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The geographical thinking skills and motivation of the students in the departments of Geography in Turkey

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Abstract

The study aimed to investigate the geographical thinking skills and motivation of the students in geography departments in Turkey in learning Geography. The study utilized survey method based on a quantitative research design. The participants of the study were selected using the convenience sampling method, and consisted of 500 students from different universities in Turkey, namely; Nevşehir Hacı Bektaş Veli University, Pamukkale University, Tokat Gaziosmanpaşa University, Kırşehir Ahi Evran University. The data were collected via "The Geographical Thinking Skills Scale" developed by Balcıoğulları (2011), and "The Motivation Scale in Learning Geography developed by Kaya (2013). The data were analyzed using qualitative data analysis methods. The results revealed that a) participants' gender had a significant role in their geographical thinking skills and motivation in geography learning except for the performance sub-dimension of motivation; b) mother's and father's education level didn't make a significant difference except for geographical questions so that it had a role in seeking information; c) mother's and father's education level did not make a significant difference except for self-confidence so that it had a role in the cognitive dimensions of motivation; d) income did not affect geographical thinking skills and motivation except for performance; e) all demographic variables in this study approximately had equal importance for the analysis when comparing to each other in geographical thinking skills; f) father's education level and gender had an important role comparing to other demographic variables in motivation in learning geography; and d) the interest-field had a casual and significant role in seeking geographical knowledge.

Keywords: Geographical thinking skills; motivation in learning geography; neural networks; path analysis

1. Introduction

Thinking skills are the core element of any discipline since it is impossible to reckon with the relevant specific problems without them in any field. Therefore, thinking skills

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can be classified as general thinking skills that are essential to understanding any subject, and specific thinking skills which are related to a particular discipline or a field. One of the specific thinking skills, geographical thinking skills are regarded as interlinked with geographical content and method.

Geospatial expertise gives us geographic thinking tools and techniques. Geographical capabilities are the way we understand geographically, and we start to think geographically using these geographical capabilities. In this manner, physical and social events which are the fields of geography become easier for us to understand (Balcıoğulları, 2011). Geographic thinking is closely connected with the concept powerful knowledge of Michael Young and Johan Muller (2010). Ways of thinking can be powerful since they can change the beliefs, values, and expectations of a student, their concerns, and their explanations. It provides students with powerful ways of analyzing, explaining, and understanding. This enables young people to be independent of the dominant sources of information in society by giving students some power over their knowledge (Maude, 2015). Powerful knowledge is simultaneously specialized and distinguished according to Young (2013). Its specialization is represented through a disciplinary experience that has been established over decades and often over centuries across the theoretical sense. As such, it is often distinct from the daily information gained and taken to school by students with them (Uhlenwinkel, 2017). The exploration of spatial orders, patterns, and connections encompass geographical thinking skills. Students can use several geographic information to investigate social and environmental issues through these skills (Balcıoğulları, 2011). If we can identify and justify how this thinking allows students to perceive the environment in multiple ways, it is really necessary that they "think geographically," to transform the way young perceive the world in the strong broad geographical ideas (Brooks, Butt, and Fargher, 2017). In this respect, it is important to investigate student's geographical thinking skills and factors affecting those skills to provide them with more qualified feedback in educational environments.

Just like any field motivation is a key concept enabling individuals to keep their energies to continue their work. Motivation in its simplest definition is to demonstrate any actions to reach a goal voluntarily (Baumeister & Vohs, 2007). Motivation is a mechanism that is connected to the intensity, direction, and expectations of actions to accomplish a certain aim (Pintrich & Schunk, 1996). Students with high motivation are more successful in academic studies such as participating in classes, asking questions, participating in activities (Wolters & Rosenthal, 2000). When an individual is well-motivated, his learning and his willingness to utilize the learning process more effectively would be affected positively. Since the individual has gotten more lasting learning without needing anyone. Motivation is an important concept in thinking skills since it requires one to keep attention and mind to focus on a particular subject or aspect. Therefore, it is important to understand the motivation of students in geography and its relation with geographical thinking skills. Hence, this study aimed to investigate

geographical thinking skills and motivation in learning the geography of the students in geography departments, and the research question was formulated as "***How are the geographical thinking skills and motivation of the students in the departments of Geography in Turkey?***".

The sub-research questions of the study can be given as follows:

1- Do geographical thinking skills and motivation in learning geography significantly differ in terms of gender?

2- Do geographical thinking skills and motivation in learning geography significantly differ in terms of the mother's education level?

3- Do geographical thinking skills and motivation in learning geography significantly differ in terms of the father's education level?

4- Do geographical thinking skills and motivation in learning geography significantly differ in terms of monthly family income?

5- Is there any significant correlation between geographical thinking skills and motivation in learning geography?

6- Is there any significant causal connection of geographical thinking skills for motivation in learning geography?

7- Is there any significant causal connection of motivation in learning geography for geographical thinking skills?

2.Method

This quantitative study was based on the survey model. A survey is a method for gathering data from individuals in a community to define the features of the entity's population. The main goal of this type of study was to obtain information describing the characteristics of a large sample of individuals of interest quickly (Ponto, 2015).

2.1. Participants

The participants of the study comprised 500 students who were selected via convenience sampling method from the following 4 universities; Nevşehir Hacı Bektaş Veli University, Pamukkale University, Tokat Gaziosmanpaşa University, and Kırşehir Ahi Evran University. All participants voluntarily participated in this research and they accepted the requirements of the research.

For correlational survey models, the number of participants is taken into consideration as a result of the calculation with the following formula (Tabachnick, Fidell, 2007):

N: Number of participants

m: number of independent variables

N > 50 + 8m where m= 11 (4 independent variables from geographical thinking skills, 4 motivation scale of in learning geography)

N > 114 where The target sample size for this study is 500 which meet the requirement.

