Investigation of the Reasoning Styles of the Teacher Candidates in terms of Decision Making Styles, Learning Modalities and Gender (Süleyman Demirel University Education Faculty Case)

Volkan Duran [a] , [*], Hüseyin Mertol [b]

[a] Iğdır University, Turkey
[b] Süleyman Demirel University, Turkey

Abstract

Aim: The main aim of this study is to investigate the reasoning styles of teacher candidates in terms of their gender, decision making styles, and learning modalities. Methodology: The study is a quantitative study based on correlational survey model. Population: The population consists of 4th-grade students (teacher candidates) in social studies education in Süleyman Demirel University who are in Formal Operational Stage of Cognitive Development of Piaget. Results: No significant difference was found in terms of gender for reasoning styles. No significant difference was found in terms of gender for those styles except avoidant decion making styles and visual learning modalitiy both for parametric and non-parametric dimensions of decision making styles and learning modalities. Rational decision making style is correlated all the sub-dimension of reasoning styles at moderate or weak level, whereas other decision making styles are partially correlated with them except avoidant decision making style and spontaneous decion making styles. It was found that there was a significant weak correlation among he sub-dimension of the reasoning styles with learning modalities. Tt was found that there was a significant weak correlation among rational decion making style and intuitve decision making style among physical, auditory and visual learning modalities. However, dependent decision making style and avoidant decion making style has only weak correlation with physical and auditory learning modalities. No correlation was found among learning modalities with spontaneous decion making style. Discussion: Findings have strong indication regarding the content validity of reasoning styles model in this regard.

Keywords: reasoning style, teacher candidate, learning modalities, gender.

[*] Corresponding author
E-mail addresses: volkan.duran8@gmail.com (V. Duran)

1. Introduction

A style of reasoning is a pattern of inferential relations that are used to select, interpret, and support evidence for scientific results or specific phenomena. Reasoning styles model is a model developed by Duran and Şentürk (2019), Duran (2019), Duran and Özer (2017), Duran (2017), Duran (2014) to classify the reasoning skills in the context of styles. According to this model there is an inference plane which consists of four dimensions; representations, assumptions, resemblances, and appearances. There is also organization axes for inductive and deductive reasoning.
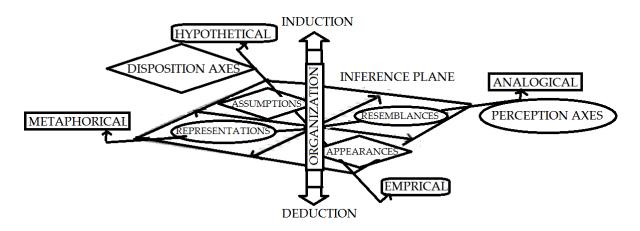

Fig. 1. Reasoning styles model (Duran, Şentürk, 2019)

The model also consists of three axes such as perception, disposition, and organization axes. Perception axes have two dimensions defined as representations or resemblances. The reason why it is called perception axes is that human cognition is fundamentally either based on sensations – the outward orientation or the ideas – inward orientation. Therefore, inferences based on representations are defined as metaphorical whereas inferences based on the resemblances are analogical. Again, they are located in the opposite corner of the inference plane as assumptions and appearances. There is also disposition axes where two inferences patterns as hypothetical and empirical are located in the opposite corner of the inference plane. This is because these assumptions are disposed based on the ideas created in abstract ways whereas appearances are fundamentally based on the data through the senses.
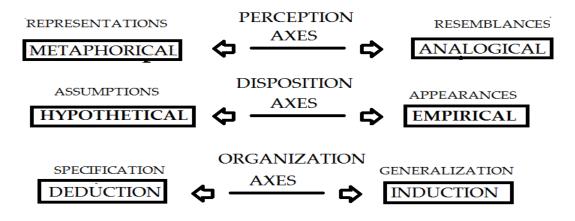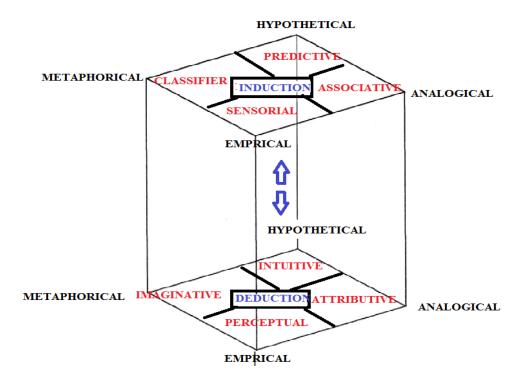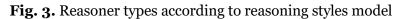

