenleri olarak bilişsel yapılar üzerinde etkisinin olması, başarının kestirilmesinde önemli bir rolünün olması, bilişsel yapıların çeşitli bağlamlar ve kültürlerde anlaşılmasını sağlaması sıralanabilir. Özellikle kültürler arası karşılaştırma çalışmalarında, akademik öz-yeterlilik, duyuşsal zeka, tutum gibi çeşitli bilişsel olmayan yapıların ve bu yapıların başarı ile ilgili çıktılarla ilişkisi üzerindeki ilgi giderek artmaktadır. (Richardson, Abraham & Bond, 2012). Bilişsel olmayan yapıların ölçülmesinin avantajlarının yanı sıra, değer, tutum gibi yapıların ölçülmesinde bilişsel yapıların ölçülmesinde söz konusu olmayan bazı sınırlılıklar söz konusudur. Bunlardan biri bu yapıların tepki stillerinin etkisine maruz kalmasıdır (McGrath, Mitchell, Kim, & Hough, 2010). Bilişsel olmayan yapıların ölçülmesinde sıklıkla kullanılan yaklaşım, cevaplayıcılara katılım düzeylerini belirleyecekleri birtakım ifadeler listesi vermektedir. Fakat bu yaklaşım, uç tepki stili (UTS), kabullenici tepki stili (KTS), orta nokta tepki (OTS) stili gibi bazı tepki stillerinin etkisine açıktır (Van Herk, Poortinga, & Verhallen, 2004). Kültürler arası karşılaştırma çalışmalarında sıklıkla karşılaşılan tepki stilleri UTS ve KTS'dir. UTS grup ortalamaların farklılaşmasına, iç tutarlılık anlamında güvenilirliğin düşmesine neden olurken KTS tip II hatanın oluşmasına yol açmaktadır.

Alan yazında, bu geçerlilik tehdidinin belirlenmesine yönelik kabul edilmiş tek bir yöntem yoktur. Bu yöntemlerden bazılarında çeşitli betimsel istatistikler hesaplanmakta veya bilişsel olmayan yapının ölçülmesinde kullanılan ölçekteki maddelerle ilişkisiz ilave maddeler eklenmektedir. Fakat bu yöntemler, tepki stilinin miktarını belirlemede yetersiz kalmaktadır. Bu yöntemlerin yanı sıra gizil sınıf analiziyle de tepki stillerinin etkisi belirlenebilmektedir. Fakat, bu yöntemin en büyük sınırlılığı tepki stilini süresiz bir değişken olarak ele almasıdır. Madde tepki kuramına dayalı bazı yöntemlerde ise bu sınırlılık ortadan kaldırılmıştır. Örneğin madde tepki ağacı modellerinde çeşitli tepki stillerinin etkisi rahatlıkla modellenilebilmektedir. Fakat, analiz öncesinde oluşturulması gereken ağaç farklı bir şekilde oluşturuldu ise analiz sonuçları yanlış çıkabilmektedir. Böyle bir belirsizlik tepki stilinin etkisinin dahil edildiği kısmi puan modelinde söz konusu değildir. Bu model sayesinde tepki stilinin etkisinin miktarı belirlenebilmektedir. Tepki stilini sürekli bir değişken olarak ele alan bu modelde, bireye ve tepki stiline ilişkin parametreler eş zamanlı olarak kestirilebilmekte ve böylelikle tepki stili ve bireyin tutumu arasındaki ilişkiler belirlenebilmektedir.

*Araştırmanın Amacı:* Bu çalışmanın amacı, tepki stillerinin etkisinin TIMSS 2015’de uygulan matematiğe yönelik verilen değerle ilgili veri setinde etkisinin olup olmadığını ve bu etkinin öğrencilerin değer puanları ve madde parametrelerinde nasıl bir değişime yol açtığını belirlemektir.

*Araştırmanın Yöntemi:* Betimsel modelde bu olan bu araştırmanın örneklemini TIMSS 2015 uygulamasına katılan ülkelerden Japonya ( $n_1=4745$ ), Kore ( $n_2=5309$ ), Tayvan ( $n_3=5711$ ), Türkiye ( $n_4=6079$ ), Umman ( $n_5=9105$ ) ve Ürdün ( $n_6=7861$ )’deki sekizinci sınıf öğrencileri oluşturmaktadır. Ülkelerin seçiminde matematiğe yönelik çok fazla değer veren öğrencilerin yüzdesinin en fazla ve en düşük olması durumu dikkate alınmıştır. Bir diğer ifade ile matematiğe fazla değer veren öğrencilerin fazla olduğu ve buna karşın başarıların düşük olduğu öğrencilerin yer aldığı ülkeler ile matematiğe değer veren öğrencilerin çok az olduğu ve buna karşın başarıların yüksek olduğu öğrencilerin yer aldığı ülkeler seçilmiştir.