The characteristics of the participants in terms of their gender and monthly family income are given in Table 2.1 below.

Table 2.1. The characteristics of the sample in terms of gender and monthly family income

		Monthly Income									
		750-1000	1000-2000	2000-3000	3000-4000	4000-5000	5000-6000	6000-7000	7000-8000	8000 +	Total
Gender	Male	9	18	32	20	11	9	8	6	7	120
	Female	43	56	134	49	42	26	9	10	11	380
Total		52	74	166	69	53	35	17	16	18	500

The characteristics of the participants in terms of father's education level and mother's education level are given in Table 2.2 below.

Table 2.2. The characteristics of the sample in terms of father's education level and mother's education level

Count							
		father's education level					
		Primary school	Secondary school	High school	College	Postgraduate	Total
Mother's education level	Primary school	173	75	45	17	0	310
	Secondary school	10	20	32	9	0	71
	High school	10	8	34	23	0	75
	College	11	9	7	8	3	38
	Postgraduate	2	1	0	1	2	6
Total		206	113	118	58	5	500

2.2. Data Collection Tools and Analysis

The data collection tools of the study were; "The Geographical Thinking Skills Scale" developed by Balcıoğulları (2011), and "The Motivation Scale in Learning Geography developed by Kaya (2013). Altough Kaya (2013) used this scale for secondary school students the items were thought to be appropriate for higher grades and levels in terms

of their content and structure. The data were analyzed using qualitative data analysis methods as presented in the findings part below.

3. Findings

Before conducting the analysis, it is important to examine whether the data is normally distributed or not to decide the analysis method. Kolmogorov-Smirnov statistics show that the data is not normally distributed so that non-parametric tests are chosen for subsequent analysis. However, skewness and kurtosis values are checked to do linear regression and multiple regression analysis as well.

3.1. Findings on geographical thinking skills and motivation in learning geography in terms of gender

Mann-Whitney U statistics for geographical thinking skills and motivation in learning geography in terms of gender show that there are significant differences in all dimensions of the two scales except the performance dimension in motivation in learning geography.

Table 3.1. Mann-Whitney U statistics for geographical thinking skills and motivation in learning geography in terms of gender

Test Statistics [a]	asking geographical questions	asking geographical information	organizing geographical information	analyzing geographical information	interest-field	self-confidence	knowledge acquisition	Performance
Mann-Whitney U	19271,000	19394,500	18683,000	17902,000	17769,000	17914,000	20369,000	21467,000
Wilcoxon W	91661,000	91784,500	91073,000	90292,000	90159,000	90304,000	92759,000	28727,000
Z	-2,561	-2,471	-2,990	-3,551	-3,652	-3,561	-1,767	-1,009
Asymp. Sig. (2-tailed)	,010	,013	,003	,000	,000	,000	,077	,313

a. Grouping Variable: gender

Mean ranks for geographical thinking skills and motivation in learning geography show a significant difference in favor of males in all dimensions.

Table 3.2. Mean ranks for geographical thinking skills and motivation in learning geography in terms of gender

Ranks					
		Gender	N	Mean Rank	Sum of Ranks
Asking questions	geographical	Male	120	279,91	33589,00
		Female	380	241,21	91661,00
		Total	500		
Asking information	geographical	Male	120	278,88	33465,50
		Female	380	241,54	91784,50
		Total	500		
Organizing information	geographical	Male	120	284,81	34177,00
		Female	380	239,67	91073,00
		Total	500		
Analyzing information	geographical	Male	120	291,32	34958,00
		Female	380	237,61	90292,00
		Total	500		
interest-field		Male	120	292,43	35091,00
		Female	380	237,26	90159,00
		Total	500		
Self-confidence		Male	120	291,22	34946,00
		Female	380	237,64	90304,00
		Total	500		
Knowledge-acquisition		Male	120	270,76	32491,00
		Female	380	244,10	92759,00
		Total	500		
Performance		Male	120	239,39	28727,00
		Female	380	254,01	96523,00
		Total	500		

3.2. Findings on geographical thinking skills and motivation in learning geography in terms of mother's education level

Kruskal Wallis statistics for geographical thinking skills and motivation in learning geography in terms of mother's education level show that there is a significant difference in asking geographical questions dimension in geographical thinking skills and there are significant differences in interest field, knowledge acquisition, and performance dimensions in learning geography in terms of mother's education level.

Table 3.3. Kruskal Wallis statistics for geographical thinking skills and motivation in learning geography in terms of mother's education level

	asking geographical questions	asking geographical information	organizing geographical information	analyzing geographical information	interest-field	self-confidence	knowledge acquisition	performance
Chi-Square	8,653	4,236	,225	1,846	12,995	4,784	9,825	16,206
Df	3	3	3	3	3	3	3	3
Asymp. Sig.	,034	,237	,973	,605	,005	,188	,020	,001

Mean ranks show that the lowest mean rank belongs to mothers who graduated from high school in asking geographical questions and a similar case is observed for differences interest-field, knowledge acquisition, and performance dimensions in learning geography in terms of mother's education level.