Fig. 2. Formation of the axis in the reasoning style model (Duran, Şentürk, 2019)

To sum up, inference plane consists of empirical and analogical part because the analogical and empirical inferences are tangible and concrete. Also, there is an opposite inference dimension which is hypothetical and metaphorical because they are abstract and idea-oriented. As for the

dimension of organization of reasoning, it is considered as inductive and deductive where induction is based on generalizations whereas deduction when based on specification of the inferences.

Fig. 3. Reasoner types according to reasoning styles model

As mentioned above, the intersection of three axes which include perception, disposition, and organization results in different reasoner types. The reasoner types are grouped mainly in two different planes where deduction and induction are the centers of those opposite planes.

As for the induction plane, individuals who are hypothetical-inductive are called as predictive reasoners, because their hypothetical inferences are aiming at making generalizations and predictions in an inductive way. In other words, if an inductive organization of the information is based on hypothesis, it is defined as predictive. Individuals who are empirical-inductive are also called sensorial reasoners because they make generalizations based on empirical and sensible (i.e. data from the senses) information, in other words they are sensorial dependent. Individuals who are metaphorical-inductive are classifiers because making metaphors means representing the information via subjective names, symbols, and signs. In other words, metaphorical-inductive individuals are labeled as classifiers because they use figure of speech in which a word or phrase used to make generalizations regarding an object or idea is not literally applicable. Individuals who are analogical-inductive are associative reasoners because they cites accepted similarities between two systems to support the conclusion that some further similarity exists, hence they make associations based on similarities.

As for the deduction plane, individuals who are hypothetical-deductive are known as intuitive reasoners, because they make deductions based on their assumptions and hypothesis. Individuals who are empirical-deductive are perceptual reasoners because their deductions are based on the empirical knowledge where the main sources of the deductions cames from tangible information. Individuals who are metaphorical-deductive are imaginative reasoners because they use their imagination to create a new form of information labelling the objects as well as the ideas. Individuals who are analogical-deductive are attributive reasoners because they attribute the similar or common characteristics of objects and ideas in a way that they centralize main identical features.

Decision-making style refers to the way individuals process information in order to solve problems. It is defined as a stable learned habitual response pattern based on cognitive abilities

used in decision situations (Gettinger et al., 2013). The decision-making style is a response that an individual has previously learned and made a habit of when he/she is confronted with a decision-making situation (Ehtiyar, Tekin, 2010: 3399). Scott and Bruce (1995) define five behavioral dimensions based on DMs' self-evaluation: (i) a rational, (ii) an intuitive, (iii) a dependent, (iv) an avoidant, and (v) a spontaneous style. Studies have shown that even though an individual may have a predominant style, decision styles are not mutually exclusive (Loo, 2000; Spicer, Sadler-Smith, 2005; Thunholm, 2004).

Table 1. Description of General Decision-Making Styles (Fischer et al., 2015)

Core decision process
Rational – Thorough search for information and logical evaluation of optional alternatives
– Analytic, sequential information processing and systematic appraisal
Intuitive – Strong reliance on emotions, presentiments, hunches, and gut feelings
– Simultaneous information processing
Spontaneous – Sense of immediacy and desire to finish the decision process as quick as possible
Decision-regulatory process
Dependent – Extensive advice seeking, consulting, and directions from relevant others
Avoidant – Attempt to escape the choice situation and thereby avoid or delay the decision

According to this model, "a rational style characterized by a thorough search for and logical evaluation of alternatives; an intuitive style characterized by the use of hunches and feelings in decision making; a dependent style characterized by a reliance on the advice of others, and avoidant style characterized by attempts to avoid decision making, spontaneous style characterized by a sense of immediacy and desire to complete decision making as soon as possible" (Erol Öngen, 2014). In this regard, it is thought that reasoning styles and decision-making styles are correlated at least some dimension such as rational decision-making style or intuitive style.