Veri toplama aracı olarak öğrenci anketinin kullanıldığı bu çalışmada öğrencilerin matematiğe değer verme alt ölçeğine ait maddelere verilen cevaplar analiz sürecine dâhil edilmiştir. Bu doğrultuda, UTS’nin ve KTS’nin etkisini belirlemek amacıyla tepki stiline etkisinin dâhil edildiği kısmi puan modeli ve tepki stiline etkisinin dahil edilmedi kısmi puan modeli analiz edilmiştir. Tepki stillerinin birey parametreleri üzerindeki etkisini belirlemek amacıyla kovaryans matrisi ve birey parametrelerine ilişkin varyans değerleri hesaplanmıştır. Bunun yanı sıra, tepki stillerinin madde parametreleri üzerindeki etkisini belirlemek amacıyla madde eşik parametrelerinde düzeltme yapılmıştır. Madde ve birey parametrelerinin kestiriminde R programında “PCMRS” paketi (Schauberger, 2018) ve madde tepki eğrilerinin oluşturulmasında “dplyr” (Wickham, François, Henry, & Müller, 2019), “mirt” (Chalmers, 2012) and “mirtCAT” (Chalmers, 2016) paketleri kullanılmıştır.

*Araştırmanın Bulguları:* Araştırmanın sonuçlarına göre tepki stiline ait standart sapma değerleri ( $\hat{\sigma}_{Y(japonya)} = 1.80$ ,  $\hat{\sigma}_{Y(kore)} = 2.41$ ,  $\hat{\sigma}_{Y(tayvan)} = 2.13$ ,  $\hat{\sigma}_{Y(türkiye)} = 1.46$ ,  $\hat{\sigma}_{Y(umman)} = 1.34$ ,  $\hat{\sigma}_{Y(ürdün)} = 1.63$ ) öğrencilerin matematiğe yönelik değerlerine ait cevaplarında tepki stiline etkisinin olduğunu göstermektedir. Bunun yanı sıra, seçilen ülkelerde KTS’ye sahip öğrencilerin yüzdeki UTS’ye sahip öğrencilerin yüzdesinden fazladır. Araştırmanın bir diğer bulgusu ise tepki stillerinin madde eşik parametrelerin ve buna bağlı olarak madde tepki eğrileri üzerinde etkisinin olduğudur. Öğrencilerin tepki stiline ait parametre değerlerinin miktarına göre tepki kategorilerini seçme olasılıklarının değiştiği bulunmuştur.

*Araştırmanın Sonuçları ve Önerileri:* Araştırmada TIMSS 2015’in matematiğe yönelik değerle ilgili veri setinde tepki stiline etkisinin olduğu, seçilen ülkelerdeki öğrencilerin matematiğe yönelik değerle ilgili puanlarındaki değişimin bir nedeninin öğrencilerin sergilemiş olduğu tepki stillerinin olduğu sonucuna ulaşılmıştır. Aynı zamanda, seçilen ülkelerdeki öğrencilerin KTS sergileme eğilimlerinin daha fazla olmasında ülkelerin kültürel yapılarının etkili olduğu ifade edilebilir. Bunun yanı sıra, tepki stillerinin özellikle uç noktadaki eşik parametrelerinin kestiriminde ve bunlara bağlı olan madde tepki eğrilerinin oluşturulmasında yanlışlığa neden olduğu sonucuna ulaşılmıştır. İlerleyen

çalıřmalarda farklı madde formatlarının veya farklı sayıdaki tepki kategorilerin tepki stillerinin varlıęı konusundaki etkisi araştırılabilir. Bunun yanı sıra, tepki stilinin biliřsel olmayan farklı yapıların ölçülmesindeki etkisi de incelenebilir.

*Anahtar Sözcükler:* Kabullenici tepki stili, kültürler arası çalıřma, uç tepki stili, TIMSS



**Submission Checklist**  
**Makale Sunumu Kontrol Çizelgesi**

\* Aday makalenin değerlendirilmeye hazır olduğunu aşağıdakilerin her biri ile karşılaştırarak kontrol ediniz.