Table 3.4. Mean ranks for geographical thinking skills and motivation in learning geography in terms of mother's education level

Ranks			
	Mother's education level	N	Mean Rank
asking geographical questions	Primary	310	259,09
	Secondary	71	224,58
	Highschool	75	213,33
	College	38	263,24
	Total	494	
interest-field	Primary	310	260,74
	Secondary	71	246,20
	Highschool	75	194,66
	College	38	246,21
	Total	494	
knowledge acquisition	Primary	310	255,24
	Secondary	71	242,62
	Highschool	75	204,15
	College	38	279,05
	Total	494	
Performance	Primary	310	260,20
	Secondary	71	242,29
	Highschool	75	191,07
	College	38	264,97
	Total	494	

3.3. Findings on geographical thinking skills and motivation in learning geography in terms of father's education level

Kruskal Wallis for geographical thinking skills and motivation in learning geography in terms of father's education level shows that there are significant differences in asking geographical questions and asking geographical information dimension for geographical thinking skills and interest field knowledge acquisition, and performance in motivation in learning geography in terms of father's education level.

Table 3.5. Kruskal Wallis for geographical thinking skills and motivation in learning geography in terms of father's education level

Test Statistics [a, b]								
	asking geographical questions	asking geographical information	organizing geographical information	analyzing geographical information	interest-field	self-confidence	knowledge acquisition	Performance
Chi-Square	12,489	8,945	2,079	2,739	17,221	5,462	14,142	10,950
Df	3	3	3	3	3	3	3	3
Asymp. Sig.	,006	,030	,556	,434	,001	,141	,003	,012

a. Kruskal Wallis Test
b. Grouping Variable: Father's education level

Mean ranks for geographical thinking skills and motivation in learning geography in terms of father's education level show that all significant differences can be attributed to fathers who graduated from college because they have the lowest mean rank comparing to others.

Table 3.6. Mean ranks for geographical thinking skills and motivation in learning geography in terms of father's education level

Ranks			
	Father's education level	N	Mean Rank
asking geographical questions	Primary	206	257,99
	Secondary	113	272,68
	Highschool	118	229,92
	College	58	201,22
	Total	495	
asking geographical information	Primary	206	254,48
	Secondary	113	269,94
	Highschool	118	236,50
	College	58	205,66
	Total	495	
interest-field	Primary	206	257,66
	Secondary	113	273,18
	Highschool	118	239,39
	College	58	182,14
	Total	495	
knowledge acquisition	Primary	206	259,80
	Secondary	113	260,96
	Highschool	118	246,58
	College	58	183,72
	Total	495	
Performance	Primary	206	257,73
	Secondary	113	262,41
	Highschool	118	242,94
	College	58	195,67
	Total	495	

3.4. Findings on geographical thinking skills and motivation in learning geography in terms of monthly family income

Kruskal Wallis test results for geographical thinking skills and motivation in learning geography in terms of monthly family income show that there is no significant difference in all dimensions of the two scales except the performance dimension in learning geography in terms of monthly family income.

Table 3.7. Kruskal Wallis test results for geographical thinking skills and motivation in learning geography in terms of monthly family income

Test Statistics [a, b]								
	asking geographical questions	asking geographical information	organizing geographical information	analyzing geographical information	interest-field	self-confidence	knowledge acquisition	performance
Chi-Square	10,263	7,042	13,465	5,704	6,665	2,282	9,199	19,687
Df	8	8	8	8	8	8	8	8
Asymp. Sig.	,247	,532	,097	,680	,573	,971	,326	,012

a. Kruskal Wallis Test

b. Grouping Variable: monthly income

It seems that the main source of this significant difference can be attributed to either 6000-7000 monthly income due to its lowest mean rank or 7000-8000 monthly income due to its highest mean rank.

Table 3.8. Mean ranks for motivation in learning geography in terms of monthly family income

Ranks			
	Monthlyincome	N	Mean Rank
Performance	750-1000	52	258,38
	1000-2000	74	265,61
	2000-3000	166	252,24
	3000-4000	69	272,21
	4000-5000	53	239,88
	5000-6000	35	218,91
	6000-7000	17	184,85
	7000-8000	16	316,44
	8000 üzeri	18	162,39
	Total	500	

3.5. Findings of the independent variable importance analysis for geographical thinking skills and motivation in learning geography in terms of demographic variables

Model summary for geographical thinking skills in terms of demographic variables is given in Table 3.9. According to the model, Sum of Squares Error is 40,940 in training, and Sum of Squares Error is 16,277 in testing.

Table 3.9. Model summary for geographical thinking skills in terms of demographic variables

Model Summary			
Training	Sum of Squares Error		40,940
	Average Overall Relative Error		1,000
	Relative Error for Scale Dependents	asking geographical questions	1,001
		asking geographical information	1,000
		organizing geographical information	1,001
		analyzing geographical information	1,000
	Stopping Rule Used		1 consecutive step(s) with no decrease in error[a]
	Training Time		0:00:00,04
Testing	Sum of Squares Error		16,227
	Average Overall Relative Error		1,006
	Relative Error for Scale Dependents	asking geographical questions	1,015
		asking geographical information	1,013
		organizing geographical information	1,003
		analyzing geographical information	,999

a. Error computations are based on the testing sample.

Independent variable importance for geographical thinking skills in terms of demographic variables shows that approximately gender and monthly incomes are the

most important factors and mother's and father's education level is the second important factor.

Table 3.10. Independent variable importance for geographical thinking skills in terms of demographic variables

Independent Variable Importance		
	Importance	Normalized Importance
Gender	,262	97,9%
Mother's education level	,231	86,2%
Father's education level	,240	89,6%
Monthly income	,268	100,0%

Model summary for motivation in learning geography in terms of demographic variables shows that the sum of squares error is 41,219 in training and the sum of squares error is 15,817 in testing.