Learning modality described, as learners' relatively permanent preferences about perceive the information. As one of the basic dimensions of the learning style, there are three generally accepted types of learning. These are kinesthetic, auditory and visual modalities (Şimşek, 2002). Concepts such as body, balance, dexterity, activity, sport, dance, drama, theater, movements are critical in the definition of kinesthetic modality. A student with this style usually has a special interest in expressing his emotions and thoughts in body language, using tools and making concrete things. Rather than, listening or observing things. Students with auditory style are sensitive to music and audible stimuli. Talking, discussing, listening, telling, tone of voice, language, melody, different voices, poetry are things that the students of this style care about and prefer. Students with visual style can visualize what they read or hear. They can remember visually and in detail the events that have taken place. Painting, drawing, map, line, color, direction, plan, and attract those students (Şimşek, 2002).

In this article it is thought that there shouldn't be any significant correlation particular for a specific decion making style or reasoning style. Hence, the main aim of this study is to investigate the reasoning styles of the teacher candidates in terms of their gender and their decision making styles, learning modalities.

The main problems of the study can be given as below:

1.   Is there any significant difference for reaoning styles, decion making styles and learning modalities of the students in terms of gender?

2.   Is there any significant correlation among the sub-dimensions of reaoning styles, decion making styles of the students?

3.   Is there any significant correlation among the sub-dimensions of reaoning styles, learning modalities of the students?

4.   Is there any significant correlation among the sub-dimensions of decision making styles, learning modalities of the students ?

2. Method

The study is a quantitative study based on correlational survey model. The spearman correlation test was performed to investigate the relationship among the reasoning styles, decision making styles, learning modalities. T-test and Mann Whitney-U test were performed to investigate whether he reasoning styles, decision making styles, learning modalities varied in terms of gender.

Population

The population of the study consists from teacher candidates in the branches related with social sciences (as 182 of them in primary school teacher candidates, 130 of them social studies teacher candidates that sums up 312 in total – Turkish Language Teachers and English Language Teachers were regarded as the part of Language Teaching) in Süleyman Demirel University (Egitim.sdu). The sample was selected in terms of convenience sampling technique that are 141 students studying in the branches related with social sciences. Because convenience sampling is a specific type of sampling method that relies on data collection from population members who are conveniently available to participate in study in terms of time and cost, the sample group was chosen as the most available group of individuals in the 4th-grade students (teacher candidates) in social studies education and primary school teaching in Süleyman Demirel University. Additionally, in order to determine the size of the sample, the formula of Yamane (2010) was used as follows:

$$n = \frac{Nz^2pq}{(N-1)d^2+z^2pq} = \frac{312(1.96)^2 0.5.0.5}{(311)(0.07)^2+(1.96)^2(0.5)(0.5)} = \frac{299.645}{2,4843} = 120,62$$

Where N= the number of individuals in the population as 312 individuals
z = 1.96 (standard normal distribution table value for the desired reliability level (95 %))
d = 0.07 (sensitivity)
p: the ratio of individuals with the desired feature in the stack (p + q = 1, p = q = 0.50 to make the maximum sample diameter)

As a result of the procedure, it is assumed that the sample of 121 students can represent the universe and this value is accepted as the lower limit for the sample size. Therefore because our sample consisting from 141 students, it is appropriate representing for the population.

Additionally for correlational survey models, the number of sample size is taken into consideration as a result of the calculation made with the following formula (Tabachnick, Fidell, 2007):

N > 50 + 8m

N: Number of participants m: number of independent variables where m= 11 (4 independent variables from reasoning styles, 4 from decion making styles and 3 from learning modalities)

N > 138 where The target sample size for this study is 141 which meet the requirement.

Age distribution shows that they are compatible with the aims of meaurement tools of this research because when the age distirbution was investigated, it could be seen that most of them are in Formal Operational Stage of Cognitive Development of Piaget. Hence it indicates that students participating in this study can think about abstract and theoretical concepts as well as have cognitive skills such as logical thought, deductive reasoning, and systematic planning. Therefore, the population is thought to be suitable for the cognitive development level of the students in this regard.