\* Indicate that this submission is ready to be considered by this journal by checking off the following.

<b>Manuscript Agreement:</b> <i>I / We hereby accept that, the article after being accepted for publication in the Eurasian Journal of Educational Research (EJER), the author (s) as, all rights related to the article has been transferred to the ANI PUBLISHING under the laws of the, "copyright transfer".</i> Makale Eurasian Journal of Educational Research (EJER) dergisinde basıma kabul edildikten sonra, yazar(lar) olarak; makale ile ilgili tüm hakları, "Telif Hakkı Devir" yasaları uyarınca, ANI YAYINCILIK'A devrettiğimizi kabul ediyoruz.		
<b>Manuscript Submission:</b> <i>I have prepared my manuscript based on the criteria listed below and I accept all submission conditions.</i> Makalemi aşağıda belirtilen kriterlere göre hazırladım ve makale gönderme koşullarının tamamını kabul ediyorum. <i>Indicate that this submission is ready to be considered by this journal by checking off the following.</i> Aday makalenin değerlendirilmeye hazır olduğunu aşağıdakilerin her biri ile karşılaştırarak kontrol ediniz.		
1	<input checked="" type="checkbox"/>	<i>The manuscript is a report of original educational research or a discussion article on research topics in education.</i> Aday makale, eğitim alanıyla doğrudan ilgili bir araştırma ya da tartışma yazısıdır.
2	<input checked="" type="checkbox"/>	<i>The submission has not been previously published, nor sent to another journal for consideration.</i> Sunulan çalışma daha önce herhangi bir yerde yayınlanmamıştır, başka bir derginin incelemesinde değildir.
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6	<input checked="" type="checkbox"/>	<i>Each paragraph is longer than two sentences.</i> Her bir paragraf en az üç cümle içermektedir.
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12	<input checked="" type="checkbox"/>	<i>The article is preceded by <b>English Structured Abstract of not more than 250 words</b> and not less than 200 using five required headings: <b>Purpose:</b> State the problem in field. Then explain the purpose of the study. <b>Method:</b> Specify the research design, sample, and research instrument and data analysis in brief. <b>Findings:</b> Highlight the significant, interesting or surprising results. <b>Implications for Research and Practice.</b> (These headings may need some adaptation in the case of discussion papers: <i>Background, Purpose of Study, Sources of Evidence, Main Argument, and Conclusions</i>). More information available from <a href="http://www.tandf.co.uk/journals/authors/rereabstracts.asp">http://www.tandf.co.uk/journals/authors/rereabstracts.asp</a></i> Yapılandırılmış İngilizce öz 200-250 sözcük uzunluğunda olup, aday makalenin başında yer almakta ve <b>Purpose</b> (ilk önce alanda karşılaşılan sorunu belirtelim. Daha sonra araştırmanın amacını bir cümle ile veriniz ), <b>Method</b> (Araştırma deseni, örneklem, veri toplama aracı ve verilerin analizini kısaca açıklayınız), <b>Findings</b> (En önemli ve çarpıcı araştırma bulgularını verelim) <b>Implications for Research and Practice</b> , (Uygulama ve ileriye dönük araştırmalar için olası çıkarımlarınız ) başlıklarını içermektedir. Bu başlıklar tartışma yazıları için: <i>Çalışmanın Temeli, Çalışmanın Amacı, Kanıt Kaynakları, Ana Tartışma ve Sonuçlar</i> şeklinde olabilir. Daha fazla bilgi için; <a href="http://www.tandf.co.uk/journals/authors/rereabstracts.asp">http://www.tandf.co.uk/journals/authors/rereabstracts.asp</a> adresine başvurunuz.
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14	<input checked="" type="checkbox"/>	<p>An extended (750-1000 words) Turkish structured abstract is placed following the "References" section using five required headings: Problem Statement, Purpose of Study, Methods, Findings and Results, and Conclusions and Recommendations. (These headings may need some adaptation in the case of discussion papers: Background, Purpose of Study, Sources of Evidence, Main Argument, and Conclusions). More information available from <a href="http://www.tandf.co.uk/journals/authors/rereabstracts.asp">http://www.tandf.co.uk/journals/authors/rereabstracts.asp</a></p> <p>Kaynakça'dan sonra 750-1000 sözcükten oluşan Türkçe yapılandırılmış öze yer verilmiştir. Türkçe yapılandırılmış öz <i>Problem Durumu, Araştırmanın Amacı, Araştırmanın Yöntemi, Araştırmanın Bulguları, Araştırmanın Sonuçları ve Önerileri</i> başlıklarını içermektedir. Bu başlıklar tartışma yazıları için: <i>Çalışmanın Temeli, Çalışmanın Amacı, Kanıt Kaynakları, Ana Tartışma ve Sonuçlar</i> şeklinde olabilir. Daha fazla bilgi için; <a href="http://www.tandf.co.uk/journals/authors/rereabstracts.asp">http://www.tandf.co.uk/journals/authors/rereabstracts.asp</a></p>