Table 3.11. Model summary for motivation in learning geography in terms of demographic variables

Model Summary			
Training	Sum of Squares Error		41,219
	Average Overall Relative Error		,971
	Relative Error for Scale Dependents	interest-field	,956
		self-confidence	,970
		knowledge acquisition	,973
		Performance	,990
	Stopping Rule Used		1 consecutive step(s) with no decrease in error [a]
	Training Time		0:00:00,10
Testing	Sum of Squares Error		15,817
	Average Overall Relative Error		1,002
	Relative Error for Scale Dependents	interest-field	,980
		self-confidence	1,026
		knowledge acquisition	1,006
		Performance	,999

a. Error computations are based on the testing sample.

Independent variable importance analysis for motivation in learning geography in terms of demographic variables shows that the father's education level is the most important factor and gender is the second important factor.

Table 3.12. Independent variable importance analysis for motivation in learning geography in terms of demographic variables

Independent Variable Importance		
	Importance	Normalized Importance
Gender	,369	98,7%
Mother's education level	,101	26,9%
Father's education level	,374	100,0%
Monthly income	,156	41,7%

3.6. Findings on the correlation analysis for geographical thinking skills and motivation in learning geography

Spearman's correlation for geographical thinking skills and motivation in learning geography shows that there are positive correlations among the sub-dimensions of both scales and most of them are weak and some of them are average level as indicated in Table 3.17.

Table 3.17. Spearman's correlation for geographical thinking skills and motivation in learning geography

			interest-field	self-confidence	knowledge acquisition	performance
Spearman's rho	asking geographical questions	Correlation Coefficient	,439**	,345**	,395**	,236**
		Sig. (2-tailed)	,000	,000	,000	,000
		N	500	500	500	500
	asking geographical information	Correlation Coefficient	,388**	,263**	,316**	,147**
		Sig. (2-tailed)	,000	,000	,000	,001
		N	500	500	500	500
	organizing geographical information	Correlation Coefficient	,408**	,274**	,284**	,059
		Sig. (2-tailed)	,000	,000	,000	,191
		N	500	500	500	500
	analyzing geographical information	Correlation Coefficient	,488**	,385**	,402**	,192**
		Sig. (2-tailed)	,000	,000	,000	,000
		N	500	500	500	500

3.7. Findings on the neural network and path analysis of geographical thinking skills for motivation in learning geography

Model summary for geographical thinking skills and motivation in learning geography shows that sum of squares error is 31,937 in training and the sum of squares error is 15,659 in testing.

Table 3.18. Model summary for geographical thinking skills and motivation in learning geography

Model Summary			
Training	Sum of Squares Error		31,937
	Average Overall Relative Error		,801
	Relative Error for Scale Dependents	interest-field	,700
		self-confidence	,799
		knowledge acquisition	,801
		Performance	,924
	Stopping Rule Used		1 consecutive step(s) with no decrease in error[a]
	Training Time		0:00:00,16
Testing	Sum of Squares Error		15,659
	Average Overall Relative Error		,849
	Relative Error for Scale Dependents	interest-field	,760
		self-confidence	,910
		knowledge acquisition	,806
		Performance	,962

a. Error computations are based on the testing sample.

Independent variable importance of geographical thinking skills for motivation level in learning geography in terms shows that analyzing geographical information is the first important factor and asking geographical questions is the second important factor.

Table 3.19. Independent variable importance for motivation level in learning geography in terms of geographical thinking skills

Independent Variable Importance		
	Importance	Normalized Importance
asking geographical questions	,411	82,6%
asking geographical information	,043	8,6%
organizing geographical information	,049	9,8%
analyzing geographical information	,498	100,0%

Structural equation modeling analyses indicated that the indicators of asking geographical questions and analyzing geographical information in the model were explained by their corresponding factors significantly.

Table 3.20. Regression weights in Amos support the neural network model

			Estimate	S.E.	C.R.	P	Label
Moti	<---	asking geographical questions	,442	,097	4,537	***	par_57
Moti	<---	asking geographical information	-,042	,065	-,649	,516	par_58
Moti	<---	organizing geographical information	-,120	,142	-,845	,398	par_59
Moti	<---	analyzing geographical information	,486	,110	4,435	***	par_60

Therefore, regression weights are not appropriate to validate the whole model given in Fig 3.1 since we include the asking geographical information and organizing geographical information. However, the results also support the neural network analysis because in this analysis asking geographical questions and analyzing geographical information are important factors, and asking geographical information and organizing geographical information is not important just as not significant given in Table 3.15. However, although asking geographical questions and analyzing geographical information are important factors, poor modification indices indicate that there is no causal relationship in this model.

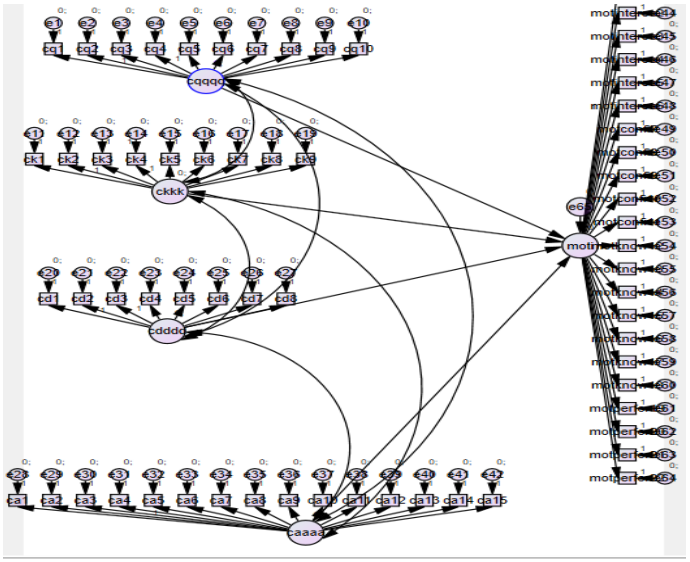

Figure 3.1. The path diagram of geographical thinking skills for motivation in learning geography

We can confirm this direct effect via linear regression analysis as well. Although the variables are not normally distributed according to the Kolmogorov-Smirnov test, skewness and kurtosis values of analyzing geographical information (skewness: -,288 ; ,109 and kurtosis:,080; ,218) and asking geographical questions (skewness: -,224 ; ,109 and kurtosis: -,856 ; ,218) and total score of motivation level (skewness: -,865 ; ,109 and kurtosis: ,336 ; ,218) in the range between +1.5 and -1.5 so that linear regression analysis can be conducted between two variables (Tabachnick & Fidell, 2013). First of all, to make a regression analysis there is no high correlation between variables. Table 3.21 shows that there is no high correlation among the variables so that the condition for regression analysis is met.

