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CONTENTS		Pages
	Inside cover	1
	Generics Page	2
	Contents	3
	Articles:	
1.	An Application of Cognitive Diagnosis Modeling in TIMSS: A Comparison of Intuitive Definitions of Q-Matrices	4
2.	Youth and Youth Education Activities in Konya Metropolitan Municipality	18
3.	An Investigation of Pre-Service English Language Teachers' Self-Efficacy Beliefs	41

An Application of Cognitive Diagnosis Modeling in TIMSS: A Comparison of Intuitive Definitions of Q-Matrices

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Abstract:

Detection of students' ability levels is one of the common aims in educational studies. Cognitive Diagnosis Modeling approach has been used recently for the purpose of ability level detection by defined Q-matrices. To evaluate students' strengths and weaknesses, determine their mastery skills, and design instructions and interventions in learning process, Cognitive Diagnosis Modeling approach can be helpful. Cognitive Diagnosis Modeling is an alternative approach to Item Response Theory, and provides more information using multiple fine-grained skills in problem solving process rather than order students on a latent proficiency continuum. This paper aims to use Cognitive Diagnosis Modeling (CDM) in order to investigate the definition of a Q-matrix across the cognitive skills of different years and countries in Trends in International Mathematics and Science Study (TIMSS). There is a subjective way in defining Q-matrices, an intuitive definition of Q-matrices, for this purpose, an application of building Q-matrices under specific Cognitive Diagnosis Models, from a set of expert proposed attributes is examined. The proposed attributes are used to build Q-matrices for TIMSS mathematics questions across its cycles, and across different nations.

Keywords: CDM, Q-matrix definition, cognitive assessment, TIMSS, attributes

Citation:

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INTRODUCTION

Nowadays International assessments have become more important in recent decades as a consequence of globalization. To compare and evaluate the quality of education across countries, many cross-national student assessments have been conducted to compare learning outcomes across countries (Hambleton, 2005). One of the most prominent exams is the Trends in International Mathematics and Science Study (TIMSS) sponsored by the Institute of Educational Sciences (AFT, 1999; Olson, Martin, & Mullis, 2008; Mullis, Martin, Foy, & Arora, 2012). TIMSS has been conducted every four years since 1995. For its last two cycles, technical reports provided average tests scores and percentages to show achievement gaps using classical test theory (CTT), and item response theory (IRT) to estimate achievements on specific cognitive domains (Olson et al., 2008; Mullis et al, 2012).

In mathematics education, in addition to the comparison of achievement scores, students' mastery level of specific attributes has been evaluated by using the TIMSS (Lee, Park, Taylan, 2011). The Rule Space Model (RSM; Tatsuoka, 1983) applied to TIMSS 1999 mathematics items, and 30 attributes are defined to show the gap across gender and ethnicities (Birenbaum, Tatsuoka, & Yamada, 2004; Birenbaum, Nasser, & Tatsuoka, 2007). Similarly, Chen, Thompson, Gorin, and Tatsuoka (2008), Dogan and Tatsuoka (2008) also used the RSM approach in TIMSS 1999 mathematics items to report the classification rates of the students by gender and ethnicity. Furthermore, Lee, Park, and Taylan (2011) investigated TIMSS 2007 mathematics items using a cognitive diagnosis model (CDM), specifically the deterministic, inputs, noisy, "and" gate (DINA; Haertel, 1989; Junker & Sijtsma, 2001) model to explain the reasons for achievement gaps. In this study, 15 attributes were defined and mastery proportions were given for each attribute of the United States data.

To compare TIMSS scores across years and across nations by CDM models, an attribute pattern needs to be built for each assessment. The aims of this paper are (1) to fit the DINA and generalized DINA (G-DINA; de la Torre, 2011) models to TIMSS 2011 fourth grade mathematics items using the attributes that are proposed for TIMSS 2007 by Lee, Park, and Taylan (2011), and (2) to compare different Q-matrices and validate the most appropriate Q-matrix for the TIMSS 2011 data based on the G-DINA model fit results.

Background

To evaluate students' strengths and weaknesses, determine their mastery skills, and design instructions and interventions in learning process, CDM approach can be helpful. CDM is an alternative approach to IRT, and provides more information using multiple fine-grained skills in problem solving process rather than order students on a latent proficiency continuum (de la Torre, 2008). CDM is a latent variable model where skills are defined as attributes, and represented by the binary vector α to assess student mastery and non-mastery of the skills (de la Torre, 2011). Specific CDMs that are included in this paper are

DINA, and G-DINA. Both DINA and G-DINA models require a $J \times K$ Q-matrix; where J is the test length, K is the number of attributes (Tatsuoka, 1983). The element in row j and column k of the Q-matrix, q_{jk} , is equal to 1 if the k th attribute is required to answer item j correctly; otherwise it is equal to 0 (de la Torre, 2011). Q-matrix is a cognitive design matrix that identifies the cognitive specification for each item (de la Torre, 2008).

The DINA Model

Let X_{ij} be the response of examinee i ($i= 1, \dots, I$) to item j ($j= 1, \dots, J$), and $\alpha_i = \{\alpha_{ik}\}$ ($k= 1, \dots, K$) be the examinee's binary skills vector, where a 1 on the k th element denotes the presence or mastery of skill k , and 0, the absence or non-mastery of the skill. The gate part of the DINA model creates two latent groups by comparing the examinee's skills vector and the Q-matrix (de la Torre, 2008).

$$\eta_{ij} = \prod_{k=1}^K \alpha_{ik}^{q_{jk}} \quad , \quad (1)$$

where $\eta_i = \{\eta_{ij}\}$ is a latent response vector where 1 indicates that examinee i possesses all the skills required for answering correctly item j , and 0 indicates that the examinee lacks at least one of the required skills. Therefore, the DINA model creates two groups for each item, one with the examinees who mastered all required attributes, and another with the examinees who lack at least one of the required attributes. Furthermore, the DINA model has slip and guessing parameters, which introduce the noise into the model. The slip parameter, $s_j = P(X_{ij} = 0 | \eta_{ij} = 1)$, is defined as the probability that examinees who possess all the required skills for an item can slip and miss the item, while the guessing parameter, $g_j = P(X_{ij} = 1 | \eta_{ij} = 0)$, is the probability that examinees who lack at least one of the required skills can guess and answer the item correctly. The probability of answering item j correctly by examinee i with the skills vector α_i under the DINA model is given by,

$$P_j(\alpha_i) = P(X_{ij} = 1 | \alpha_i) = g_j^{1-\eta_{ij}} (1 - s_j)^{\eta_{ij}} \quad , \quad (2)$$

where answering an item correctly means that an examinee possessing all the necessary attributes, must not slip; or an examinee lacking at least one of the required skills must guess correctly (de la Torre, 2008).

The G-DINA Model

In the G-DINA model, the gate part creates $2^{K_j^*}$ latent groups by comparing the examinee's skills vector with the Q-matrix (de la Torre, 2011).

$$K_j^* = \sum_{k=1}^K q_{jk} \quad , \quad (3)$$

where K_j^* represents the number of required attributes for item j . The item response function of the G-DINA model is given by,

$$P(\alpha_{lj}^*) = \delta_{j0} + \sum_{k=1}^{K_j^*} \delta_{jk} \alpha_{lk} + \sum_{k'=k+1}^{K_j^*} \sum_{k=1}^{K_j^*-1} \delta_{jkk'} \alpha_{lk} \alpha_{lk'} \dots + \delta_{j12\dots K_j^*} \prod_{k=1}^{K_j^*} \alpha_{lk}, \quad (4)$$

where

δ_{j0} is the intercept for item j ;

δ_{jk} is the main effect due to α_k ;

$\delta_{jkk'}$ is the interaction effect due α_k and $\alpha_{k'}$; and

$\delta_{j12\dots K_j^*}$ is the interaction effect due to $\alpha_1, \dots, \alpha_{K_j^*}$,

where δ_0 represents the probability of a correct response when an examinee possesses none of the required attributes; δ_{ik} represents the change in the probability of a correct response when an examinee possesses a single attribute α_k ; $\delta_{jkk'}$ is a first-order interaction effect which means the change in the probability of a correct response due to the mastery of both α_k and $\alpha_{k'}$ and $\delta_{j12\dots K_j^*}$ is the change in the probability of a correct response due to the mastery of all the required attributes (de la Torre, 2011).

The G-DINA is a saturated model, and by applying constraints to the different link functions, specific reduced models can be obtained. For example the DINA model, the item response function is given,

$$P(\alpha_{lj}^*) = \begin{cases} g_j & \text{if } \alpha_{lj}^* < \mathbf{1}_{K_j^*} \\ 1 - s_j & \text{otherwise,} \end{cases} \quad (6)$$

where $\mathbf{1}_{K_j^*}$ is a vector of ones and of length K_j^* (de la Torre, 2011). In the DINA model, except δ_{j0} and $\delta_{j12\dots K_j^*}$ all parameters will be set to 0.

METHOD

Data

Data were taken from booklets 2 and 3 of TIMSS 2011 fourth grade mathematics assessment, which consist of 26 items with 12 multiple-choice items and 14 constructed response items. The data are recoded similar to Lee, Park, and Taylan (2011), as in constructed response items with polytomous responses were dichotomized as incorrect if they are wrong, partially true, unreached or omitted; or as correct if they are fully true.

Table 1
Attributes of TIMSS 2007 for fourth grade mathematics

Content Domain	Attributes
Number (N)	<p><i>Whole Numbers (4)</i></p> <ol style="list-style-type: none"> 1. Representing, comparing, and ordering whole numbers as well as demonstrating knowledge of place value. 2. Recognize multiples, computing with whole numbers using the four operations, and estimating computations. 3. Solve problems, including those set in real life contexts (for example, measurement and money problems). 4. Solve problems involving proportions. <p><i>Fractions and Decimals (2)</i></p> <ol style="list-style-type: none"> 5. Recognize, represent, and understand fractions and decimals as parts of a whole and their equivalents. 6. Solve problems involving simple fractions and decimals including their addition and subtraction. <p><i>Number Sentences with Whole Numbers (1)</i></p> <ol style="list-style-type: none"> 7. Find the missing number or operation and model simple situations in number sentence or expressions. <p><i>Patterns and Relationships (1)</i></p> <ol style="list-style-type: none"> 8. Describe relationships in patterns and their extensions; generate pairs of whole numbers by a given rule and identify a rule for every relationship given pairs of whole numbers.
Geometric Shapes & Measurement (GM)	<p><i>Lines and Angles (1)</i></p> <ol style="list-style-type: none"> 9. Measure, estimate, and understand properties of lines and angles and be able to draw them. <p><i>Two- and Three-dimensional Shapes (2)</i></p> <ol style="list-style-type: none"> 10. Classify, compare, and recognize geometric figures and shapes and their relationships and elementary properties. 11. Calculate and estimate perimeters, area, and volume.
Data & Display (DD)	<p><i>Location and Movement (1)</i></p> <ol style="list-style-type: none"> 12. Locate points in a coordinate to recognize and draw figures and their movement. 13. Read data from tables, pictographs, bar graphs, and pie charts. 14. Comparing and understanding how to use information from data. <p><i>Organizing and Representing (1)</i></p> <ol style="list-style-type: none"> 15. Understanding different representations and organizing data using tables, pictographs, and bar graphs.

To define the skills required in solving a particular item, 15 attributes are used in this study. Lee, Park, and Taylan (2011) developed those attributes based on the TIMSS 2007 Mathematics Framework (Mullis et al., 2005). The process of the attribute list is formed according to the TIMSS's specific content subdomain areas, which are number, geometric shapes and measures, and data display, also 38 objectives of TIMSS. Then three mathematics

educators experienced in fourth-grade mathematics, and two domain-expert researchers defined the attributes for the TIMSS 2007. According to the attributes given in the Table 1, Q-matrix for the TIMSS 2007 is defined for 25 fourth grade mathematics items (Lee, Park, and Taylan, 2011) and given in Table 2.

Table 2
TIMSS 2007 fourth grade mathematics Q-matrix

Item		Attribute														
		1	2	3	4	5	6	7	8	9	1	1	1	1	1	1
		0	1	2	3	4	5				0	1	2	3	4	5
1	M041052	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	M041056	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
3	M041069	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0
4	M041076	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
5	M041281	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0
6	M041164	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
7	M041146	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0
8	M041152	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0
9	M041258A	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
10	M041258B	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
11	M041131	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0
12	M041275	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
13	M041186	1	1	0	1	0	0	0	0	0	0	0	0	1	0	0
14	M041336	1	1	0	0	1	1	0	0	0	0	0	0	1	1	0
15	M031303	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
16	M031309	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
17	M031245	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
18	M031242A	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0
19	M031242B	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0
20	M031242C	0	1	1	0	0	0	0	1	0	0	0	0	0	1	0
21	M031247	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0
22	M031219	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
23	M031173	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
24	M031085	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
25	M031172	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1

The fundamental step of this study is to define the Q-matrix for TIMSS 2011 fourth grade mathematics questions from the proposed attributes for TIMSS 2007 by the experts. TIMSS mathematics results are stated to be comparable across participated countries and over years across cycles.

Table 3
TIMSS 2011 fourth grade mathematics Q-matrix 1

Item		Attribute														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	M051305	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0
2	M051091	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0
3	M051001	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0
4	M051007	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
5	M051203	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6	M051601	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0
7	M051064A	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1
8	M051064B	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
9	M051015	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0
10	M051123	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
11	M051109	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1
12	M051117	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0
13	M041010	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	M041098	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
15	M041064	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
16	M041003	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
17	M041104	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
18	M041299	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
19	M041329	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
20	M041143	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
21	M041158	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
22	M041328	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0
23	M041155	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0
24	M041284	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0
25	M041335	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0
26	M041184	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1

Furthermore, since the same mathematics framework, and the same specific content subdomain areas, with 38 objectives are defined for TIMSS mathematics questions for all cycles (Olson et al., 2009; Mullis et al., 2012), the use of the identical attributes is expected to yield valid results over time. Thus, the defined 15 mathematics attributes for the TIMSS 2007 is used across countries, also across cycles of TIMSS. For this purpose, the defined 15 mathematics attributes is used in order to build the Q-matrices of American and Turkish samples in the TIMSS 2011 mathematics assessment. According to the attributes assigned to the TIMSS 2007 items by Lee, Park, and Taylan (2011), booklets are chosen from TIMSS 2011 and the first Q-matrix for TIMSS 2011 dataset is defined in Table 3.