Table 2. The distribution of the population according to their age

		Frequency	Percent
Valid	18	5	3,5
	19	15	10,6
	20	30	21,3
	21	33	23,4
	22	28	19,9
	23	19	13,5

24	7	5,0
25	1	,7
26	1	,7
28	1	,7
32	1	,7
Total	141	100,0

Measurement Tools

There are three measurement tools used in this study. These are reasoning style scale developed by Duran (2019), The Decision Making Styles Scale (CTRS) developed by Scott and Bruce (1995), Big16 Learnıng Modalıty Inventory developed by (Şimşek, 2002).

Reasoning Style Scale Developed by Duran (2019)

The Reasoning Styles Scale was developed by Duran (2019). There are four dimensions for this scale as Metaphorical-Deductive, Emprical, Analogical Inductive, Hypotetical, hence it doesn't encompass all the dimensions of the model given in Figure 1. Metaphorical-Deductive style corresponds to imaginative reasoner according to this model given in Figure 3. Analogical Inductive style corresponds to associative reasoner style in this scheme. There are also Emprical and Hypotetical that are conceptually opposed to each other also in this scheme. Therefore, The Reasoning Styles Scale was developed by Duran (2019) could be regarded as the limited version of this model. However, because it is reliable and valid scale, it can be used as a measurement tool for the investigation of the some reasoning styles in this respect.

Fig. 4. Reasoning style scale only partially corresponds to reasoning style model

There are 17 items in this scale for four dimensions. Likert type scale items are is scored according to options as storngly agree (1), agree (2), partially agree (3), disagree, (4), strongly disagree (5).

The Decision Making Styles Scale (CTRS) developed by Scott and Bruce (1995)

The Decision Making Styles Scale (CTRS) was developed by Scott and Bruce (1995) to measure individual differences in decision-making styles that individuals use to approach problems in decision-making processes. There are five dimensions of this scale as (i) a rational, (ii) an intuitive, (iii) a dependent, (iv) an avoidant, and (v) a spontaneous style. Likert type scale items are is scored according to options as storngly agree (1), agree (2), partially agree (3), disagree, (4), strongly disagree (5) (Taşdelen, 2002; Kurban, 2015).

Learning Modalities Inventory

Big16 Learnıng Modalıty Inventory developed by Şimşek (2002). The items in the inventory are collected in 3 factors explaining 42,923 % of the total variance. There are 48 items in this

inventory for three dimension as kinesthetic, auditory and visual modalities. Likert type scale items are is scored according to options as storngly agree , agree, partially agree, disagree, strongly disagree. The Cronbach Alpha value for the whole inventory was calculated as .844. The findings regarding the reliability of the inventory show that the results can be considered sufficient.

3. Analysis of the Data

The data must be cleaned before being analyzed because duplication or unusual data will reduce the validity and reliability of the study. Therefore, before the data of 148 people participating in the study were analyzed, the unusual cases of the participants deviated from the norms were screened in SPSS (data screening method). Data screening method is a process that takes place before data data analysis to ensure the integrity of data. Data screening method means checking for and removing data from undesired errors. The aim is to maximize the characteristics of the structure to be obtained and to minimize "noise" by identifying and repairing errors. First, it is intended to correct the lost data before analyzing the data. For this, the missing data was recovered by using the mean of the series mean method. In the second stage, it is ensured whether there is any out-of-range value in the options of the items through investigating the maximum and minimum values of each item. Out of range values are defined as the values that are below the minimum or above the maximum possible value for each item. When the data were examined, it was seen that no item has such a value for any of the three scales. In the third stage, it is examined whether there are unexpected cases. Unusual cases occur when the answers of a case are very different from the responses given by most of the other responders. The Unusual cases tab in SPSS was used for this purpose. In this context, firstly unexpected situations were examined for three styles.

When the Table 3 was investigated, the Anomaly Case Index List For Reasoning Styles shows that there are five cases as shown below.

Table 3. Anomaly Case Index List For Reasoning Styles

Case	Anomaly Index	Variable Impact	Variable Value	Variable Norm
117	3,256	,087	5,00	1,9826
147	2,308	,116	5,00	1,7733
137	2,192	,583	5,00	1,1667
116	2,133	,133	5,00	1,9826
136	2,071	,695	5,00	1,3056

When the Table 4 was investigated, the Anomaly Case Index List For Decison Making Styles shows that there are one cases as shown below.