Table 3.21. Regression weights in Amos support the neural network model

		motivation	asking geographical questions	analyzing geographical information
Pearson Correlation	motivation	1,000	,385	,448
	asking geographical questions	,385	1,000	,450
	analyzing geographical information	,448	,450	1,000
Sig. (1-tailed)	motivation	.	,000	,000
	asking geographical questions	,000	.	,000
	analyzing geographical information	,000	,000	.
N	motivation	500	500	500
	asking geographical questions	500	500	500
	analyzing geographical information	500	500	500

Table 3.22 shows the regression model summary. According to Table 13, the change in 24% of motivation level can be explained by analyzing geographical information and asking geographical questions.

Table 3.22. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,493[a]	,243	,240	16,37070
a. Predictors: (Constant), asking geographical questions, analyzing geographical information				
b. Dependent Variable: motivation				

The ANOVA results in which motivation in learning geography is significantly predicted by asking geographical questions, analyzing geographical information dimensions.

Table 3.23. ANOVA results

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	42761,000	2	21380,500	79,778	,000[b]
	Residual	133195,912	497	268,000		
	Total	175956,912	499			
a. Dependent Variable: motivation						
b. Predictors: (Constant), asking geographical questions, analyzing geographical information dimensions						

Coefficients for the regression equation are given in Table 3.24. According to these coefficients, a regression equation can be given as follows:

Motivation in learning geography = (0,605 x asking geographical questions) + (0,422 x analyzing geographical information) + 45,283

Beta values show in Table 3.24 that analyzing geographical information (β= 0,344) is the first important factor and asking geographical questions (β= 0,231) is the second important factor for motivation in learning geography in terms of relative importance just as shown in neural network analysis. Both variables are also significantly predicting the motivation in learning geography level.

Table 3.24. Coefficients for the Regression Equation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	45,283	3,766		12,024	,000			
	asking geographical questions	,605	,115	,231	5,276	,000	,385	,230	,206
	analyzing geographical information	,422	,054	,344	7,873	,000	,448	,333	,307

3.8. Findings on the neural network and path analysis of motivation in learning geography for geographical thinking skills

Model summary for geographical thinking skills in terms of demographic variables is given in Table 3.25. According to the model, Sum of Squares Error is 31,919 in training, and Sum of Squares Error is 14,816 in testing.

Table 3.25. Model summary of motivation in learning geography for geographical thinking skills

Model Summary			
Training	Sum of Squares Error		31,919
	Average Overall Relative Error		,795
	Relative Error for Scale Dependents	Cq	,801
		Ck	,856
		Cd	,817
		Ca	,732
	Stopping Rule Used		1 consecutive step(s) with no decrease in error [a]
	Training Time		0:00:00,08
Testing	Sum of Squares Error		14,816
	Average Overall Relative Error		,871
	Relative Error for Scale Dependents	Cq	,880
		Ck	,841
		Cd	,893
		Ca	,850

a. Error computations are based on the testing sample.

Independent variable importance of motivation level in learning geography in terms of geographical thinking skills shows that interest-field is the most important factor for geographical thinking skills.

Table 3.26. Independent variable importance of motivation level in learning geography in terms of geographical thinking skills

Independent Variable Importance		
	Importance	Normalized Importance
interest-field	,491	100,0%
self-confidence	,144	29,3%
knowledge acquisition	,236	48,0%
Performance	,129	26,2%

Performing structural equation modeling of motivation in learning geography for geographical thinking skills, we may assume that interest-field should be a common factor for all the dimensions of geographical thinking skills. However, once we conduct the analysis we remove the dimensions of asking geographical questions and asking geographical information, and we covariate two dimensions of organizing geographical information and analyzing geographical information because they belong to the same structure as well as the analysis results. After removing some items having less standardized regression weight and make some modifications, the model given in Figure 3.2 is created.