Table 4
TIMSS 2011 fourth grade mathematics Q-matrix 2

Item		Attribute														
		1	2	3	4	5	6	7	8	9	1	1	1	1	1	1
		0	1	2	3	4	5									
1	M051305	0	0	1	0	1	1	0	0	0	0	0	0	0	0	
2	M051091	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
3	M051001	0	0	1	0	0	0	0	1	0	0	0	0	0	0	
4	M051007	0	1	1	1	0	0	0	0	0	0	0	0	0	0	
5	M051203	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
6	M051601	1	1	0	0	0	0	0	1	0	0	0	0	0	0	
7	M051064A	0	0	0	0	0	0	0	0	0	0	0	1	0	1	
8	M051064B	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
9	M051015	0	0	0	0	0	0	0	0	1	1	0	1	0	0	
10	M051123	0	0	0	0	0	0	0	0	0	1	0	1	0	0	
11	M051109	0	1	0	0	0	0	0	0	0	0	0	1	0	0	
12	M051117	0	1	0	0	0	0	1	0	0	0	0	1	0	0	
13	M041010	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	M041098	0	1	1	0	0	0	0	0	0	0	0	0	0	0	
15	M041064	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
16	M041003	1	0	0	0	0	0	0	1	0	0	0	0	0	0	
17	M041104	0	0	0	0	1	1	0	0	0	0	0	0	0	0	
18	M041299	0	0	1	0	0	1	0	0	0	0	0	0	0	0	
19	M041329	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
20	M041143	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
21	M041158	0	1	0	0	0	0	0	0	0	1	1	0	0	0	
22	M041328	0	0	0	0	0	0	0	0	1	1	0	1	0	0	
23	M041155	0	1	0	0	0	0	0	0	0	1	0	0	0	0	
24	M041284	0	0	0	0	0	0	0	0	0	1	0	0	1	0	
25	M041335	0	0	0	0	0	0	0	0	0	0	0	1	1	0	
26	M041184	0	0	0	0	0	0	0	0	0	0	0	1	0	1	

The second Q-matrix for TIMSS 2011 dataset is defined according to the solution of the 26 specific items and given at Table 4. Some of the required attributes that are defined for several items on the first Q-matrix that may not be required are removed and thus an under-specified Q-matrix is created. For example, an examinee requires to possess attributes 2, 4, and 5 according to the Q-matrix 1, and attribute 5 only according to Q-matrix 2 to answer the item 2 correct.

The third Q-matrix for TIMSS 2011 dataset is defined according to the solution of the 26 specific items again and given at Table 5. However, some of the required attributes for several items on the first Q-matrix that may not be included are added and an over-specified Q-matrix is created compared to the first Q-matrix. For example, an examinee requires to

posses attribute 2 only according to the Q-matrix 1, and attributes 2, and 7 according to Q-matrix 3 to answer the item 5 correct.

Table 5
TIMSS 2011 fourth grade mathematics Q-matrix 3

Item		Attribute															
		1	2	3	4	5	6	7	8	9	1	1	1	1	1	1	
		0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
1	M051305	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0
2	M051091	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0
3	M051001	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
4	M051007	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
5	M051203	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
6	M051601	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
7	M051064A	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1
8	M051064B	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
9	M051015	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0
10	M051123	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0
11	M051109	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1
12	M051117	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0
13	M041010	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	M041098	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
15	M041064	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
16	M041003	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
17	M041104	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
18	M041299	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
19	M041329	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
20	M041143	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
21	M041158	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0
22	M041328	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0
23	M041155	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0
24	M041284	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0
25	M041335	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
26	M041184	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	1

In the last step, the fourth Q-matrix for TIMSS 2011 dataset is defined according to the results of the first three Q-matrices and given at Table 6. The decision is made according to the attribute classification results from Q-matrix 1. Some of the required attributes for several items on the first Q-matrix that may not be required are removed and some of the required attributes for several items on the first Q-matrix that may not be included are added.

Given the defined four Q-matrices for TIMSS 2011 and one Q-matrix for TIMSS 2007, the datasets of TIMSS 2007 and TIMSS 2011 are fitted to (1) the DINA and the G-DINA

model respectively, and (2) four Q-matrices for TIMSS 2011 are compared using the G-DINA model. The computer program Ox (Doornik, 2002) was used for analysis.

Table 6
TIMSS 2011 fourth grade mathematics Q-matrix 4

Item		Attribute															
		1	2	3	4	5	6	7	8	9	1	1	1	1	1	1	
		0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5
1	M051305	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0
2	M051091	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
3	M051001	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
4	M051007	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
5	M051203	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
6	M051601	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
7	M051064A	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
8	M051064B	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
9	M051015	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0
10	M051123	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0
11	M051109	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
12	M051117	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0
13	M041010	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	M041098	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
15	M041064	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
16	M041003	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
17	M041104	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
18	M041299	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
19	M041329	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
20	M041143	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
21	M041158	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0
22	M041328	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0
23	M041155	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
24	M041284	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
25	M041335	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
26	M041184	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1

RESULTS

The model fit results for the DINA and G-DINA models are evaluated by -2loglikelihood (-2LL), AIC and BIC statistics. The results are given in Table 7 and Table 8.

Table 7

Model fit of the DINA and the G-DINA model

		2LL	AIC	BIC
2007	DINA	22383.0145	88017.0145	242682.0981
	G-DINA	20804.8657	86862.8657	242527.0961
2011	DINA	24747.1937	90385.1937	247921.9752
	G-DINA	23304.2153	89242.2153	247499.0223

According to the results on Table 7, for both TIMSS 2007 and TIMSS 2011 the G-DINA model fit is better than that of the DINA model. The differences between the model fits are significant based on the BIC results across the DINA and the G-DINA models. For TIMSS 2007 the difference is 155.002 (242682.0981 - 242527.0961) and for TIMSS 2011 the difference is 422.9529 (247499.0223 - 247921.9752).

Table 8

Model fit of the G-DINA model based on different Q-matrices

		2LL	AIC	BIC
2011	Q-matrix 1	23304.2153	89242.2153	247499.0223
	Q-matrix 2	23302.3245	89216.3245	247487.0719
	Q-matrix 3	23304.4782	89240.4782	247492.1330
	Q-matrix 4	23301.1198	89123.1198	247101.5169

According to the results on Table 8, the differences across four Q-matrices are significant except for the differences between Q-matrix 1 and Q-matrix 3. The best model fit is obtained with the last Q-matrix when the required attributes are modified after considering the Q-matrix 1 results. The BIC differences are 11.9504, 6.8893, and 397.5054 between Q-matrix 1 to 2, 1 to 3 and 1 to 4 respectively.

DISCUSSION AND CONCLUSION

To evaluate the students' mastery skills and gain information about their ability levels, CDM models provide better estimation and detailed information than the traditional methods. This paper investigated that the model-data fit of the DINA and the G-DINA models in the United States sample for the fourth grade mathematics items in TIMSS 2007 and TIMSS 2011, and G-DINA model fit of the TIMSS 2011 with four Q-matrices defined.

To design a Q-matrix is one of the biggest challenges in the use of CDM models (de la Torre, 2009). Usually some content experts, teachers and researchers need to work together and decide for the attributes, and build Q-matrices for each specific test. In this paper, the use of the same attributes is investigated across years with an internationally administered large-scale test by comparing model fit of different Q-matrices under the G-DINA model. Furthermore, the process of building Q-matrices should be investigated by different empirical and methodological approaches to find the more appropriate Q-matrix.

This study investigates the fit of the DINA and the G-DINA models in the United States and Turkish samples for the fourth grade mathematics items in TIMSS 2007 and TIMSS 2011. Also the G-DINA model interpretations are interpreted to define mastery levels of Turkish students in TIMSS 2011 mathematics assessment.

The results reveal that the fit of the G-DINA models are better than the DINA models under all circumstances. According to the literature, CDMs have better model fit to data than traditional statistical models and IRT models, and also they are more useful to obtain detailed diagnostic information in student attainment. The advantages of CDMs are to be able to define student attainment in attribute mastery level, and to outline information for student instruction in specific subjects even in very small sample sizes. On the other hand, studying with CDMs has drawback of relying on the Q-matrix. Therefore, the Q-matrix needs to be validated by the combined findings from different approaches, together with relative theories, and content expert opinions before making final conclusions (De la Torre, 2008; Tatsuoka, 2009). The use of the CDMs in large-scale surveys is demonstrated in this study with TIMSS fourth grade mathematics items. The Q-matrices are created by the experienced content specialists, and tested by using the DINA and the G-DINA models. Thus, the first limitation of this study is the use of the particular attributes under the particular models only. In further studies, alternative attribute sets and Q-matrices can be proposed by the other researchers and experienced content specialists, also other statistical methods can be used to test the validation of the Q-matrices. The process of building Q-matrices should be investigated by different approaches to find the more appropriate Q-matrices.

In future research, the validation of the intuitive Q-matrices should be investigated by using methodological approaches. The major limitation of expert-base Q-matrices, being subjective, should be supported by the computer-based definitions of Q-matrices.

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Youth and Youth Education Activities in Konya Metropolitan Municipality

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Abstract:

Public relations activities are carried out by local governments with different headings and message channels. While cultural studies are a channel between the municipality and the public, another channel is education, especially youth education. Especially for years between 2011 and 2018 youth education, culture and public relations activities carried out by the municipality of Konya, are among the best in Turkey. The youth education activities carried out within the framework of public relations activities by the Municipality of Konya, which is a local government institution, and a youth survey conducted with five thousand university students in this context are being mentioned in this article. With a young population of over 13 million, Turkey has a dynamic structure when it is compared to many developed countries. The reason for Turkey's sustainable growth momentum in recent years is not only dependent on the stability of economic, political and diplomatic relations; but also closely related to place a particular importance to the youth and their roles as well. It is very important for young people to have a living space that is appropriate for the requirements of the time and place they live in, both in terms of meeting their personal development at the highest level and in accessing the equipment that can compete with their peers in the external world (Kizilkaya, et al, 2013: p.230). Local governments have played the most important role in the constitution and implementation of youth policies. Because of being the closest institutions to the public, when it is compared to other local administrations, municipalities come foremost. Within the scope of cultural municipality, various projects have started to be organized for the youth. The construction of cultural centers and youth centers, the establishment of youth assemblies and the provision of youth services have grown and gained momentum. After 2004, fundamental changes have started in local governments and as a result many services have been provided in various fields. Among these activities, youth services have a very important position. In this study, the activities of Konya Metropolitan Municipality under the title of "youth" and within the scope of these activities, a quantitative (meaning analysis) research with the youth in Konya Province will be interpreted.

Keywords:

Public relations, quantitative research, education, youth, local government

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INTRODUCTION

Although youth education is under the responsibility of the Ministry of National Education, local governments and municipalities have recently started to focus on youth education and activities within the scope of public relations activities. Public relations activities for local governments are also important in terms of reaching out to the younger generation. To the first point noted above, the acceptance of market interventions at the local government level causes cities to rely on PR and marketing strategies to create positive images in the minds of a diverse customer base that includes residents, business owners, employees and youths (Lee, 1998).

Public engagement practices have become embedded in areas as diverse as higher education (Mahony and Stephansen 2016) and environmental policy (Metzger et al. 2017). All youth services in Konya Province, as in all of Turkey, has gained considerable speed after the year 2004. In the previous period, there was not any service related to youth, on behalf of social municipality. However, it was carried out a limited number of conferences, panels, festivals, theaters and chess tournaments. Youth services, which started in 2004 with the strengthening of the physical possibilities of the areas where the youth are located, have increased rapidly and become traditional with the participation of young people. Subsequently, a youth council was established in 2010 and the youth center was opened. In the following years, the quality of the services was enriched, many opportunities were provided for young people, enabling them to have a voice in these activities towards them and including them in the management.

We can explain the youth services of Konya Metropolitan Municipality under four main titles. These are:

1. *Values Education Centers for Youths*
 - Youth Centre
 - Wisdom Houses
 - 100 Libraries for 100 Schools
 - School of Civilization
 - Publishings
2. *Vocational Training Centers for Youth*
 - Komek (Course Centers)
 - Komek for Youth
 - Kadem School for Youths
3. *Science Education Centers for Youth*
 - Science Centre
4. *Sports Training Centers for Youth*
 - Konya Metropolitan Stadium
 - Sports and Convention Center
 - Sports Centres

1. Values Education Centers for Youths: Youth Center, Wisdom Houses and School of Civilization have been established with the aim of providing young people with the brackets of national and spiritual values of history and future consciousness and making these gains feasible and sustainable in the society.

A. Kilicarslan Youth Centre: Kilicarslan Youth Center was established in 2010; there are 1 study hall, 1 meeting room, 1 music workshop, 1 fine art workshop, 1 internet house, 5 multi-purpose halls, 1 sports hall, 1 archery hall, 3 cinema halls, 1 laundry and cafeteria. In 2016, halls were allocated to university student communities and NGO's (nongovernmental organizations) in this Youth Centre for 2655 times. There are 1.500 members in 2010 but this number has increased 20.000 in the year 2016. About 30 thousand young people benefit from the Kilicarslan Youth Center.

24.150 university students have benefited from various courses such as; painting, violin, marbling art, baglama, guitar, reed flute, archery, Quran, theatre, AutoCad, elocution, Ottoman Language, English, photography, mobile applications, social media applications, Turkish Classical Music Choir.

In summer schools; violin, guitar, baglama, reed flute, painting, marbling art, elocution, English, Quran, archery, values education was given in 12 branches to 1357 middle and high school students in 2016. Up till now, 35 different branches are totally put into service.

✓ **Youth Card:** With the Youth Card, all students in Konya Province can benefit from discounts. With Youth Card, students' social behavior can be monitored and their participation in programs can be analyzed. 17.650 student members have used Youth Card by the end of 2016.

✓ **Laundry:** Laundry service has started in the Youth Center in 2013. Only Youth Card holders can wash and dry their own laundry in a single machine free of charge. Approximately 380 young people benefit from the laundry service.

✓ **Soup Catering:** At the Youth Center and University Pedestrian Overpass, about 2200 cup of soup and pastry is served daily. A total of 1 million young people have benefited from soup and pastry. Youth Center has been visited by 2 million young people between the years 2010 and 2016.

Youth Assembly; was established in 2010 and consists of totally university students. It continues its activities with more than 500 volunteer members. It is also the regional coordinator for national projects. The Youth Assembly currently consists of 1 chairman, 1 deputy chairman, 5 members of the council, 9 commissions and 6 departments. A total of 60.000 young people benefited from the work of the Youth Assembly. In December 2016, the Youth Assembly decided that 666 young people would go to Vienna with an EU donation. Weekly programs are served to young people such as; Idea and Thought Workshops, Psychological Concepts Workshop, "Dem Bu Dem Talks", Youth Talks in Camli Palace.

B. Wisdom Houses: Values education is given in Wisdom Houses which is consist of a complex structure including a computer lab, a sports hall, an art workshop, a library

and a masjid; the aim is to make an awareness or increase the knowledge and skills of students' values and keep them away from harmful environment. Every year 3.500 students between the ages of 8-15 are studying values in three main wisdom houses; Aliya İzzetbegovic Wisdom House, Ali Ulvi Wisdom House, and Izzeddin Keykavus Wisdom House.

Mobile Wishdom Houses; these are for the young people who live in districts and villages. Mobile Wisdom Houses enable young people can benefit from the services of Wisdom Houses. These mobile Wisdom Houses serve approximately four thousand students each month.

C. 100 Libraries for 100 Schools: Within the scope of 100 Libraries for 100 Schools project, 104 libraries were established. There are 45 libraries in the districts and 59 libraries in the center. 29 of these were established in high schools.

The School of Civilization: Values and discourse have infiltrated rituals of birth, kinship, marriage, leisure and play, death, religious beliefs and practices, as well as more prosaic practices such as those relating to health, education, values of exchange and other knowledge systems (science and technology) (L'Etang, 2008: 216). The School of Civilization is an important area of responsibility that will enable us to experience the values that are necessary to live humanely and fairly. Rather than just a certain age group and a certain mass, this place is for all people who live in this city and reminds many values that can be forgotten in a caos of daily life. The School of Civilization Project started in 2014 and through various activities, all segment of society enable to get values education. Between 2014 and 2016; 40.900 theater plays were performed for 120 thousand students. In two years, 1.200.000 copies of 16 issues "Konya Children Journal" were distributed to the students who are a member of the School of Civilization. 10 different theater plays were exhibited for 50 thousand students from high school and university students. 300 thousand story books were distributed to the students in two years. 100.000 copy of "Alone with Young People", and 140.000 copy of "Prophet Muhammad" books were distributed to young people who participated in events such as conferences, seminars, interviews and symposiums. Ten thousand books have been printed and distributed such as; History of Science in Islam, Safahat, Bir Hilal Uğruna, Mathawi Rose Garden which are among the important books for young people. Debates and quiz shows were also organized in all districts within the scope of School of Civilization.