Table 4. Anomaly Case Index List For Decison Making Styles

Case	Anomaly Index	Variable Impact	Variable Value	Variable Norm
146	2,074	,089	5,00	2,2500

No anomaly was found for the Anomaly Case Index List For BIG 16 Learning Modalitiy Inventory. Finally after the elimination of the unusual cases, 141 individuals'results will be analyzed.

When the test of normality was investigated, it is seen that all the dimensions of Reasoning Styles Scale was not normally distributed. Similarly, except for dependent decion making style all the dimensions of Decion Making Styles were not normally distributed also. However, as for the learning modality inventory, except visual dimenion, the other two dimensions are normally distirbuted. Hence it can be said that it would be proper to use non-parametric tests for the analysis of the data.

Table 5. Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Reasoning Styles	Metaphoricaldeductive	,196	141	,000	,811	141	,000
	Emprical	,163	141	,000	,886	141	,000
	Analogicalinductive	,146	141	,000	,900	141	,000
	Hypotetical	,098	141	,002	,949	141	,000
Decision Making Styles	Rationaldecionmaking	,122	141	,000	,914	141	,000
	İntuitivedecionmaking	,105	141	,001	,938	141	,000
	Dependentdecionmaking	,067	141	,200[*]	,971	141	,005
	Avoidantdecionmaking	,110	141	,000	,956	141	,000
	Spontaneousdecionmaking	,112	141	,000	,960	141	,000
Bıg 16 Learning Modalitiy Inventory	Physical	,054	141	,200[*]	,978	141	,021
	Auditory	,058	141	,200[*]	,978	141	,025
	Visual	,076	141	,044	,959	141	,000
	a. Lilliefors Significance Correction						
	*. This is a lower bound of the true significance.						

When the correlation analysis was done, the range values of correlations as taken given below table (Akoğlu, 2018).

Table 6. Interpretation of correalation values for the analysis (Akoğlu, 2018)

+/- 1	Perfect
+/- 0.7-0.9	Strong
+/- 0.4-0.6	Moderate
+/- 0.1-0.3	Weak

4. Results
Result of the first question as "Is there any significant difference for reaoning styles, decion making styles and learning modalities of the students in terms of gender?"

When Mann-Whitney-U test was performed on the non-parametric dimensions of reasoning styles scale, no significant difference was found in terms of gender for those styles as given Table 7.

Table 7. Mann-Whitney U test results for the resoning styles

	Metaphorical-Deductive	**Emprical**	**Analogical Inductive**	**Hypotetical**
Mann-Whitney U	1674,500	1807,000	1772,000	1886,000
Wilcoxon W	7030,500	7163,000	7128,000	2627,000
Z	-1,336	-,706	-,867	-,333
Asymp. Sig. (2-tailed)	,181	,480	,386	,739

a. Grouping Variable: Gender

When Mann-Whitney-U test was performed on the non-parametric dimensions of decision makin styles scale and visual learning modality, no significant difference was found in terms of gender for those styles except avoidant decion making styles and visual learning modalitiy as given Table 8.

Table 8. Mann-Whitney U test results for non-parametric dimensions of decision makin styles scale and visual learning modality

	Rational Decion Making	**İntuitive Decion Making**	**Avoidant Decion Making**	**Spontaneous Decionmaking**	**Visual**
Mann-Whitney U	1589,000	1814,500	1216,000	1710,500	1,442E3
Wilcoxon W	2330,000	2555,500	1957,000	2451,500	6,798E3
Z	-1,725	-,665	-3,450	-1,148	-2,398
Asymp. Sig. (2-tailed)	,085	,506	**,001**	,251	**,016**

When the mean ranks were investigated it was found that females have more higher mean rank for avoidant decion making but males have more higher mean rank for visual learning modality (Table 9).

Table 9. Mean rank values for avoidant decion making style and visual learning modality in terms of gender

	Ranks			
	Gender	N	Mean Rank	Sum of Ranks
avoidant decion making	Female	103	78,19	8054,00
	Male	38	51,50	1957,00
	Total	141		
visual	Female	103	66,00	6797,50
	Male	38	84,57	3213,50
	Total	141		

When the parametric independent sample test was performed for the dependent decion making style and physical and auditory learning modalities, no significant difference was found for those sub-dimensions.