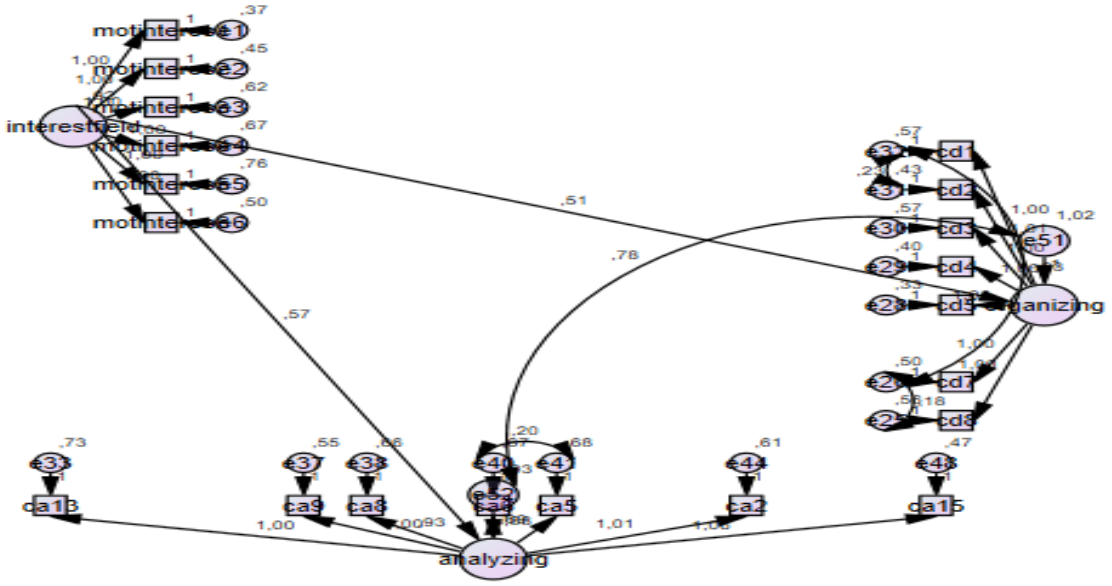

Figure 3.2. The path diagram of motivation in learning geography for geographical thinking skills.

Therefore, as given in Table 3.27 it can be concluded that there is a causation between interest-field → analyzing geographical information and interest-field → organizing geographical information.

Table 3.27. Path analysis results

Hypothesis	Estimate	S.E.	C.R.	P	Result
H1: interest-field → analyzing geographical information	,513	,052	9,908	***	✔
H2: interest-field → organizing geographical information	,565	,051	11,005	***	✔
CMIN/DF= 2,856 CFI= ,962 RMSEA= ,061 AGFI= ,888 PNFI= ,858 GFI= ,908 RMR= ,083 NFI= ,942 IFI= ,962 RFI= ,937					
P values less than 0.001 are indicated by ***.					

We can confirm this direct effect via linear regression analysis as well. Although the variables are not normally distributed according to the Kolmogorov-Smirnov test, skewness and kurtosis values of analyzing geographical information (skewness: -,288 ; ,109 and kurtosis:,080; ,218) and organizing geographical questions (skewness: -,224 ; ,109 and kurtosis: -,856 ; ,218) and total score of interest field level (skewness: -,624 ; ,109 and kurtosis: -,431 ; ,218) in the range between +1.5 and -1.5 so that linear regression analysis can be conducted between two variables (Tabachnick & Fidell, 2013). The regression model summary is given in Table 3.28. According to Table 3.28, the change in 23% of analyzing geographical information can be explained by motivation interest level.

Table 3.28. Model summary for analyzing geographical information

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,483[a]	,233	,232	13,41892
a. Predictors: (Constant), motivation interest				
b. Dependent Variable: analyzing geographical information				

Table 3.29 shows the ANOVA results in which analyzing geographical information is significantly predicted by the motivation interest field.

Table 3.29. ANOVA results for analyzing geographical information

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	27254,321	1	27254,321	151,356	,000b
	Residual	89673,621	498	180,068		
	Total	116927,942	499			
a. Dependent Variable: analyzing geographical information						
b. Predictors: (Constant), motivation interest field						

Coefficients for the regression equation are given in Table 3.30. According to these coefficients, a regression equation can be given as follows:

Analyzing geographical information = (1,220 x motivation interest field) + 19,192

Table 3.30. Coefficients for the regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	19,192	2,264		8,478	,000			
	interest field	1,220	,099	,483	12,303	,000	,483	,483	,483

According to Table 3.31, the change in 17% of organizing geographical information can be explained by motivation interest level.

Table 3.31. Model summary for organizing geographical information

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,416[a]	,173	,171	8,32581
a. Predictors: (Constant), motivation interest field				
b. Dependent Variable: organizing geographical information				

Table 3.32 shows the ANOVA results in which organizing geographical information is significantly predicted by the motivation interest field.

Table 3.32. ANOVA results

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7223,858	1	7223,858	104,212	,000[b]
	Residual	34520,900	498	69,319		
	Total	41744,758	499			
a. Dependent Variable: organizing geographical information						
b. Predictors: (Constant), motivation interest field						

Coefficients for the regression equation are given in Table 3.33. According to these coefficients, a regression equation can be given as follows:

Analyzing geographical information = (0,628 x motivation interest field) + 6,197

Table 3.33. Coefficients for the regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	6,197	1,405		4,412	,000			
	Motininterest	,628	,062	,416	10,208	,000	,416	,416	,416

4. Discussion and Conclusions

All the analyses show that there is a significant difference in favor of males in all dimensions geographical thinking skills and motivation in learning geography except performance dimension in motivation. There are different findings regarding the gender variable in the literature about geographical thinking skills. Aydın (2011) found no significant difference in high school students' views on the acquisition of thinking skills in geography lessons in terms of gender. In a similar study, it was observed that there was a significant difference in favor of female students in the evaluation of female and male students in terms of thinking skills in social studies course (Baykara (2006). Male students stated more than the textbooks were sufficient to do the homework given to the female students. Based on this, it has been suggested that male students are less interested in research and analysis activities. In the study of Hayran (2000), a significant difference was found in primary school teachers' views on thinking skills in terms of gender variable in favor of females. Çolak, Türkkaş-Anasız, Yorulmaz, and Duman (2019) found that gender had a very low-level effect on teacher candidates' critical thinking dispositions although it was a very different concept from geographical thinking skills. However, in our study, it is found that male students have higher mean ranks compared to female students in the dimensions except for the performance dimension in motivation. This can be explained by the fact that our sample is different from those two studies and it can be attributed to our measurement tools as well. Secondly, the time variable may be effective for this change also. We can conclude that gender has a significant role in geographical thinking skills and motivation in geography learning except for the performance sub-dimension of motivation.