D. Publishings: Konya is an important place in our culture and civilization history. Konya Metropolitan Municipality has concentrated on publications on the city history, Konya and Mevlana. While the Metropolitan Municipality had 59 publications before the year 2004, 320 publications were published after 2004, bringing the total number of publications to 400.

Mathawi; In order to spread Mevlana's doctrine based on tolerance, Mathawi was translated in 26 different languages. Furthermore; the translation studies in 14 languages are in progress. With the languages under study, Mathawi will be translated into 39 foreign languages. The most recently translated languages are Kurdish and Swahili.

The Library of Konya; As a result of great efforts, in order to transfer the historical and cultural memories of Konya to the future, a 9-volume Konya Encyclopedia was prepared and published. The Ottoman Attorney Registers of Konya (registers 53, 49, 45, 39, 38, 41, 37, 47, 50, 10, 140, 11, 14, 52, 150, 151, 1916, 1921), Konya Province Salname (from 1868 -1885) -It is a document prepared by the public and private institutions in the Ottoman Empire to show the events that took place for a year - 18 volumes were transcribed from Ottoman Language. Six of Konya's Forties series, which will consist of forty books, has been published. The booklet of 22 Konya neighborhoods has been published within the scope of Konya Neighborhoods Library and the project is still in progress. Within the scope of the Council (*Divan*) Series, the Divan of Asik Omer, the Council of Ulu Arif Celebi and the Council of Sultan Veled were published. Besides; many of the books, albums, audio and video publications about Konya have been published.

2. Youth Vocational Training Centers: It aims to provide vocational training for young people in various fields and to ensure that they have experience when they start to work.

A. KOMEK: In Konya Vocational Training Courses, whose short name is KOMEK, 100 thousand trainees benefit from free of charge in 53 branches, including 270 branches and 168 active branches. Since 2004, approximately 450 thousand people had certificate from KOMEK.

B. KOMEK for Youth: For students between the ages of 8-16; Art, Religion and Values, Sports are given in the framework of courses in Konya Vocational Training Courses. With Komek for Youth application, which started in 2015, 40.000 students benefited in two years.

KADEM The School of Young People: It is manifest in our values, beliefs and attitudes, evident in the language we use and embodied in our behaviours, often unconsciously (Bourdieu, 1990). To teach our values for group activities were conducted for 1500 young people on 10 different topics.

3. Youth Science Education Centers:

A. Konya Science Center: Konya Science Center was established in 2008. TUBITAK called for the establishment of a science center within the framework of the Science and Society Project Support Program and Konya Metropolitan Municipality applied to this project. As a result of the competition among many metropolitan cities, the project of Konya Metropolitan Municipality was found worthy of evaluation and then the "First Science Center with TUBITAK Supported" has come. Konya Science Center is built on an area of approximately 100 thousand m²; with its 26 thousand m² closed area, 6100 m² exhibition area and 1000 m² training units, it is the first science centre on an international scale in Turkey. Konya Science Center; is a huge complex with paramount and different architecture. The planetarium, which is connected to each other by bridges, consists of three separate buildings: the main building, the watching and observation tower. In the main building, there are exhibition areas, training workshops, congress halls, libraries, gift shops and cafeteria. The exhibitions consist of the following themes: Our World, Our Body,

Basic Steps, Sultans of Science. Also, our Universe, Me and My World, Past and Present of Konya and New Horizons are the exhibitions that are coming soon. Turkey's biggest science festivals are organized by the Konya Metropolitan Municipality. Since the opening of Konya Science Center, 545 thousand of people have visited Konya Science Centre. 300 thousand of people benefited from the science festivals organized by Konya Science Center every year.

4. Youth Sports Training Centers:

A. Konya Metropolitan Stadium: The stadium was built by Konya Metropolitan Municipality and has a capacity of 42 thousand of people. The huge complex is designed to encourage urban youth for sporting activities. Konya Stadium is one of the top five stadiums in the world and meets the needs of Konyasport youth setup and sports schools. Moreover, many national matches are held in Konya Metropolitan Stadium.

B. Sports and Convention Center: It was built in 2013 by Konya Metropolitan Municipality. The Sports and Convention Center, which has a capacity of 10.000 people, has multi-purpose areas and sports halls. The facility is used for youth-oriented activities such as youth meetings and congresses.

C. Sports Halls for Ten Schools: Konya Metropolitan Municipality has built a multipurpose sports hall for 10 schools. The sports halls have 1,730 m² indoor area.

Purpose of the Study

After 2004, fundamental changes have started in local governments and as a result many services have been provided in various fields. Among these activities, youth services have a very important position. In this study, the activities of Konya Metropolitan Municipality under the title of "youth" and with in the scope of these activities, a quantitative (meaning analysis) research with the youth in Konya Province will be interpreted.

METHOD

A quantitative research was conducted with one-to-one interview questionnaire technique and the study based on the subject of Konya Youth, their education and which communication tools they used was analyzed with SPSS program. The research ($\alpha = 5000$) was conducted in 2014 in Konya city center with all young subjects. A survey of youth in Konya was conducted in 2014. Based on the questionnaires and in the light of the findings, we tried to understand what the youth wanted and thought.

Population and Sample

The research has been prepared by Konya Metropolitan Municipality in order to get to know the university youth, to understand the basic problems of the students and to produce solutions for their problems. The research was conducted in the year 2014. 5.000

university people were interviewed. Through the survey, it was also possible to determine the expectations of young people from municipal services.

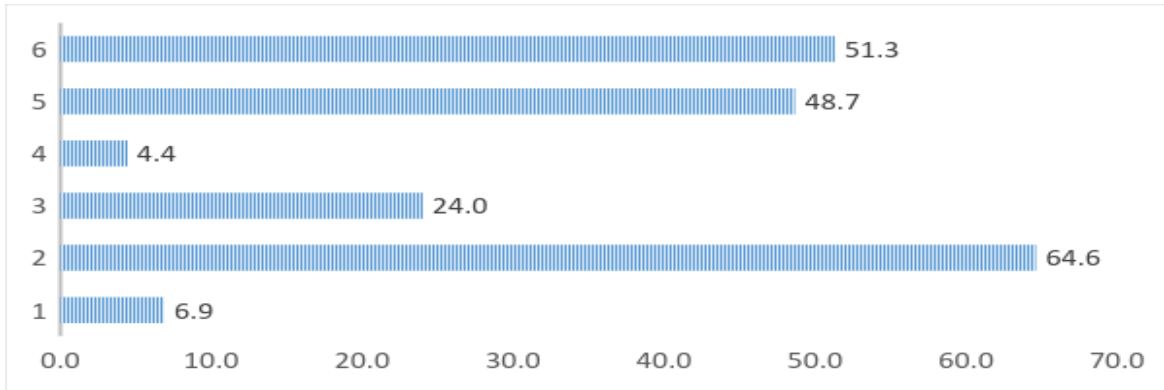
Data Collection Tool

The demographic data contain these details: age, gender, monthly income, monthly expenditure, mobile phone ownership, computer ownership, internet ownership, accommodation type and location.

In Graph 1, gender and age data of the samples were measured. As a result, 51.3% (Column chart in number six of Graph 1) of the participants were male and 48.7% (Column chart in number five of Graph 1) were female. When the age of the samples were examined, 88.6% (Column charts in number two and three of Graph 1) of the samples consisted of young people between the ages of 20-25, 6.9% (Column chart in number one of Graph 1) of them were between 17-19 years of age, 4.4% (Column chart in number four of Graph 1) of them were 26 years of age and over.

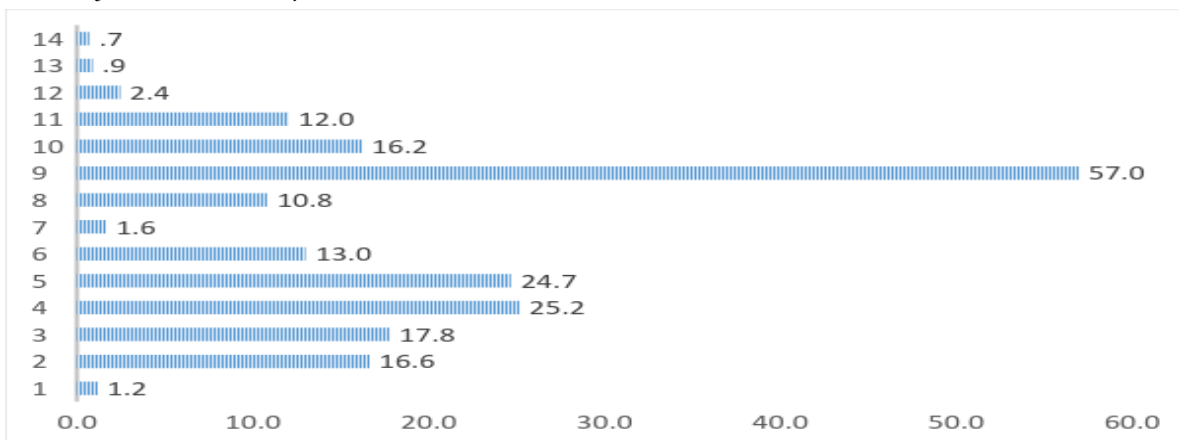
Graph. 1

Gender and Age Data



Graph. 2

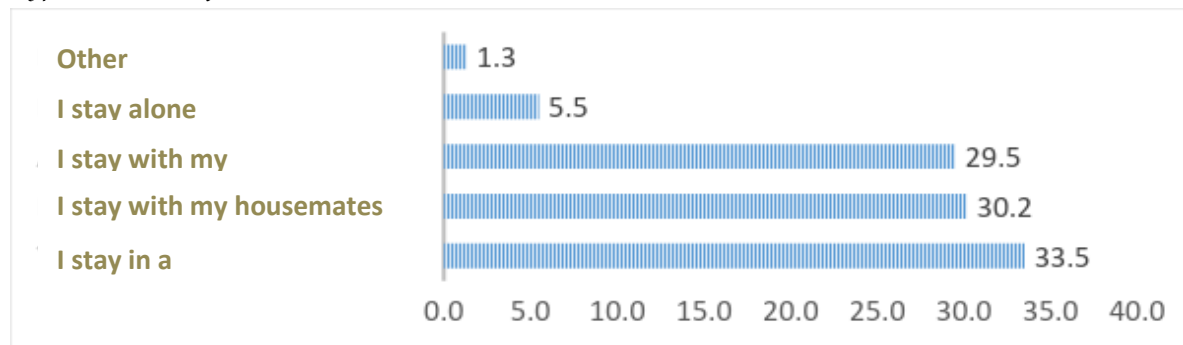
Monthly Income and Expenditure Status



In Graphic 2, the ratio of young people whose monthly household income is between 1500-3000 TL is 49.9% (Column charts in number four and five of Graph 2). The rate of those between 500 and 1500 is 34.4% (Column charts in number two and three of Graph 2). 57% (Column chart in number nine of Graph 2) of young people spend between 250-500 TL. The rate of those whose monthly expenditures are above 500 TL is 32.2% (Total of column charts in number ten, eleven, twelve, thirteen, fourteen of Graph 2). The rate of those who spend less than 250 TL per month is 10.8% (Column chart in number eight of Graph 2).

Graph. 3

Type and Place of Residence

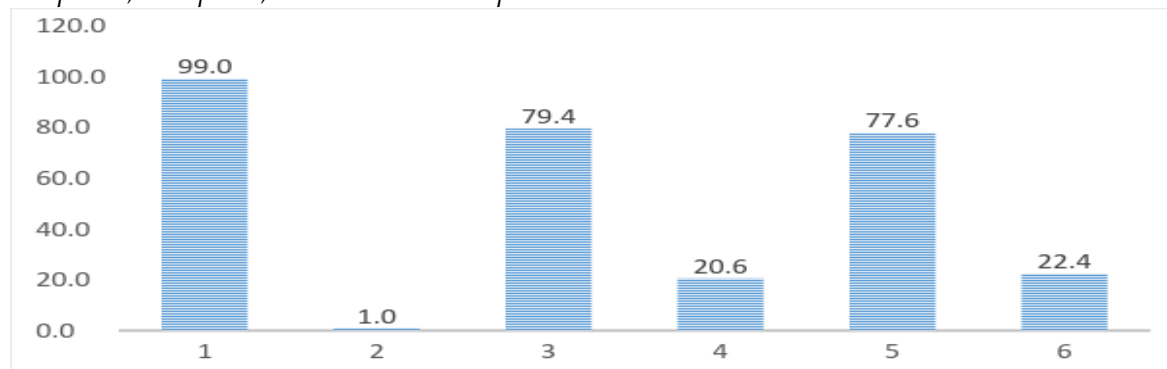


In Graphic 3, 33.5% of the youth, who are the subject of the sampling, stated that they stayed in dormitories, 30.2% stayed with their housemates and 29.5% stayed with their families. According to this, almost 70% of the youth live in other places.

RESULTS

Graph. 4

Cellphone, Computer, Internet Ownership



Graph. 4 shows that 99% (Column chart in number one of Graph 4) of the youth in Konya city center have their own mobile phones. The rate of young people with personal computers is 79.4% (Column chart in number three of Graph 4). The rate of young people

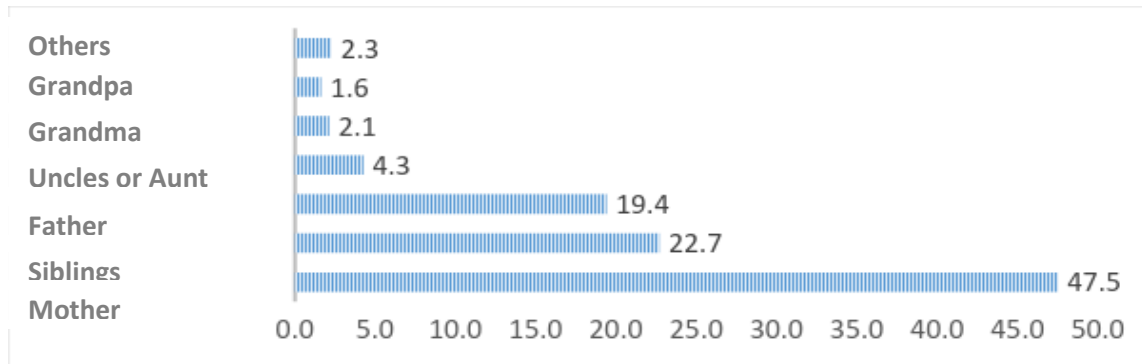
who have internet at home or in dormitory is 77.6% (Column chart in number five of Graph 4).

Attitudes and Behaviors

To the sample group were asked these questions: the best person in the family who is gotten along with in order to get ideas about the attitudes and behaviors of the young people, the requests of the parents of the young people, the most important problem faced by the youth, the petition to the municipality about the municipal services, the adequacy of education opportunities in Konya Province, the adequacy of employment opportunities in Konya Province, the sufficiency of social activity opportunities in Konya Province, the sports activities in Konya Province, professional and personal development organizations competence and Konya cultural trip organizations, issues such as attitudes and behaviors

Graph. 5

The best person in the family



Graph. 5 shows the attitudes and behaviors of young people towards family relations. According to this, the best person in the family who is gotten along with is the mother with 47.5%, the sibling with 22.7% and the father with 19.4%.