Table 10. The parametric independent sample test was performed for the dependent decion making style and physical and auditory learning modalities

		Levene's Test for Equality of Variances		t-test for Equality of Means					95 % Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Dependent decion making	Equal variances assumed	,020	,886	,400	139	,690	,31604	,78963	-1,24520	1,87729
	Equal variances not assumed			,398	65,341	,692	,31604	,79428	-1,27008	1,90217
Physical	Equal variances assumed	,104	,747	,055	139	,957	,09107	1,66800	-3,20685	3,38900
	Equal variances not assumed			,056	68,521	,956	,09107	1,63724	-3,17554	3,35769
Auditory	Equal variances assumed	,081	,776	-1,345	139	,181	-2,12704	1,58160	-5,25414	1,00005

Independent Samples Test

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95 % Confidence Interval of the Difference | |
									Lower	Upper
Dependent decion making	Equal variances assumed	,020	,886	,400	139	,690	,31604	,78963	-1,24520	1,87729
	Equal variances not assumed			,398	65,341	,692	,31604	,79428	-1,27008	1,90217
Physical	Equal variances assumed	,104	,747	,055	139	,957	,09107	1,66800	-3,20685	3,38900
	Equal variances not assumed			,056	68,521	,956	,09107	1,63724	-3,17554	3,35769
Auditory	Equal variances assumed	,081	,776	-1,345	139	,181	-2,12704	1,58160	-5,25414	1,00005
	Equal variances not assumed			-1,350	66,553	,182	-2,12704	1,57568	-5,27249	1,01841

Result of the second question as "Is there any significant correlation among the sub-dimensions of reaoning styles, decion making styles of the students?"

When the spearman correlation analysis done for among the sub-dimensions of reaoning styles, decion making styles of the students, it is found that the relationship betwen rational decision making style with metaphorical-deductive reasoning style as well as analogical style is in moderate level. However, the relationship between rational decision making style with emprical and hypothetical reasoning styl is in weak level. The relationship between intuitive decision making style with analogical-inductive and hypothetical reasoning style is found to be weak level. Furthermore, the relationship between depedent decion making style with hypothetical reasoning style is also weak level. Nevertheless, no correlation was found to be among avoidant decision making style and spontaneous decion making style with all reasoning styles.

Table 11. The correlation among decion making styles with reasoning styles

		Metaphorical-Deductive	Emprical	Analogical Inductive	Hypotetical
Rational Decision Making Style	Correlation Coefficient	**,447**[**]	**,283**[**]	**,481**[**]	**,289**[**]
	Sig. (2-tailed)	,000	,001	,000	,001
	N	141	141	141	141
Intuıtıve Decision Making Style	Correlation Coefficient	,140	,163	**,263**[**]	**,327**[**]
	Sig. (2-tailed)	,097	,053	,002	,000
	N	141	141	141	141
Dependent Decision Making Style	Correlation Coefficient	,111	,124	,160	**,220**[**]
	Sig. (2-tailed)	,190	,144	,058	,009
	N	141	141	141	141
Avoidant Decision Making Style	Correlation Coefficient	-,072	,079	-,161	,130
	Sig. (2-tailed)	,394	,352	,056	,125
	N	141	141	141	141
Spontaneous Decion Making Style	Correlation Coefficient	-,149	-,037	-,063	,097
	Sig. (2-tailed)	,077	,663	,457	,254
	N	141	141	141	141

		Metaphorical-Deductive	Emprical	Analogical Inductive	Hypotetical
Rational Decision Making Style	Correlation Coefficient	,447**	,283**	,481**	,289**
	Sig. (2-tailed)	,000	,001	,000	,001
	N	141	141	141	141
Intuitve Decision Making Style	Correlation Coefficient	,140	,163	,263**	,327**
	Sig. (2-tailed)	,097	,053	,002	,000
	N	141	141	141	141
Dependent Decision Making Style	Correlation Coefficient	,111	,124	,160	,220**
	Sig. (2-tailed)	,190	,144	,058	,009
	N	141	141	141	141
Avoidant Decision Making Style	Correlation Coefficient	-,072	,079	-,161	,130
	Sig. (2-tailed)	,394	,352	,056	,125
	N	141	141	141	141
Spontaneous Decion Making Style	Correlation Coefficient	-,149	-,037	-,063	,097
	Sig. (2-tailed)	,077	,663	,457	,254
	N	141	141	141	141

**. Correlation is significant at the 0.01 level (2-tailed).

Result of the third question as "Is there any significant correlation among the sub-dimensions of reaoning styles, learning modalities of the students?"