The study shows that there is a significant difference in asking geographical questions dimension in geographical thinking skills and there are significant differences in interest-field, knowledge acquisition, and performance dimensions in learning geography in terms of mother's education level. It is shown that the lowest mean rank belongs to mothers who graduated from high school in asking geographical questions and a similar case is observed for differences in interest field, knowledge acquisition, and performance dimensions in learning geography. When the literature is examined, Baykara (2006) found that the higher the education level of the mother, the more significant and higher the students' thinking skills activities are included. Çolak, Türkkaş-Anasız, Yorulmaz, and Duman (2019) found that mother's education level has a very low-level effect on teacher candidates' critical thinking dispositions although it is a very different concept from geographical thinking skills. Conversely, in this study, we found very opposite data

but we should note that this is not a linear order from primary school education to college education since students whose mother graduated from college have also higher mean ranks. Students whose mothers are graduated from high school tend to have low level mean ranks comparing to others. This v-shaped figure can be revealed by a qualitative analysis. We can conclude that the mother's education level doesn't make a significant difference except for geographical questions so that it has a role in seeking information. We can also conclude that mother's education level does make a significant difference except for self-confidence so that it has a role cognitive dimensions of motivation

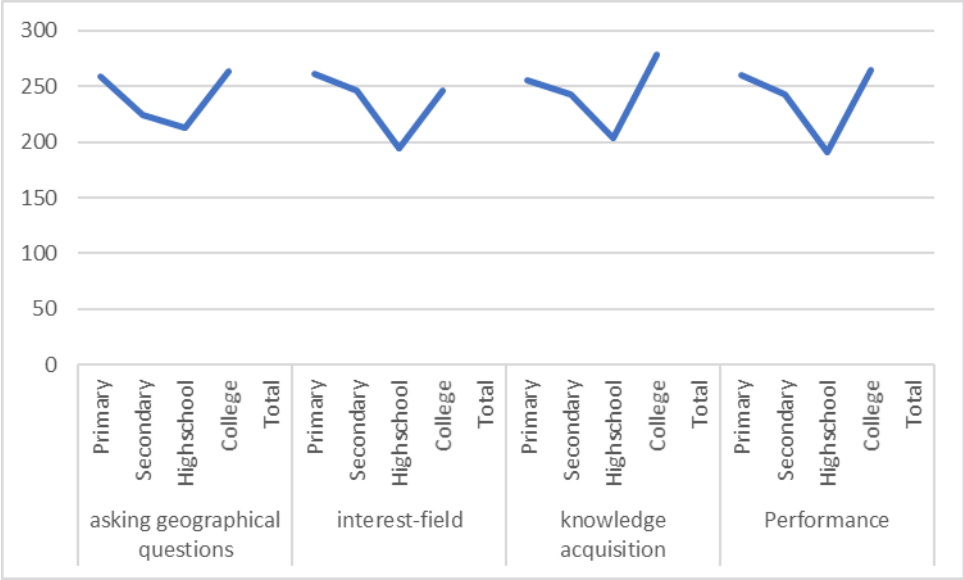

Figure 4.1. Results of mean ranks in terms of mother's education level.

The results of the study show that there are significant differences in asking geographical questions and asking geographical information dimensions for geographical thinking skills and interest field, knowledge acquisition, and performance in motivation in learning geography in terms of father's education level. It is shown that all significant differences can be attributed to fathers who graduated from college because they have the lowest mean rank comparing to others. Baykara (2006) found that the higher the education level of the father, the more significant and higher the students' thinking skills activities are included. Çolak, Türkkaş-Anasız, Yorulmaz, and Duman (2019) found that father's education level has a very low-level effect on teacher candidates' critical thinking dispositions although it is a very different concept from geographical thinking skills. Students whose fathers are graduated from college tend to have low level mean ranks comparing to others. This reverse v-shaped figure can be revealed by a qualitative analysis. We can conclude that the father's education level doesn't make a significant difference except for geographical questions and asking geographical information dimension so that it has a role in seeking information. We can also conclude that father's education level does make a significant difference except for self-confidence so that it has a role in the cognitive dimensions of motivation.

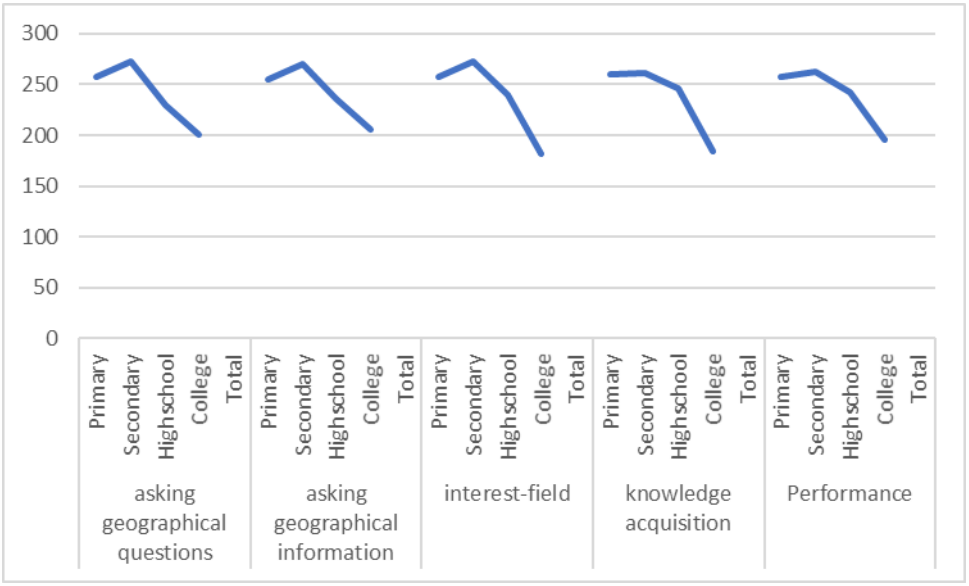

Figure 4.2. Results of mean ranks in terms of father's education level.