Table 1

Young people's requests from their parents

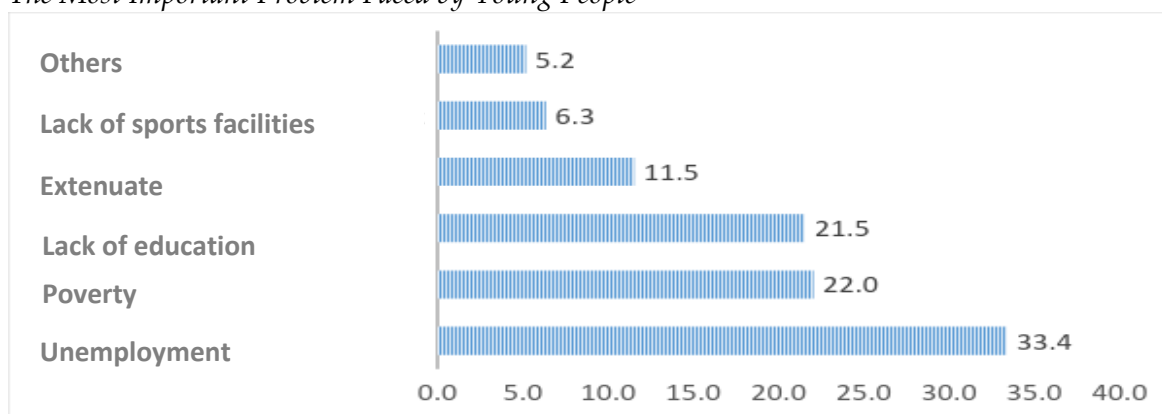
		PERCENTAGE
Being sensitive	I want	36,2
	I never want	2,0
	THEY ARE SENSITIVE	61,8
Give opportunity	I want	36,6
	I never want	4,5
	THEY GIVE OPPORTUNITY	58,9
Respect	I want	26,5
	I never want	2,7
	THEY RESPECT	70,8

Make time for something	I want	28,4
	I never want	8,6
	THEY MAKE TIME	63,1
Make sense	I want	38,2
	I never want	4,0
	THEY MAKE SENSE	57,8
Be friendly	I want	35,2
	I never want	10,2
	THEY ARE FRIENDLY	54,6
TOTAL		100,0

In Table 1, the rate of those who wanted to be sensitive from their parents is 36.2%, and the rate of those who stated they are sensitive is 61.8%. 36.6% of those who want to be given opportunity, while 4.5% of those who never want to be given opportunity. Young people who says "they give opportunity" is % 58.9. The rate of those who want their families to respect the youth is 26.5% and those who never want is 2.7%. The rate of those who think that young people are respected from their families is 70.8%. The rate of the young people who stated that their families make time to do to something with them is 63.1%. The rate of those who want to time is % 28.4, who never want is % 8.6. The rate of those who want to be made sense is %38.2, those who never want is %4. 57.8% of the youth stated that their families already understood themselves. Young people who were the subject of the sampling were asked the question "Would you like them to be friendly?" The rate of those who say "I want to" to this question is 35.2%, but the rate of those who say "I don't want" is 10.2%. The rate of those who say "they are acting friendly" is 54.6%.

Graph. 6

The Most Important Problem Faced by Young People

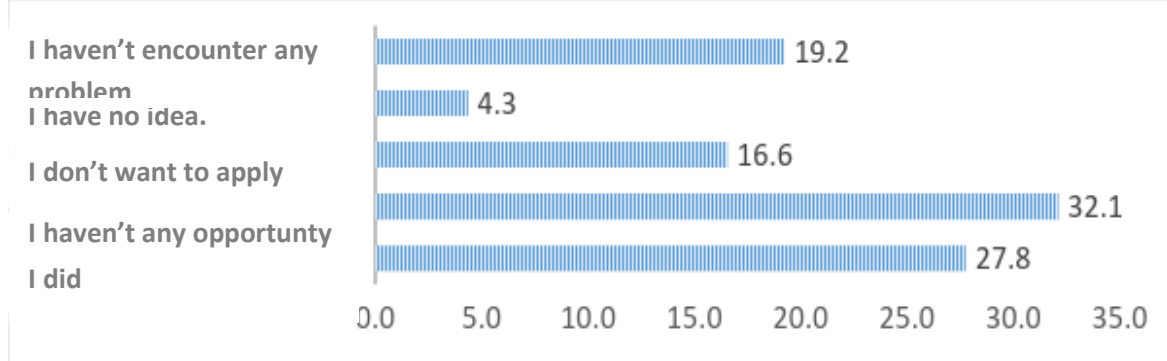


Graph 6 evaluates the most important problems faced by young people. As a result, the unemployment problem is among the most important problems faced by young people

with 33.4%. Unemployment is followed by problems such as lack of money with 22.0%, lack of education with 21.5% and not being taken seriously with 11.5%.

Graph. 7

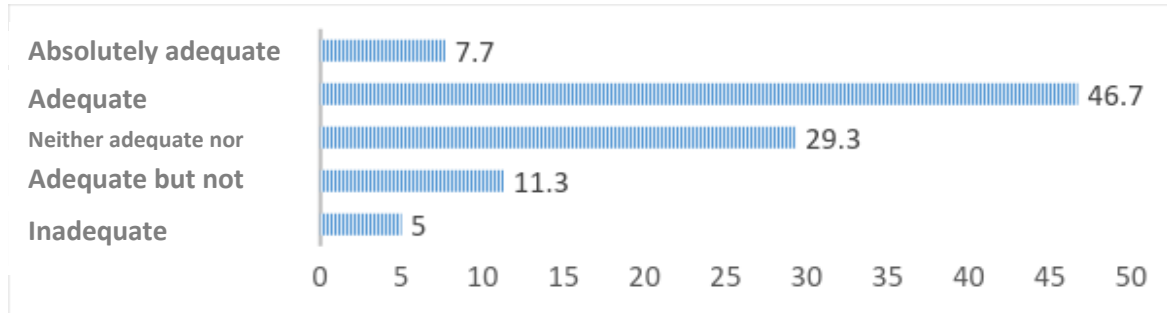
To Submit a Petition to the Municipality and Apply for Municipal Services



Graph. 7 shows the attitudes and behaviors of young people in writing a petition to the municipality about municipal services. 27.8% of the youth answered "Yes" and 32.1% answered "No, opportunity".

Graph. 8

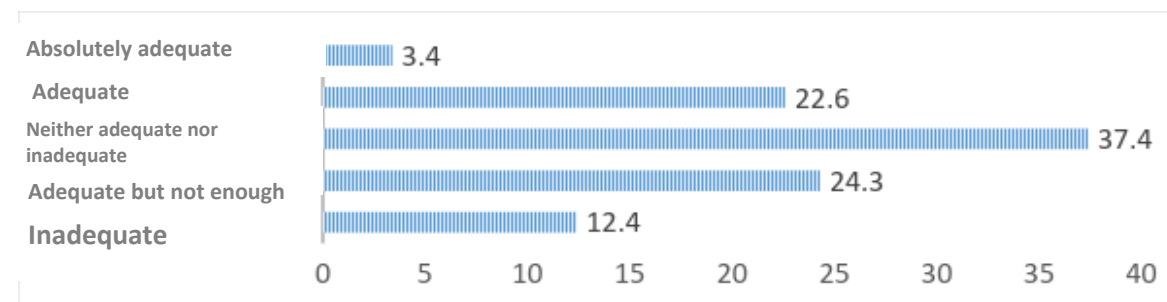
Adequacy of Education Opportunities in Konya Province



In Graph. 8, the opinions of the youth about the adequacy of education opportunities in Konya Province are taken. As a result, 46.7% of the youth stated that they have sufficient educational opportunities, 7.7% of them say absolutely adequate, 29.3% are says neither adequate nor inadequate. While the rate of those who say not enough is 11.3%, the rate of those who say not enough is 5%.

Graph. 9

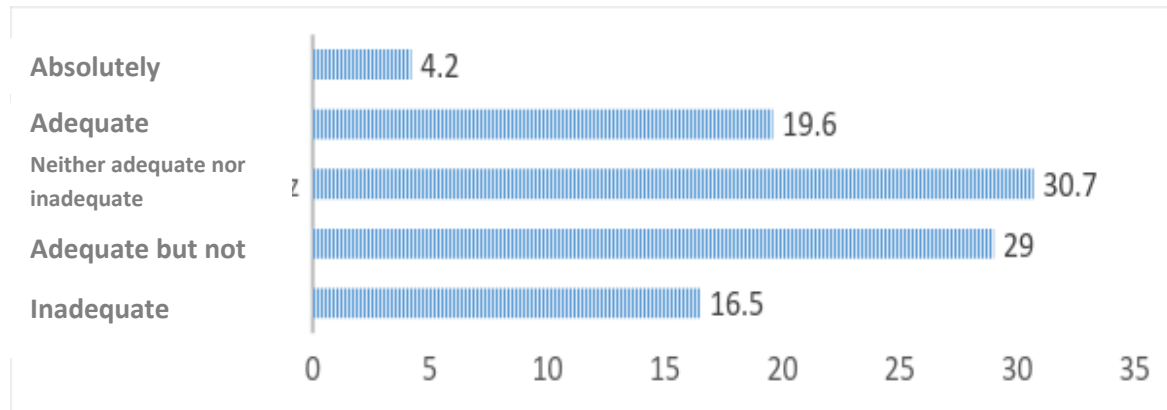
Job Opportunities in Konya Province



In Graph. 9, the attitudes and behaviors of the young people, who are the subject of sampling, about job opportunities were measured. As a result of this, 22.6% of the youth stated that they have adequate opportunities and 37.4% of them think neither adequate nor inadequate. While 24.3% never consider it is adequate, 12.4% said it is not enough.

Graph. 10

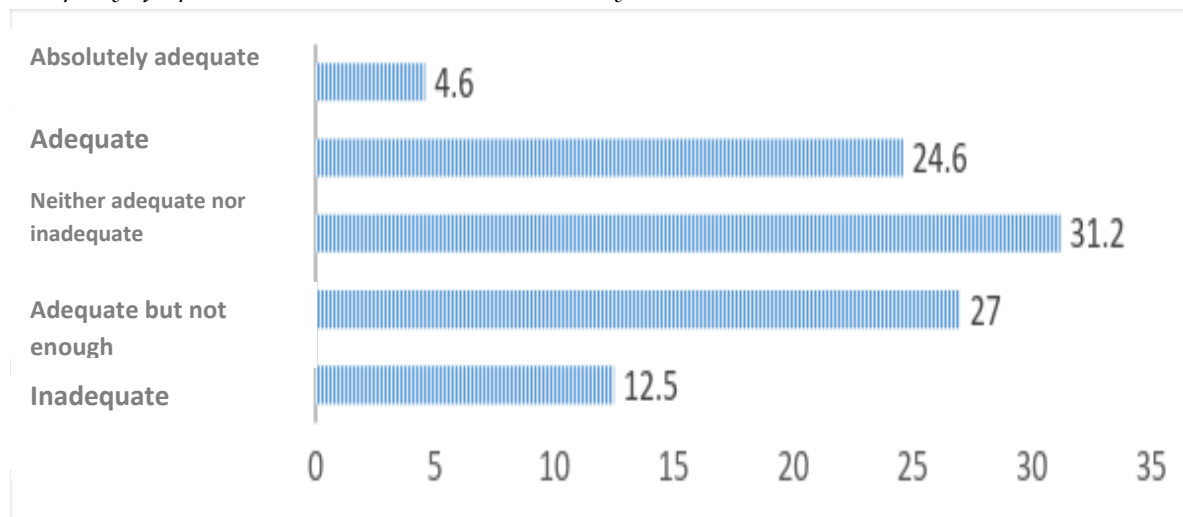
Adequacy of Social Activity Opportunities in Konya Province



The attitudes and behaviors of young people regarding the possibilities of social activity in Konya are measured in Graph.10. As a result, 19% of the youth stated that their social activity opportunities are adequate, 4.2% of them think absolutely adequate, 30.7% of them say neither adequate nor inadequate, 29% of them think inadequate, and 16.5% consider they are not adequate at all.

Graph. 11

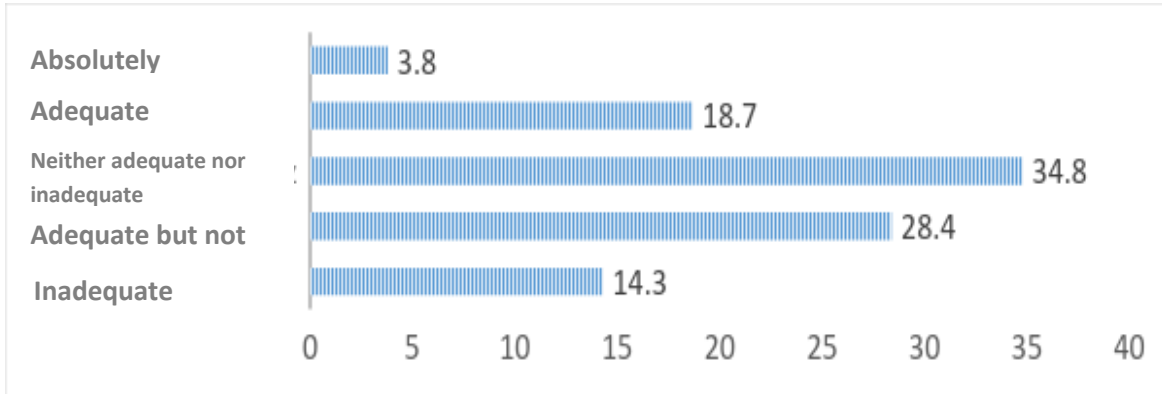
Adequacy of Sports Activities and Facilities in Konya Province



In Graphic.11, 29.2% of young people think that sports activities and opportunities in Konya are adequate. 31.2% stated that they are neither adequate nor inadequate, 27% think they are not adequate, 12.5% consider they are not adequate at all.

Graph. 12

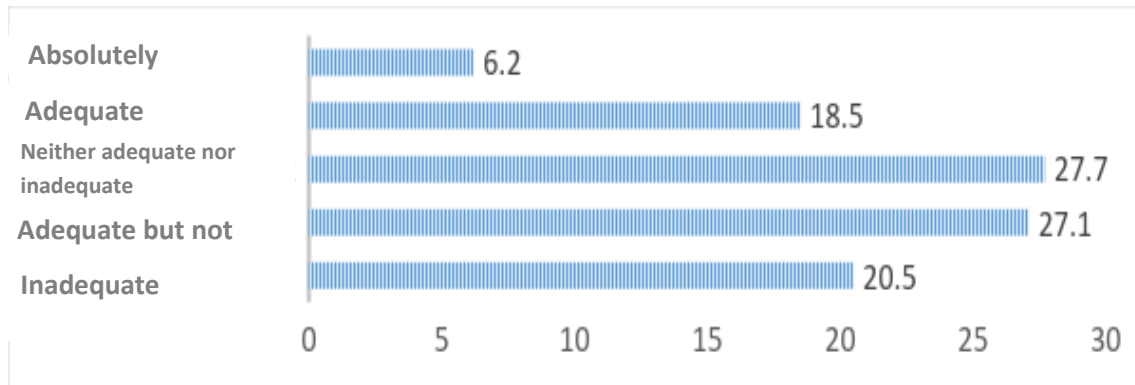
Competence of Professional and Personal Development Organizations in Konya Province



In Graph 12, the adequacy of professional and personal development organizations in Konya was asked to young people. As a result, 3.8% think it is absolutely adequate, 18.7% of them consider it is sufficient, 34.8% of them think it is neither adequate nor inadequate, 28.4% of them think it is not adequate and 14.3% of them say it is not adequate at all.