When the spearman correlation was performed among the sub-dimension of the reasoning styles with learning modalities, it was found that there was a significant weak correlation among them.

Table 12. The spearman correlation was performed among the sub-dimension of the reasoning styles with learning modalities

		Metaphorical-Deductive	Emprical	Analogical Inductive	Hypotetical
Physical	Correlation Coefficient	,280**	,244**	,243**	,336**
	Sig. (2-tailed)	,001	,004	,004	,000
	N	141	141	141	141
Auditory	Correlation Coefficient	,321**	,292**	,251**	,288**
	Sig. (2-tailed)	,000	,000	,003	,001
	N	141	141	141	141
Visual	Correlation Coefficient	,380**	,360**	,388**	,192*
	Sig. (2-tailed)	,000	,000	,000	,023
	N	141	141	141	141

Result of the fourth question as "Is there any significant correlation among the sub-dimensions of decision making styles, learning modalities of the students?"

When the spearman correlation was performed among the sub-dimension of the decision making styles with learning modalities, it was found that there was a significant weak correlation among rational decion making style and intuitve decision making style among physical, auditory and visual learning modalities. However, dependent decision making style and avoidant decion

making style has only weak correlation with physical and auditory learning modalities. No correlation was found among learning modalities with spontaneous decion making style.

Table 13. Correlation among the sub-dimensions of decision making styles, learning modalities

		Physical	Auditory	Visual
Rational Decision Making Style	Correlation Coefficient	,286[**]	,352[**]	,302[**]
	Sig. (2-tailed)	,001	,000	,000
	N	141	141	141
Intuıtıve Decision Making Style	Correlation Coefficient	,351[**]	,362[**]	,249[**]
	Sig. (2-tailed)	,000	,000	,003
	N	141	141	141
Dependent Decision Making Style	Correlation Coefficient	,194[*]	,311[**]	,142
	Sig. (2-tailed)	,021	,000	,092
	N	141	141	141
Avoidant Decision Making Style	Correlation Coefficient	,168[*]	,169[*]	-,040
	Sig. (2-tailed)	,047	,045	,635
	N	141	141	141
Spontaneous Decion Making Style	Correlation Coefficient	,119	,102	,017
	Sig. (2-tailed)	,160	,231	,839
	N	141	141	141

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

5. Discussion
Discussion of the first question as "Is there any significant difference for reaoning styles, decion making styles and learning modalities of the students in terms of gender?"

When Mann-Whitney-U test was performed on the non-parametric dimensions of reasoning styles scale, no significant difference was found in terms of gender for those styles as given. It is difficult to interpret this result because there are so scarce findings regarding reasoning styles in the context of gender except Duran (2019) study showing that no siginifical difference found in terms of gender except emprical dimension. Therefore it would be useful to investigate similar concepts such as thinking styles, cognitive styles in the cotext of gender. Many studies in relation with thinking styles shows that gender doesn't make significant difference for thinking styles (Balkıs, 2003; Jahanshahi, 2006; Kadim, 2017; Kayani, 2003; Mahdavi Shakib, 2011; Önkuzu, 2013; Çubukçu, 2004; Durdukoca, 2011; Özbaş, Uluçınar Sağır, 2014; Pour Kayani ve Shahilou, 2010; Shokri et al., 2006; Yaşar, Erol, 2015). Similarly, there are literature indicating that cognitive styles doesn't significantly differ in terms of gender (Gacar et al., 2015; Murphy ve Casey, 1997; Çakan, 2003; 2005; Çubukçu, 2004a; Horzum ve Alper, 2006; Pithers, 2002; Tinajero ve Paramo, 1997). Altough there are contrary literature regarding this issue (Atasoy, 2004; Altıparmak, 2009; Riding ve Agrell, 1997) it can be said that reasoning styles should be indepedent of gender if the gender is socially contructed in a culture where both genders are treated equally.