15	<input checked="" type="checkbox"/>	<p>Following the Turkish structured abstract, four to six keywords are included. Uzun Türkçe özetten sonra 4-6 anahtar sözcüğe yer verilmelidir.</p>
16	<input checked="" type="checkbox"/>	<p>References are not cited in the structured abstracts in English and in Turkish. İngilizce abstract ve Türkçe öz içerisinde atıfta bulunulmamıştır.</p>
17	<input checked="" type="checkbox"/>	<p>The format of headings, tables, figures, citations, references, and other details follow the <b>APA 6 style</b> as described in the <i>Publication Manual of the American Psychological Association, 6th edition</i>, available from <a href="http://www.apa.org">http://www.apa.org</a></p> <p>Aday makalenin başlıkları, tabloları, şekilleri, atıfları, kaynakçası ve diğer özellikleri tamamen APA altıncı baskıda belirtildiği şekildedir.</p>
18	<input checked="" type="checkbox"/>	<p>All illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.</p> <p>Aday makalenin şekilleri ve tabloları metin içerisinde bulunmaları gereken uygun yerlere yerleştirilmiştir. Makale sonunda sunulmamıştır.</p>
19	<input checked="" type="checkbox"/>	<p>Citations in the text of the document include the author's surname, the year of publication, and, when there is a specific quote from a source used, a page number where the quote is located in the text.</p> <p><b>Example:</b> Nothing seemed so certain as the results of the early studies (Tatt, 2001, p. 445). It was precisely this level of apparent certainty, however, which led to a number of subsequent challenges to the techniques used to process the data (Jones &amp; Wayne, 2002, p. 879). There were a number of fairly obvious flaws in the data: consistencies and regularities that seemed most irregular, upon close scrutiny (Aarns, 2003; West, 2003, p. 457).</p> <p>With studies by two authors, always include both author names: (Anderson &amp; Bjorn, 2003)</p> <p>As Anderson and Bjorn (2003) illustrated in their recent study</p> <p>As recently as 2003, a prominent study (Anderson &amp; Bjorn) illustrated</p> <p>When a study has 3, 4, or 5 authors, include the names of all the authors the first time the work is cited: (Anderson, Myers, Wilkes, &amp; Matthews, 2003)</p> <p>For all subsequent citations of this work, use "et al.": (Anderson et al., 2003)</p> <p>When a work has 6 or more authors, use et al.: (Bell et al., 2003)</p> <p>For unsigned works, include the title, enclosed in parentheses. Put quotation marks for short work titles, and italicize the titles of reports, books, and other significant works:</p> <p>("Recent Developments," 2004) (Dictionary of Tetrathalocigistic Diseases, 2004)</p>

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20	<input checked="" type="checkbox"/>	<p>Three levels of headings are used: Level 1, Level 3 and Level 4. The headings are formatted as follows: Centered Uppercase and Lowercase Heading (Level 1)  <i>Flush Left, Italicized, Uppercase and Lowercase Side Heading</i> (Level 3)  <i>Indented, italicized, lowercase paragraph heading ending with a period.</i> Start writing after the period (Level 4).</p> <p>Aday makale içerisinde üç farklı düzey başlık kullanılmıştır. Düzey 1, Düzey 2, Düzey 3. Başlıklar bu düzeylere uygun olarak aşağıdaki şekilde biçimlendirilmiştir:</p> <p>Ortalı ve Her Sözcüğün İlk Harfi Büyük Yazılmış Başlık (Düzey 1)  <i>Tam Sola Dayalı, İtalik ve Her Sözcüğün İlk Harfi Büyük Yazılmış Başlık</i> (Düzey 3)  <i>İçeriden, italik, tamamı küçük harflerle yazılmış ve nokta ile biten başlık.</i>  Noktadan sonra normal metin yazımına devam edilmeli (Düzey 4).</p>
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