Graph. 13

Adequacy of Historical and Cultural Trip Organizations in Konya Province



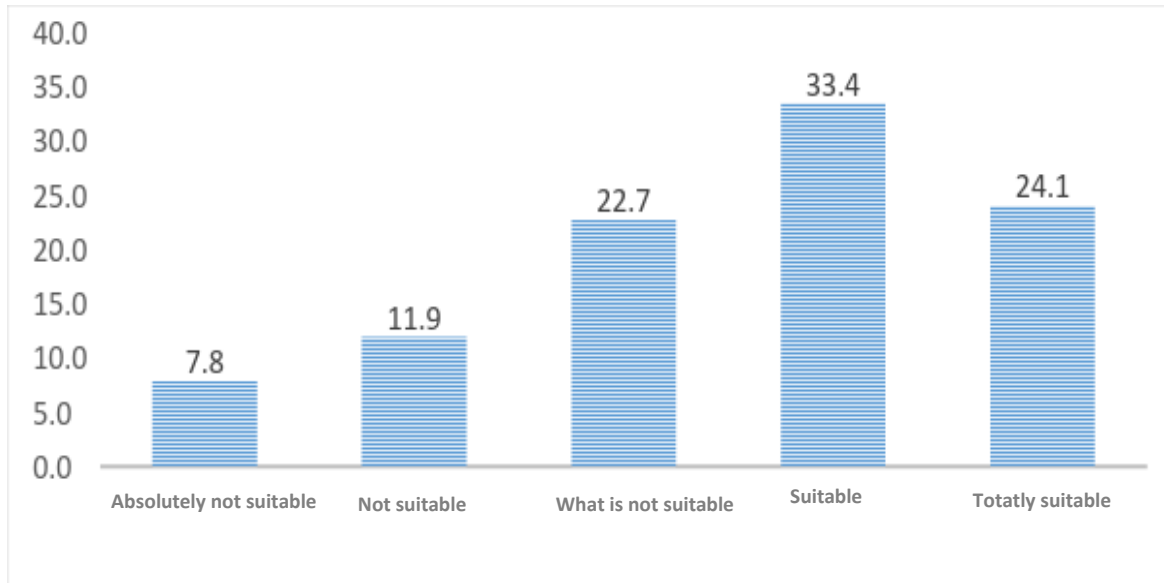
The adequacy of historical and cultural travel organizations in Konya is measured in Graph.13. 6.2% of young people consider that they are absolutely adequate, 18.5% of them consider that adequate, 27.7% of them think they are neither adequate nor inadequate, 27.1% say they are not enough, 20.5% i think not adequate at all.

Attitudes and Behaviors

In order to obtain ideas about the attitudes and behaviors of young people, these statements were asked; "I closely follow developments in domestic and foreign policy, I read a newspaper every day, I buy or not the products and goods that harm the environment, I miss or not the sports events that I'm interested in, I actively engage in a branch of art, I go to the cinema once a month, I go to the theater once a month and I read a book once a month".

Graph. 14

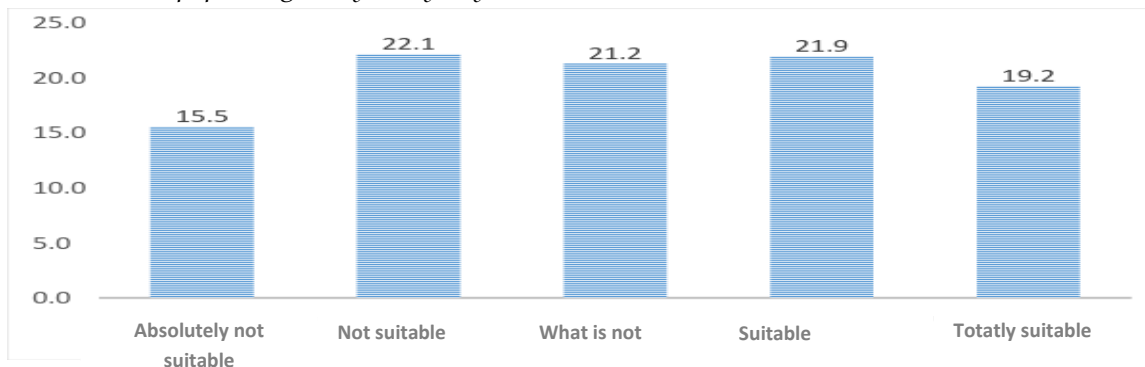
I Closely Follow Developments in Domestic and Foreign Policy



Graph. 14 presents the level of relevance of youth to domestic and foreign policy. On top of this, it was observed that 57.5% of the sample group closely followed developments in domestic and foreign policy. I closely follow developments in domestic and foreign policy, 22.7% of young people assess this situation is not suitable or not suitable, 11.9% of them are not very suitable and 7.8% of them consider are not at all appropriate.

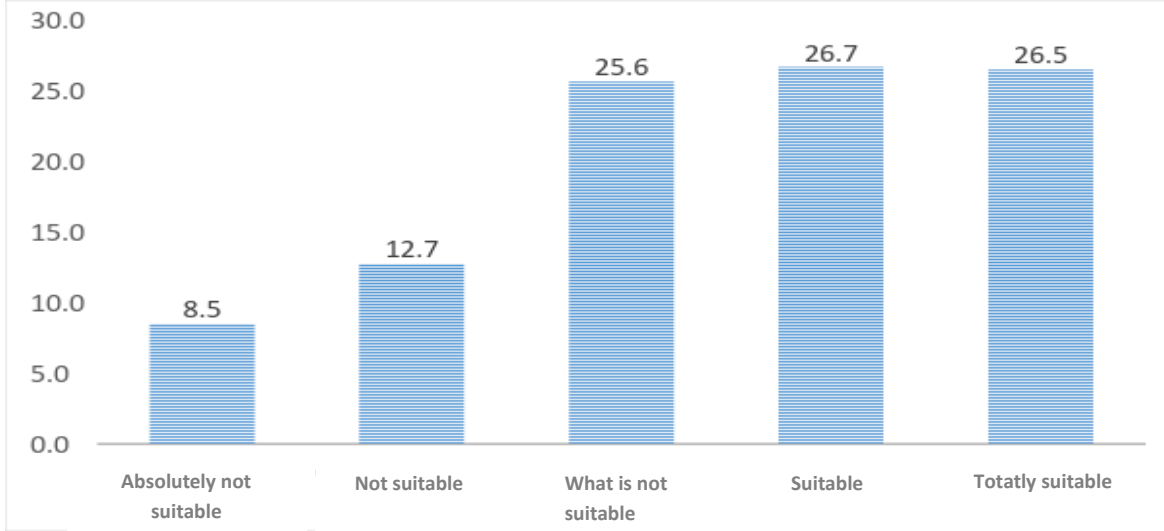
Graph. 15

I Read a Newspaper Regularly every day



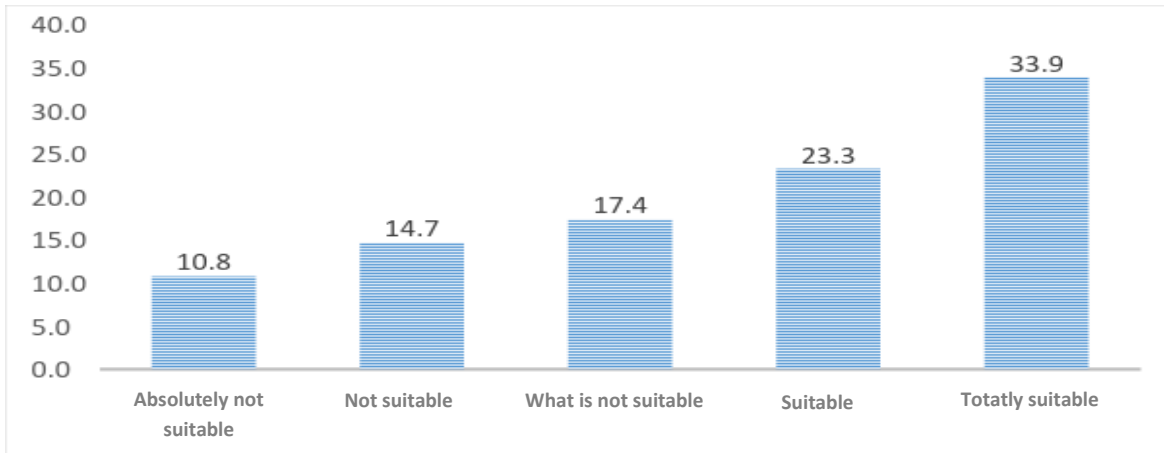
In the Graph. 15, 19.2% of the young people who are the subject of sampling regularly read the newspaper every day, 21.9% of them are appropriate, 21.2% are not suitable, 22.1% are very appropriate 15.5% of the respondents were not suitable at all.

Graph. 16

Purchasing Environmentally Damaging Products and Goods

In Graphic 16, 53.2% of the youth stated that they never buy products and goods that harm the environment. While 25.6% answered what is not appropriate or not, 12.7% was not very suitable and 8.5% gave no answer.

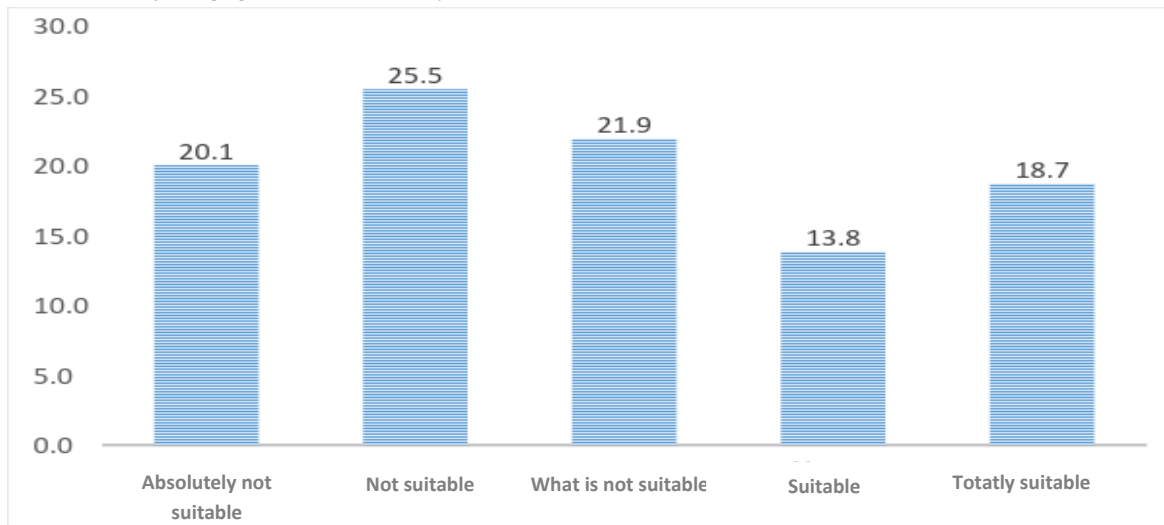
Graph. 17

I never miss sports events I'm interested in

In Graph. 17, 57.2% of the youth answered that I never miss the sports matches that I was interested in. While 17.4% of the youth answered this question, what was not appropriate and 14.7% said it was not very suitable. The rate of those who say it is not suitable is 10.8%.

Graph. 18

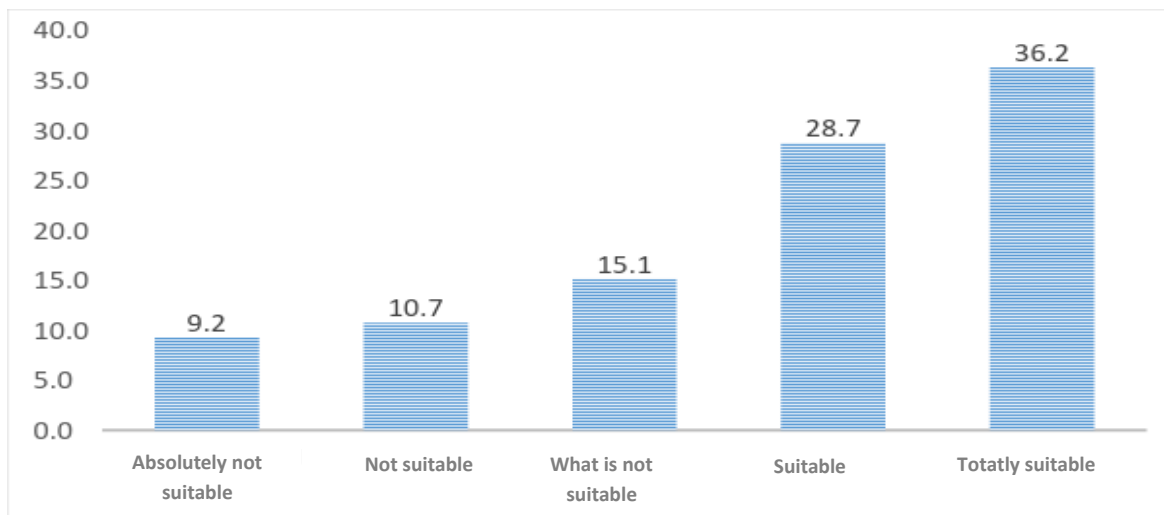
I am Actively Engaged in a Branch of Art



The participants were asked whether they were actively engaged in a branch of art. In Graph.18, it is observed that a rate of 45.6% is not actively engaged in a branch of art. 21.9% of them answered what is not appropriate or not. The rate of those who actively engage in a branch of art is 32.5%

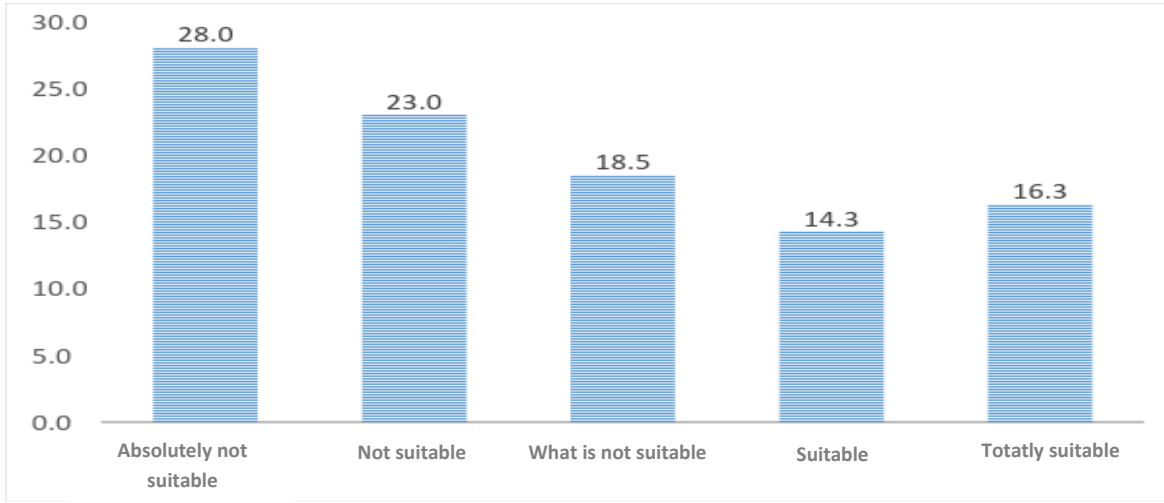
Graph. 19

I Go to the Cinema Once a Month



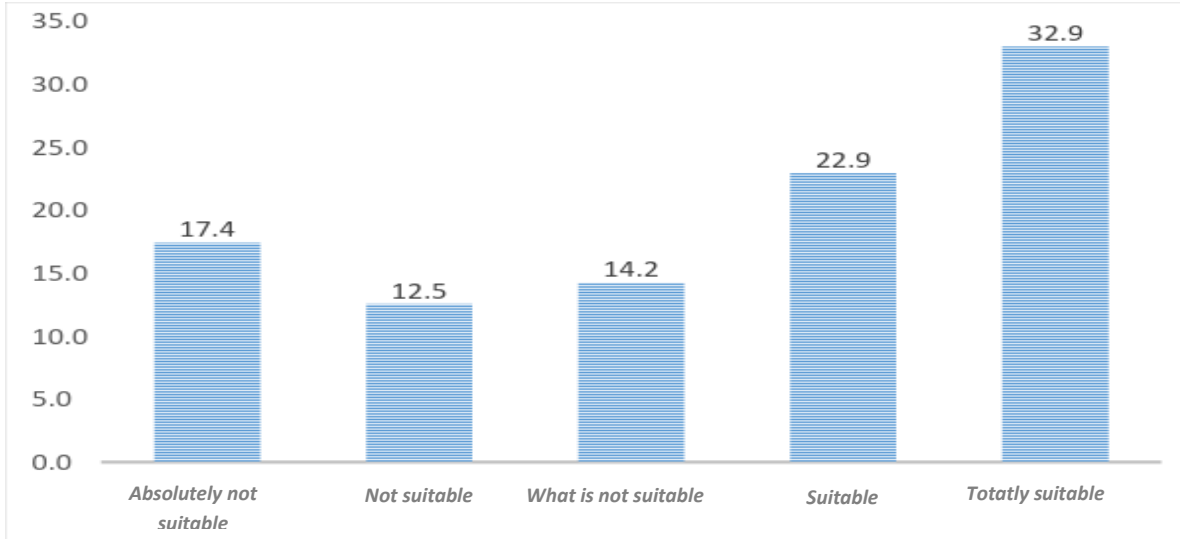
In Graph. 19, 64.9% of the youth stated that they go to the cinema once a month. Young people's interest in cinema is remarkable.