It is shown that there is no significant difference in all dimensions of the two scales except the performance dimension in motivation in learning geography in terms of monthly family income. It seems that the main source of this significant difference can be attributed to either 6000-7000 monthly income due to its lowest mean rank or 7000-8000 monthly income due to its highest mean rank. We can conclude that income doesn't affect geographical thinking skills and motivation except for performance.

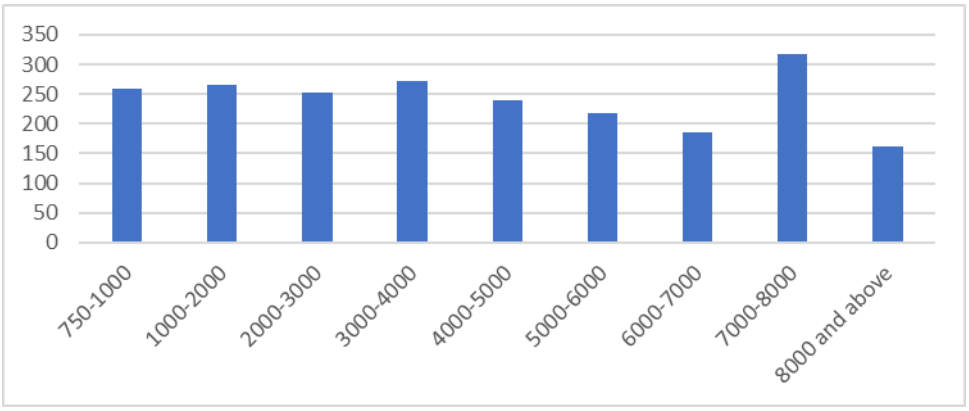

Figure 4.3. Results of mean ranks in terms of family income for performance

Independent variable importance for geographical thinking skills in terms of demographic variables shows that approximately gender and monthly incomes are the most important factors and mother's and father's education level is the second important factor. However, all the factors can be regarded as important because of their higher percentage. Therefore, we can conclude that all demographic variables in this study approximately have equal importance for the analysis when comparing to each other in geographical thinking skills. Independent variable importance analysis for motivation in learning geography in terms of demographic variables shows that the father's education

level is the most important factor and gender is the second important factor. We can conclude that the father's education level and gender have an important role comparing to other demographic variables in motivation in learning geography.

Spearman's correlation for geographical thinking skills and motivation in learning geography shows that there are positive correlations among the sub-dimensions of both scales and most of them are weak and some of them are average level. Therefore, we look at the importance level of these dimensions. Independent variable importance for motivation level in learning geography in terms of geographical thinking skills shows that analyzing geographical information is the first important factor and asking geographical questions is the second important factor. Multiple regression analysis shows that the change in 24% of motivation level can be explained by analyzing geographical information and asking geographical questions since variables are also significantly predicting the motivation in learning geography level. Beta values show that analyzing geographical information (ß= 0,344) is the first important factor and asking geographical questions (ß= 0,231) is the second important factor for motivation in learning geography in terms of relative importance just as shown in neural network analysis. The regression equation was finally found to be [Motivation in learning geography = (0,605 x asking geographical questions) + (0,422 x analyzing geographical information) + 45,283]

However, although asking geographical questions and analyzing geographical information are important factors, a poor modification for the whole model including all dimensions indices indicates that there is no causal relationship in this model. Therefore, we look at the reverse model from motivation to geographical thinking skills. Independent variable importance of motivation level in learning geography in terms of geographical thinking skills shows that interest-field is the most important factor for it. Therefore, it is assumed that interest-field should be a common factor for all the dimensions of geographical thinking skills. However, after performing the analysis we remove the dimensions of asking geographical questions and asking geographical information, and we covariate two dimensions of organizing geographical information and analyzing geographical information because they belong to the same structure as well as the analysis results. It can be concluded that there is a causation between interest-field → analyzing geographical information and interest-field → organizing geographical information. We can conclude that interest-field has a casual and significant role in seeking geographical knowledge. According to regression analysis analyzing geographical information and organizing geographical questions are significantly predicted by the motivation interest field. According to these results, a regression equation for analyzing geographical information was found to be [Analyzing geographical information = (1,220 x motivation interest field) + 19,192]. A regression equation for analyzing geographical information was found to be [Analyzing geographical information = (0,628 x motivation interest field) + 6,197].

To sum up, it is found that there is a significant difference in favor of males in all dimensions geographical thinking skills and motivation in learning geography except performance dimension in motivation. The study shows that the mother's and father's education level doesn't make a significant difference except for geographical questions so that it has a role in seeking information. It is found that mother's and father's education level does make a significant difference except for self-confidence so that it has a role

cognitive dimensions of motivation. It is found that income doesn't affect geographical thinking skills and motivation except for performance. It is found that all demographic variables in this study approximately have equal importance for the analysis when comparing to each other in geographical thinking skills. It is found that the father's education level and gender have an important role comparing to other demographic variables in motivation in learning geography. It has been found out that the interest-field has a casual and significant role in seeking geographical knowledge. According to the multiple regression analysis, a regression equation for analyzing geographical information was found to be [Analyzing geographical information = (1,220 x motivation interest field) + 19,192]. A regression equation for analyzing geographical information was found to be [Analyzing geographical information = (0,628 x motivation interest field) + 6,197].

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