Graph. 20

I Go to the Theater Once a Month

In Graphic 20, it is observed that more than 50% of young people do not go to the theater, even once a month. It is seen that interest in cinema is not shown against theater. The rate of those who go to the theater once a month is 30% and the rate of those who go to the cinema once a month is more than 60%.

Graph. 21

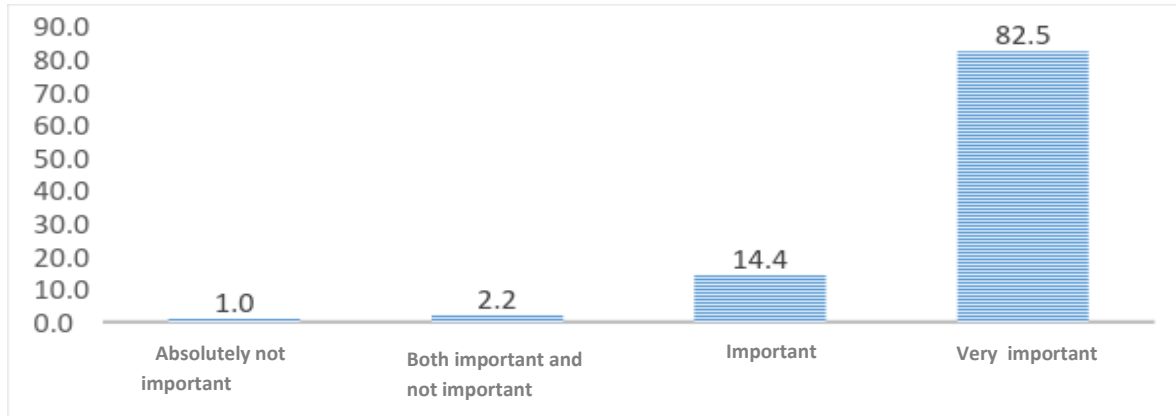
I Read a Book per month

Graph. 21 measures the reading habits of young people. 55.8% of the sample stated that they read one book a month. 14, 14.2% young people answered what was not appropriate, 12.5% was not very suitable and 17.4% gave no answer.

Values

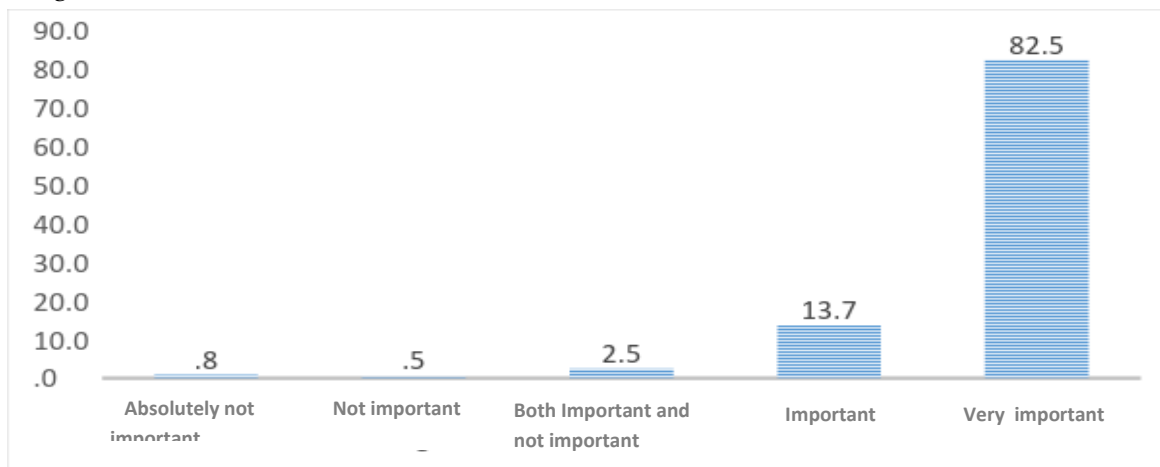
In order to get ideas about the value judgments of young people; questions were asked to the sample group on values such as national values, religious values, traditions and moral values, human rights and democracy, cultural values and historical values.

Graph. 22

National Values

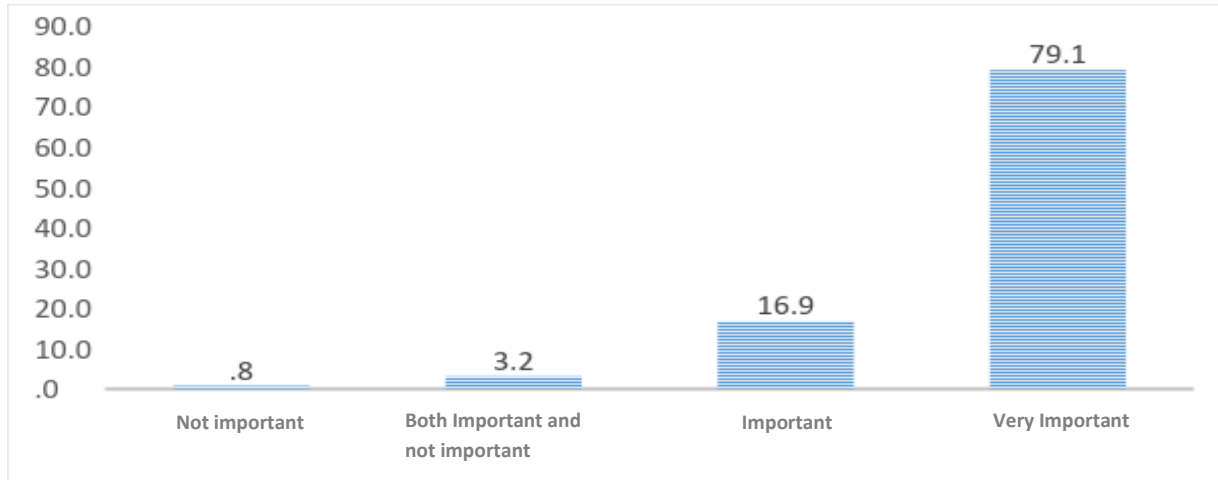
Graph. 22 shows the importance given to the national values of young people. 82.5% of the young people in the sample think that national values are very important and 14.4% think that they are important. 2.2% said it was neither important nor insignificant, while 1% said it was not important.

Graph. 23

Religious Values

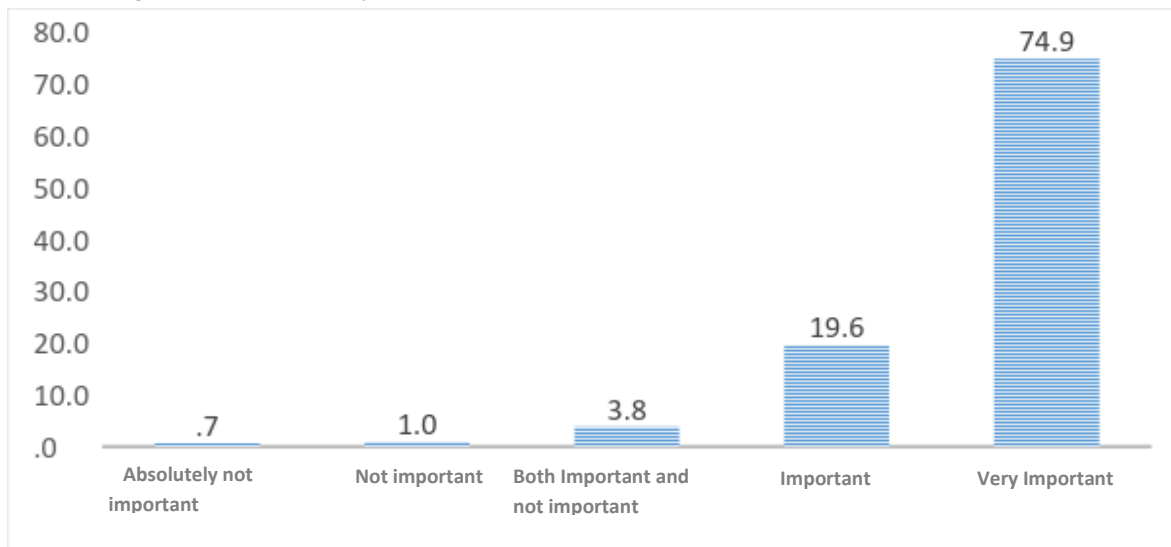
In Graph. 23, the importance given by the youth to religious values was measured. As a result, 82.5% of the youth stated that religious values were very important and 13.7% said that they were important. While 2.5% said it was neither important nor insignificant, 0.5% said it was not very important and 0.8% said it was not important at all.

Graph. 24

Traditions and Moral Values

Graph. 24 measures the importance of young people to traditions and moral values. As a result, 79.1% of the youth said that tradition and moral values were very important and 16.9% said that they were important. 3.2% said it was neither important nor insignificant, while 0.8% said it was not important.

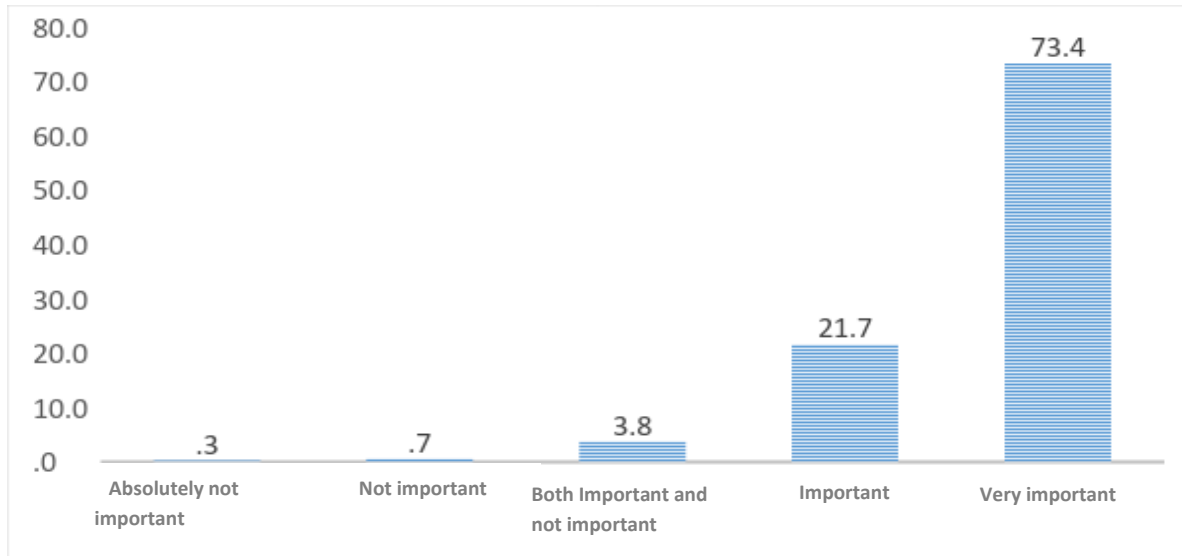
Graph. 25

Human Rights and Democracy

$p < 0.05$ a significant relationship

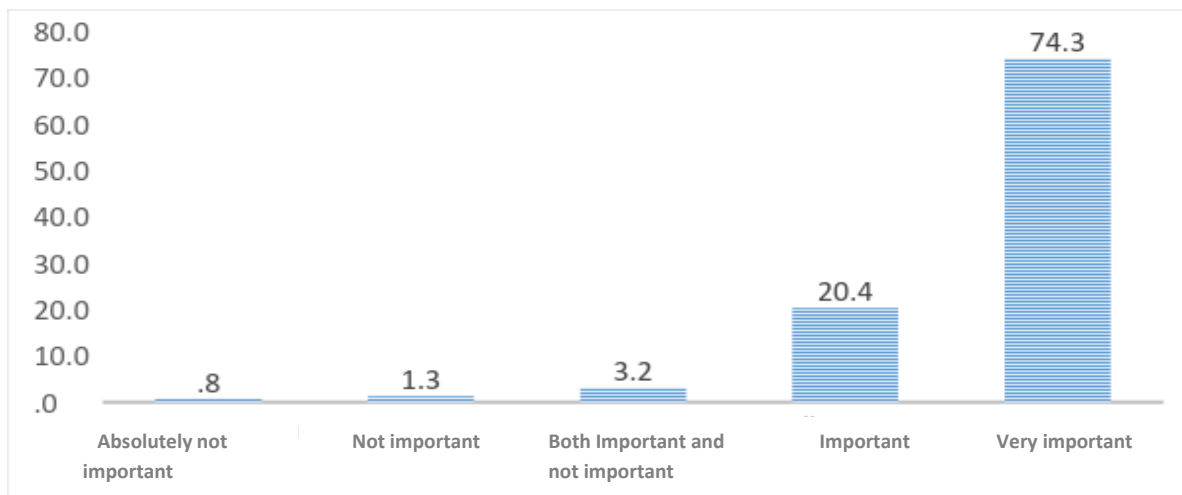
Graph. 25 measures the importance of youth for human rights and democracy. As a result, 74.9% of the youth said that human rights and democracy were very important and 19.6% said it was important. While 3.8% said it was neither important nor insignificant, 1% said it was not very important and 0.7% said it was not important at all.

Graph. 26
Cultural values



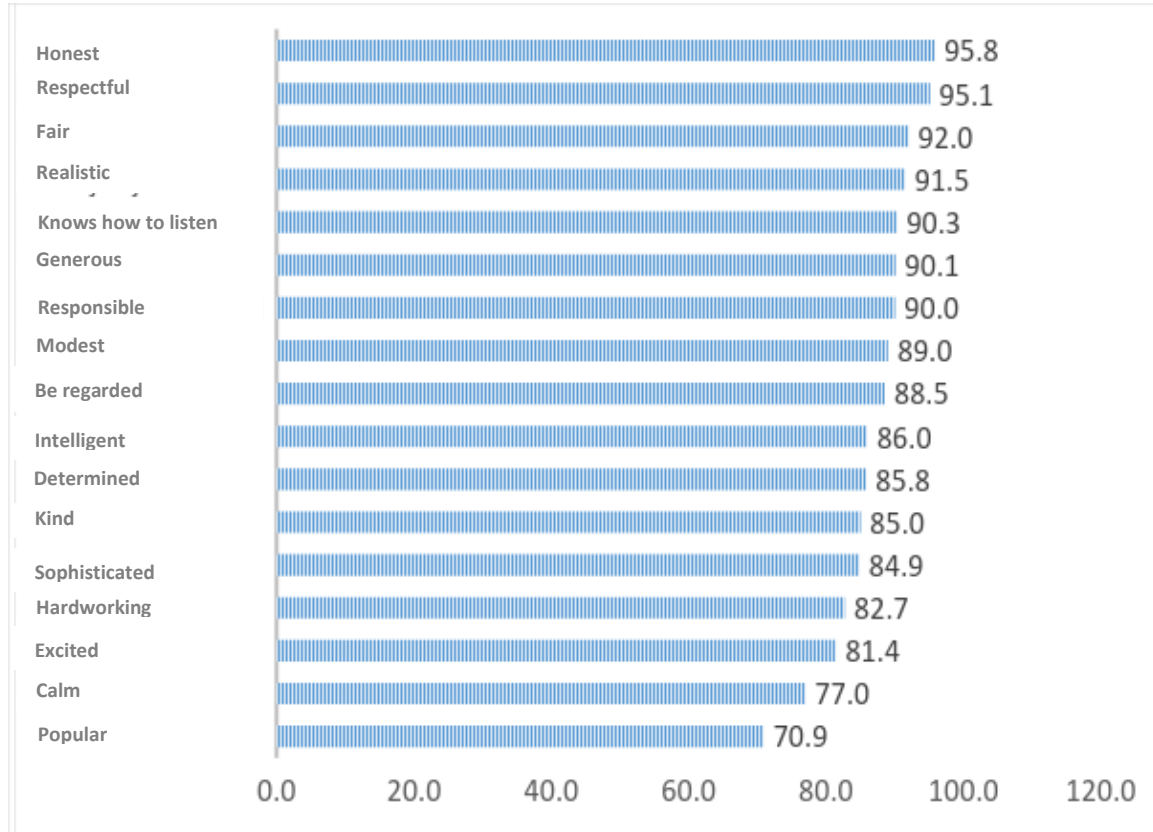
In Graph. 26, the importance given by the youth to cultural values was measured. As a result, 73.4% of the youth stated that cultural values are very important and 21.7% said that they are important. While 3.8% said it was neither important nor insignificant, 0.7% said it was not important, 0.3% said it was not important at all.

Graph. 27
Historical Values



Graph. 26 shows the importance given to the historical values of young people. As a result, 74.3% of the youth said that historical values were very important and 20.4% said that they were important. 3.2% of them are neither important nor insignificant, 1.3% is not very important, 0.8% said it does not matter at all.

Graph. 28

Self-Evaluation of Young People

In Graph.28, young people were asked to evaluate themselves. As a result, 95.8% of young people are honest, 95.1% respectful, 92% fair, 91.5% realistic, 90.3% know how to listen, 90.1% are generous, 90% responsible, 89% modest, 88.5% respected, 86% intelligent, 85.8% kind, 85% polite, 84.9% sophisticated, 82.7% are hardworking, 81.4% are excited, 77% are calm and 70.9% are popular.

THE RESULT OF THE RESEARCH

Apart from physical municipality, social and cultural municipalism of municipalities has gained importance recently and young people have played important roles. Konya Metropolitan Municipality has established many centers for youth so that they can find social and cultural areas that depend on values. Youth centers are at the most important part of this service and the activities for youth services are based on four main structures in Konya Metropolitan Municipality. These important structures give services on values, vocational education, sports education and science education. In this respect, Konya Metropolitan Municipality has managed to touch the whole of the youth with the youth services it provides.

As a result of the survey conducted in 2014, it was found that young people had positive opinions about many activities. The majority of the participants (88.6%) were

young people between aged 20-25 years. About 30% of young people live in dormitories, others live in a their own house with housemates or with their families. The best person in the family is the mother with a share of over 50%. The attitudes and behaviors of young people with their parents were positively found 70% . Families are highly sensitive in their attitude and behavior towards young people in the family. More than 30% of young people are sensitive to writing petitions about municipal services. The other part does not write petitions about municipal services as there is no opportunity. Nearly 30% of them found social, sporting and cultural sightseeing activities sufficient in Konya, while 30% stated their indecisiveness by giving neither adequate nor inadequate answers. More than 50% stated that they closely follow foreign and domestic policy. More than 50% stated that they are environmentally conscious and do not purchase products and goods that may harm the environment. 35% of the them stated that they were engaged in an active art branch. 65% of young people go to the cinema regularly every month and 30% go to the theater regularly every month. 55% of the them read a book regularly every month. More than 80% of young people attach a great importance to their national, religious, historical, cultural, customs and moral values.

95.8% of young people consider that they are honest, 95.1% respectful, 92% fair, 91.5% realistic, 90.3% know how to listen, 90.1% generous, 90% responsible, 89% modest, 88.5% respected, 86% intelligent, 85.8% determined, 85% polite, 84.9% sophisticated, % 82.7% are hardworking, 81.4% are excited, 77% are calm and 70.9% are popular.

As a result of the research conducted with the youth, the services of Konya Metropolitan Municipality have been effective in terms of youth. The scope of youth related activities should continue and develop within the years.

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An Investigation of Pre-Service English Language Teachers' Self-Efficacy Beliefs

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Abstract:

The purpose of this study was to investigate pre-service English as a foreign language (EFL) teachers' self-efficacy beliefs. The research was a descriptive study based on survey model. A total of 291 freshman, sophomore, junior and senior students studying at a state university in Turkey during the fall semester of the academic year 2018-2019 participated in the study. Teachers' Sense of Efficacy Scale (TSES), which was originally developed by Tschannen-Moran & Woolfolk Hoy (2001) and adapted into Turkish by Çapa, Çakıroğlu, and Sarıkaya (2005) was used to determine pre-service EFL teachers' self-efficacy beliefs. The self-efficacy beliefs were analyzed by descriptive statistics. Differences in participants' self-efficacy perceptions by class level were analyzed by one-way ANOVA. The Tukey multiple comparison test was used to determine significant differences among the different class levels. Research results revealed that pre-service EFL teachers had relatively high-level teacher self-efficacy perceptions in general and for classroom management, student engagement and instructional strategies subscales. Also, it was found that juniors had significantly higher scores than sophomores in both total scale and student engagement subscale. Total and subscale scores at other class levels did not differ significantly. It was suggested that pre-service EFL teachers' self-efficacy perceptions should be considered with greater attention in the ELT program at the university and special efforts are required to strengthen seniors' self-efficacy perceptions.

Pre-service EFL teachers, self-efficacy beliefs, pre-service EFL teachers' self-efficacy beliefs

Citation:

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INTRODUCTION

Bandura, Barbaranelli, Caprara, and Pastorelli (1996) suggest that people's self-efficacy beliefs are the most essential mechanisms of personal agency in terms of human functioning, that is, unless they believe they are capable of making the necessary changes by their own actions, they will not come into action about it. Perceived self-efficacy, which is identified as "the corner stone of social cognitive theory" (Pajares, 1992, p. 308), is defined by Bandura (1995) as "beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations" (p. 2) and it is suggested that self-efficacy, which is explained as people's beliefs about themselves, has a profound effect on their way of thinking, feeling and motivating themselves. The researcher explains that people's self-efficacy can be developed by four main forms of influence, namely mastery experiences, vicarious experiences provided by social models, social persuasion and physiological and emotional states, in order of priorities. Also, the researcher argues that self-efficacy beliefs are manifested in human behavior through four processes which are listed as cognitive, motivational, affective and selection processes which are in harmony with each other.

In theory of self-efficacy, Bandura (1977) states that the theory "is based on the principal assumption that psychological procedures, whatever their form, serve as means of creating and strengthening expectations of personal efficacy" (p. 193). The researcher suggests that self-efficacy beliefs affect the initiation of a behavior by a person, the amount of effort expended, and the amount of time that a person spends to sustain that effort when encountered with obstacles. In other words, it was indicated that the amount of effort depends on how strong the perceived efficacy is. The researcher clarifies that the efficacy expectation only is not enough for the performance to take place if a person lacks the required capabilities; nevertheless, strong efficacy expectations give a person incentive to act. Tschannen-Moran, Woolfolk Hoy and Hoy (1998) indicate that self-efficacy is related to "self-perception of competence rather than actual level of competence" (p. 211) and it is different from other concepts of self (eg, self-concept, self-worth, and self-esteem) because it is specific to a certain activity.

Bandura (1993, 1995) points out that efficacy beliefs contributes to academic development in three principal ways, which are students' self-efficacy to regulate their own learning and to master different academic subjects, teachers' self-efficacy to motivate and promote learning in their students, and teachers' collective self-efficacy in accomplishing desired academic progress. Pajares (1992, p. 316) defines teachers' beliefs as "teachers' attitudes about education-about schooling, teaching, learning, and students". Chacón (2005) indicates that teachers' sense of efficacy is one of those important beliefs which has an important effect on teachers' actions in the classroom and student outcomes. The researcher states that "teachers' actions and behaviors are tied to their beliefs, perceptions, assumptions, and motivation levels" (p. 257). Woolfolk Hoy and Spero (2005) define teachers' self-efficacy as "teachers' judgements about their abilities to promote students'

learning” (p. 343) and point out its significant effect on teachers’ effort, level of aspiration, and the goals about teaching. According to Bandura (1995), teachers’ talents and their self-efficacy toward teaching are of great significance in creating efficient and positive learning environments and so teachers with low instructional efficacy influence the learning environment in a negative way, which can also affect students’ self-efficacy and cognitive development negatively. Tschannen Moran & Woolfolk Hoy (2001) clearly specify the powerful relationship between teacher efficacy and many educational outcomes such as teachers’ persistence, enthusiasm, commitment and instructional behavior as well as student-related outcomes such as achievement, motivation, and student self-efficacy beliefs.

It has been indicated in literature that the role of teaching experience has an important effect on teachers’ sense of efficacy. For example, Afshar, Rahimi, Ghonchehpour, and Saedpanah (2015) found that years of experience significantly affected EFL teachers’ sense of efficacy. Therefore, the researchers suggest that teachers’ ability in classroom management could be enhanced by more training especially during first years of teaching. Tschannen-Moran and Woolfolk Hoy (2007) found that career teachers (teachers with four or more years of experience) had significantly higher overall self-efficacy than novice teachers (teachers with three or fewer years of experience). The researchers explain the lower-level self-efficacy of novice teachers with their relative inexperience. Similarly, in various studies (Aylar & Bostan, 2017; Aytaç, 2018; Çankaya, 2018; Çelik & Zehir Topkaya, 2017) it was found that experience was an important factor in teachers’ self-efficacy perceptions.

There are some studies in literature that examine pre-service EFL teachers’ self-efficacy beliefs. In a study by Alcı and Yüksel (2012) significant correlations were found among performance, teachers’ self-efficacy and metacognition of pre-service ELT (English Language Teaching) students. Alagözlü (2016) found that pre-service English teachers’ self-efficacy, perceived proficiency level and perceived use of pedagogical strategies were high all as predictors of self-concept. In another study by Baykara (2011) it was reported that pre-service EFL teachers had high level of self-efficacy and teacher efficacy perceptions did not differ by gender; however, there was a meaningful difference between first and third grade pre-service teachers in favor of first grade students. Also, a meaningful positive relationship was found between pre-service EFL teachers’ efficacy perceptions and metacognitive learning strategies. Çelik and Zehir Topkaya (2017) found that pre-service English teachers had moderately high teaching efficacy perceptions and they further reported an increase in participants’ teaching efficacy perceptions after field experience. In a study by Çankaya (2018), it was revealed that students teachers had slightly less self-efficacy levels than practicing teachers which indicated the positive effect of experience on self-efficacy.

As Bandura (1995) suggests, formal education should “equip students with intellectual tools, efficacy beliefs, and intrinsic interests” (p. 17) to provide them with a lifelong self-education opportunity. Also, the researcher indicates that teachers’ self-efficacy

beliefs have a great influence on their general orientation toward the educational process and their specific instructional activities in the class. In addition, as mentioned above, Chaco'n (2005) asserts that in order to determine the way teachers understand and organize instruction, research on teachers' beliefs, one of which is teachers' sense of efficacy, is essential. Similarly, Pajares (1992) makes a remark that teachers' and teacher candidates' beliefs should be an area of educational research which requires special interest. From all reasons mentioned above, it is believed to be important that pre-service EFL teachers have a strong sense of efficacy to sustain the required effort to succeed as an English teacher. And we can say that self-efficacy is very important for pre-service EFL teachers as their future work as language teachers will be highly influenced by their efficacy beliefs. In recent years, a great deal of studies (Aldan Karademir & Saracaloğlu, 2017; Akoğuz Yazıcı & Kalkavan, 2016; Bayrakdar, Vural Batık, & Barut, 2016; Berkant, 2017; Ekinci, 2013; Nakip & Özcan, 2016; Saracaloğlu, Yenice, & Özden, 2013; Sırmacı & Taş, 2016; Taşkın Ekici & Ekici, 2014) have been carried out on Turkish pre-service teachers' self-efficacy beliefs majoring in different departments. Among those studies, a relatively limited number of them (Alagözlü, 2016; Alcı & Yüksel, 2012; Baykara, 2011; Çelik & Zehir Topkaya, 2017) have addressed Turkish EFL pre-service teachers', or as mentioned in literature ELT students', English self-efficacy beliefs. So, the purpose of this study was to examine pre-service EFL teachers' self-efficacy beliefs. With this purpose, the following research questions were addressed:

1. What is the level of perceived self-efficacy belief among pre-service EFL teachers majoring at ELT department?
2. Does pre-service EFL teachers' perceived self-efficacy differ by class level?

METHOD

Research Design

This study was designed as a descriptive study based on survey model and the data were collected via quantitative data collection techniques. The purpose of survey model was to determine the type and level of the variables individually (Karasar, 2005).

Participants

Using a census sampling method, all pre-service EFL teachers majoring at ELT department at a large state university located in Konya, Turkey were invited to participate in this study. The inclusion criteria were being a student at ELT department of the university and willingness to participate in this study. 291 pre-service EFL teachers out of approximately 472 (334 female and 138 male) registered (response rate was 61.6%) majoring at ELT department participated in the study voluntarily. Although the participation in the study seems relatively small, it should be noted that a considerable number of the registered students were non-attendant. In addition, 22.3% of the participants were freshman (n= 65),

26.1% of were sophomores (n= 76), 30.9% were juniors (n= 90), and 20.6% were seniors (n= 60). As a considerable number of previous studies (Akoğuz Yazıcı & Kalkavan, 2016; Baykara, 2011; Berkant, 2017; Çankaya, 2018; Tschannen-Moran & Woolfolk Hoy, 2007; Ülper & Bağcı, 2012) revealed no gender differences in pre-service teachers' self-efficacy beliefs and due to the small proportion of male students at ELT department at the university, gender was not used as a variable although both male and female students participated in the study. All the participants were informed about the study prior to completing the questionnaire.

Instrumentation and procedure

The long and Turkish version of the Teachers' Sense of Efficacy Scale (TSES) which was originally developed by Tschannen-Moran & Woolfolk Hoy (2001) and adapted into Turkish by Çapa, Çakıroğlu, and Sarıkaya (2005) was used to determine pre-service EFL teachers' self-efficacy belief in teaching English. This 9-point Likert type scale comprised of three eight-item dimensions (efficacy for classroom management, efficacy for student engagement, and efficacy for instructional strategies) and 24 items totally. The possible highest score is 216 while the possible lowest score is 24. The Cronbach alpha coefficient was .84 for factor 1 (efficacy for classroom management), .82 for factor 2 (efficacy for student engagement), .86 for factor 3 (efficacy for instructional strategies), and .93 for the Instrument overall. In this study, the Cronbach alpha coefficient was .88 for factor 1, .86 for factor 2, .88 for factor 3, and .95 for the overall instrument.

Data Collection and Analysis

Data were collected in the fall semester of the academic year 2017-2018 during the courses at the faculty. It took approximately 10-15 minutes for participants to fill out the questionnaire. Pre-service EFL teachers' self-efficacy beliefs were analyzed by descriptive statistics (mean and standard deviation). The data were tested for normal distribution with the Kolmogorov-Smirnov test and for homogeneity of variances with Levene's test. Differences in participants' self-efficacy perceptions by class level were analyzed by one-way ANOVA. The Tukey multiple comparison test was used to determine significant differences among the different class levels. The level of significance was set to $p < .05$. The data were analyzed by SPSS 16 software for Windows.

Assumptions and limitations

One of the important limitations of this study is that our findings are based on self-reported data, so they must be interpreted with caution. Also, the results in this study were limited to data obtained from 291 volunteer pre-service ELT teachers studying at only one state university during the winter semester of academic year 2017-2018. Also, it was assumed that all the participants honestly and accurately answered each question in the scale.

RESULTS

Table 1 shows that participants' teacher self-efficacy score was 158.79 for the total scale, 52.88 for the classroom management subscale, 52.68 for the student engagement subscale, and 53.24 for the instructional strategies subscale. It could be said that pre-service EFL teachers had relatively high-level teacher self-efficacy perceptions in general.

Table 1

Descriptive statistics for EFL pre-service teachers' teacher self-efficacy perception scores (n=291)

	Min	Max	Mean	SD
Total	53	216	158.79	24.06
Classroom Management	18	72	52.88	8.85
Student Engagement	11	72	52.68	8.85
Instructional Strategies	14	72	53.24	8.57

Min=Minimum, Max=Maximum, SD=Standard Deviation

Similarly, it can be said that pre-service EFL teachers had relatively high-level self-efficacy perceptions for classroom management, student engagement and instructional strategies subscales. Also, as it was shown in Table 1, pre-service EFL teachers felt themselves as the most efficacious for instructional strategies, followed by classroom management and student engagement respectively.

Table 2

One-way Anova Results for pre-service EFL teachers' teacher self-efficacy perception scores by class level

	Class level	n	Mean	SD	df	F	p
Total	1	65	156.40 ^a	20.85	3-287	2.97	0.03
	2	76	155.37 ^{bc}	27.89			
	3	90	164.99 ^{cb}	20.38			
	4	60	156.43 ^d	25.95			
Classroom Management	1	65	51.97	7.46	3-287	1.77	0.15
	2	76	52.33	10.45			
	3	90	54.64	7.19			
	4	60	51.92	10.03			
Student Engagement	1	65	52.11 ^a	8.01	3-287	3.85	0.01
	2	76	50.89 ^{bc}	10.24			
	3	90	55.19 ^{cb}	7.10			
	4	60	51.78 ^d	9.54			
Instructional Strategies	1	65	52.32	7.96	3-287	2.26	0.08
	2	76	52.14	9.32			
	3	90	55.16	7.92			
	4	60	52.73	8.90			

^{a-d} Similar superscripts in the same column indicate significant differences between the grade level (one-way ANOVA with Tukey, $p < 0.05$).

As shown in Table 2, pre-service EFL teachers' total scale score [$F_{(3-287)} = 2.97$ $p = 0.03$] and student engagement subscale score [$F_{(3-287)} = 3.85$ $p = 0.01$] differed significantly by class level. As it is seen in Table 2, juniors had significantly higher

scores than sophomores in both total scale and student engagement subscale, however, total and student engagement subscale scores at other class levels did not differ significantly ($p>0,05$). Also, classroom management [$F_{(3-287)}= 1.77$ $p=0.15$] and instructional strategies [$F_{(3-287)}= 2.26$ $p=0.08$] subscale scores did not differ significantly by class level.

DISCUSSION

The aim of this study was to examine the level of perceived self-efficacy belief among pre-service EFL teachers majoring at ELT department and to find out if their perceived self-efficacy differed by class level. As to the first aim of the study, pre-service EFL teachers' self-efficacy perceptions were found relatively high in our study. As one of the three principal ways in which efficacy beliefs contribute to academic development (Bandura, 1995), pre-service EFL teachers' perceived self-efficacy was relatively high in this study. So, it can be said that the participants in our study have the power to motivate their students and they have the ability to support the learners during teaching-learning process. Besides, Bandura (1995) suggests that teachers' talents and self-efficacy perceptions have great importance in creating learning environments suitable for learning. Other studies in literature (Schunk & Pajares, 2001; Tschanen Moran & Woolfolk Hoy, 2001) show that self-efficacy has a significant effect on achievement and motivation. Chaco'n (2005) indicates that teachers' sense of efficacy, as one of teachers' important beliefs, has an important effect on teacher practices and student outcomes. Therefore, it is believed that pre-service EFL teachers in our study have an important advantage before starting their career as English teachers and they will probably be successful in creating positive classroom atmosphere which will support students' self-efficacy perceptions and will also affect their students' motivation and achievement positively. Also, it is believed that their high perceived self-efficacy can aid in collective school efficacy as "teachers operate collectively within an interactive social system" (Bandura, 1995, p. 20).

This result was in concordance with a previous study by Alagözlü (2016) reporting that pre-service English teachers' self-efficacy perceptions of their teaching ability were found high. Based on the results, the researcher suggested that pre-service English teachers in the study had the power to face the challenges and adversities during their career as English teachers. Also, this result of the study is in line with the findings of Alci and Yüksel (2012) who found approximately a similar total self-efficacy score (162.29) which could indicate that ELT students had high-level self-efficacy. Moreover, similar to our results, Baykara (2011) found that pre-service English teachers' teacher efficacy perceptions were high, and the researcher suggested that the participants would create an effective teaching environment when they start their career as an English teacher. In the same way, Çelik and

Zehir Topkaya (2017) reported that pre-service senior EFL teachers were found to hold moderately high teaching efficacy perceptions.

Regarding subscale scores (classroom management, student engagement and instructional strategies subscales) in our study, it was revealed that pre-service EFL teachers had relatively high-level self-efficacy perceptions for classroom management (52.88), student engagement (52.68) and instructional strategies (53.24). Baykara (2011) reported approximately similar self-efficacy scores for classroom management (54.68), student engagement (53.53), and instructional strategies (54.33), which is compatible with our results. As it is clear, in our study participants felt themselves as the most efficacious for instructional strategies. It can be attributed to the fact that pre-service teachers take several courses on instructional strategies or on similar topics at their department, so they could be acquainted with that kind of theoretical knowledge. In line with our results, Çankaya (2018) reported that pre-service EFL teachers considered themselves as the most efficacious about instructional concerns. But in contrast to our study Baykara (2011) found that pre-service EFL teachers considered themselves as the most efficacious about classroom management. In addition, our participants felt themselves as the least efficacious for student engagement although it indicates a relatively high-level efficacy as well. It was an expected result that as pre-service teachers our participants had very limited experience in the field. In line with our results, Çankaya (2018) and Baykara (2011) reported that pre-service EFL teachers considered themselves as the least efficacious about student engagement.

As to the second aim of the study, pre-service EFL teachers' total scale score and student engagement subscale score differed significantly by class level. When examined in detail, it was seen that juniors had significantly higher scores than sophomores in both total scale and student engagement subscale. This was an expected result as we know from literature (Aylar & Bostan, 2017; Aytaç, 2018; Çelik & Zehir Topkaya, 2017) that experience is an important factor in teachers' self-efficacy perceptions. Also, in their study, Tschannen-Moran and Woolfolk Hoy (2007) accounted for novice teachers' significantly lower-level self-efficacy by attributing it to their relative inexperience compared to experienced teachers. Expectedly, juniors in our study had significantly higher-level teacher self-efficacy than sophomores probably because they had more experience compared to sophomores. Comparison of the teacher self-efficacy scores by class level showed that total and subscale scores at other class levels did not differ significantly in our study. It was an interesting finding because it was expected that seniors had significantly higher-level teacher self-efficacy than especially freshmen and sophomores. Contrary to the expected, seniors had lower teacher self-efficacy score than juniors though it is not statistically significant, and they also had nearly similar teacher self-efficacy scores to freshmen and sophomores. The reason could be that seniors mainly focus on Public Personnel Selection Examination (KPSS) in the last year of their university education, so they could not be interested in their teaching experience as expected. Excessive exam anxiety and busy studying schedule might affect

pre-service teachers' self-efficacy perceptions as well as their environmental communication, social relationships and artistic, cultural and sporting activities negatively as reported by Sezgin and Duran (2011).

As explained before, seniors (156.43) had similar teacher self-efficacy score to freshmen (156.40) and sophomores (155.37). The high self-efficacy perception of freshmen and sophomores in our study can be explained with their intensive preparatory class education which they needed to complete successfully before starting the program at their department. This yearlong intensive English education might affect their teacher self-efficacy positively as pre-service English teachers. Moreover, it should be borne in mind that freshmen might have unrealistic self-efficacy beliefs. In relation to pre-service teachers' unrealistic beliefs, Pajares (1992) states that "most pre-service teachers have an unrealistic optimism and a self-serving bias" (p. 323). The researcher clarifies that most of the pre-service teachers assume that they have already owned the most important attributions for successful teaching, they believe that they will not face the same problems others have faced before and they will have much better performance in teaching than the other ones. Nevertheless, it should be noted that even these unrealistic beliefs might somewhat contribute to their motivation and actions as well. Because Bandura (1995) states that "people's level of motivation, affective states, and actions are based more on what they believe than on what is objectively the case" (p. 2). Also, the researcher remarks that optimistic efficacy beliefs foster human accomplishments and positive well-being. So, it can be said that pre-service teachers with a strong sense of efficacy are expected to make the required effort to succeed.

In contrast to our results, Alci and Yüksel (2012) found that 1st year students' teacher self-efficacy score was significantly lower than that of the third- and fourth-year students. In that study, third and fourth-year ELT students had stronger teacher self-efficacy beliefs which suggested that teacher's self-efficacy increases by time according to the authors. In another study, Baykara (2011) found a meaningful difference between first grade and third grade pre-service English teachers' self-efficacy. Different from our results, it was reported that freshman students had the highest-level self-efficacy beliefs while the juniors had the lowest level of self-efficacy. The researcher explains the first-grade students' high-level teacher self-efficacy with their enthusiasm to choose the ELT department.

CONCLUSION AND IMPLICATIONS

There are some possible conclusions to be drawn from the results of our study. One of the conclusions is that preservice EFL teachers had relatively high teacher self-efficacy perceptions. This finding is crucial in terms of pre-service EFL teachers' motivation and performance as language teachers because Bandura (1995) explains that sense of efficacy affects personal goal setting. According to the researcher, people who have a high sense of

efficacy generally visualize success scenarios which guide and support their performance while those who have a low sense of efficacy visualize failure scenarios which affect their performance in a negative way. The researcher also signifies the important role of self-efficacy in self-regulation of motivation, level of stress and depression in difficult situations as well as the activities and environments people choose in their life. Similarly, Chaco'n (2005) specifies that teachers' perceived capabilities to teach seem to have a direct impact on teaching practices.

The other conclusion that can be drawn from the data is the significant difference between juniors and sophomores' teacher self-efficacy perceptions in favor of juniors. Unexpectedly, the results showed no significant difference at other class levels. Seniors were expected to have significantly higher teacher self-efficacy than the other class levels. Based on our results, we suggest that pre-service EFL teachers' self-efficacy perceptions should be considered with greater attention in the ELT program at the university. In the same way, Pajares (1992) indicates that teacher education programs need to take pre-service teachers' entering beliefs into account. Likewise, Tschanen Moran & Woolfolk Hoy (2001) point out that considering the significant effects of teacher efficacy on teachers' capabilities requires significant changes during the preparation program at the faculty. The researchers suggest that teacher preparation programs could appear like apprenticeships full of mastery experiences rather than a university classroom with vicarious experience and verbal persuasion if teacher self-efficacy is considered seriously in the program. Accordingly, Tschannen-Moran et al. (1998) emphasize that teacher education programs should provide pre-service teachers more opportunities to practice and chances for mastery experiences and feedback. Çankaya (2018) points out the significant role of teacher education program in enhancing pre-service teachers' self-efficacy. As mastery experiences and vicarious experiences are the most effective ways to develop self-efficacy (Bandura, 1995), it is believed that teaching practices courses starting from the first years of the university education would be effective in creating a strong sense of efficacy in that those courses could provide pre-service teachers both good social models and chances to have successful experiences. In a similar vein, Woolfolk Hoy and Spero (2005) emphasize the important influence of mastery experiences during student teaching and the first year of teaching in developing teacher efficacy. The researchers specify that the first years of teaching can be very important in terms of developing long-term teacher efficacy because of the malleability of the efficacy early in learning according to the theory of self-efficacy. Bandura (1977) emphasizes that after strong efficacy expectations are developed by a person, occasional failures will not have a negative influence on self-efficacy. Meanwhile, based on the results it is suggested that special precautions must be taken for the senior students who need to study hard for Public Personnel Selection Examination (KPSS) in order to minimize the negative effects of the exam on their teacher self-efficacy. Social persuasion, which is a way of strengthening people's beliefs (Bandura, 1995), would provide seniors the needed social support to reduce their exam anxiety as it was demonstrated in a study by Tschannen-

Moran and Woolfolk Hoy (2007) that novice teachers' self-efficacy was influenced by contextual factors such as verbal persuasion and the availability of the resources more than the experienced teachers. In addition, Bandura (1977) suggests that verbal persuasion is easy, always available, and contributes to a person's success although its effect could be weaker than the mastery experiences.

As mentioned before, his study was mostly motivated by the limited number of the studies which focus on Turkish pre-service EFL teachers' self-efficacy beliefs. Despite the limitations (limited number of participants, restriction to one university context and the self-reported data), it is believed that our results are useful and provide some new insight in the literature related to the positive effect of pre-service teachers' experience gained through their education at the faculty and the negative effect of Public Personnel Selection Examination (KPSS) on seniors' teacher self-efficacy perceptions. However, it is suggested that the study should be replicated with more participants from different university contexts. Moreover, the investigation of the effect of other factors such as gender, age, background, English proficiency level on teacher efficacy can also contribute to literature.

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