When Mann-Whitney-U test was performed on the non-parametric and parametric dimensions of decision making styles scale and visual learning modalities, no significant difference was found in terms of gender for those styles except avoidant decion making styles and visual learning. When the mean ranks were investigated it was found that females have more higher mean rank for avoidant decion making but males have more higher mean rank for visual learning modality. There are literature support the idea that decision making styles are of having no significance in terms of gender (Fischer et al., 2015; Kurban, 2015). Similarly, empirical research contends that gender has no influence on the preferred decision making style (Loo, 2000; Spicer,

Sadler-Smith, 2005). Similarly, recent research indicates that gender differences in adoption and use of technology do not exist anymore for younger subjects (Morris et al., 2005; Gettinger et al., 2013). Therefore except for avoidant decision making style, the result of this study is supported by the literature. Avoidant decision makers tries to avoid to making decisions, hence the males in this sample are more avoidant than the females because the less point means the higher values in terms of scales. This can be explained by sample differences because it is thought that that gender differences should be disappeared because of educational and cultural changes that promote equality between the sexes (Loo, 2000).

Except for visual learning style, there is no significant difference among learning modalities with gender. Some studies shows that there is no significant differences in terms of gender for learning styles (Coşkun, 2011; Çağlayan, 2007). It is thought that gender shouldn't be significantly related with learning modalities also, the differences should be related samples indicating that social constructs somehow affects genders shows this kind of differences. However, there are literature supporting the finding of this results. For example Mahiroğlu (1999) found that auditory and visual, kinestetic preferences was differentiated for male students, while visual learning was preferred to kinestetic learning in female students in terms of gender. Therefore it is debateble whether these differences are natural result of sexual differences or gender differences.

Discussion of the second question as "Is there any significant correlation among the sub-dimensions of reaoning styles, decion making styles of the students?"

When the spearman correlation analysis done for among the sub-dimensions of reaoning styles, decion making styles of the students, it is found that the relationship betwen rational decision making style with metaphorical-deductive reasoning style as well as analogical style is in moderate level. However, the relationship between rational decision making style with emprical and hypothetical reasoning styl is in weak level. Whether it is moderate or weak, in all the dimensions of reasoning styles, it is found that there is a positive correlation between rational decision making with reasoning styles. Rational reasoning style is related with exhaustive information search, systematic evaluation of alternatives, hence it is expected that reasoning styles are related with rational reasoning style in this context. Weak or moderate values indicate that altough students consider they have some reasoning preferences, they don't reflect it in actual setting such as decision making processes.

The relationship between intuitive decision making style with analogical-inductive and hypothetical reasoning style is found to be weak level. Intuitive is related with unsystematic information processing and reliance on premonitions and feelings (Allwood, Salo, 2012). Hence it is expected that there should be correlation with hypothetical and analogical-inducitve reasonings because they also depend on intuition to some degree. It should be noted that individuals who are hypothetical-deductive are called as intuitive reasoners hence this finding is partially supports the labelling of reasoning styles.

Furthermore, the relationship between depedent decion making style with hypothetical reasoning style is found to be weak level. This can be explained by the fact that hypothetical reasoning styles might be depedended upon the advice from others to some little bit degree and this is the reason why there is a weak correlation found between them.

Nevertheless, no correlation was found to be among avoidant decision making style and spontaneous decion making style with all reasoning styles. Avoidant decision makers tries to avoid making decisions (Allwood, Salo, 2012). Therefore it is natural to observe no significant correlation between avoidant decision making with reasoning styles, because reasoning styles requires making logical decision whereas avoidant decision makers not. So negative or no correlation can be expected between the correlations of these styles.

Spontaneous decision makers wants to reach a decision quickly so it is expected that there should be no correlation with any of reasoning styles with this dimension (Allwood, Salo, 2012).

"Cognitive scientists generally believe that "rational" or "intuitive" decision-making styles lead to improved life decision outcomes, whereas "avoidant" and "spontaneous" decision-making styles affect them negatively. "Dependent" decision making, on the other hand, has not proven to be related to decision outcomes" (Fischer et al., 2015). Similarly, it is also expected that preferring reasoning styles should be related with improved life decision outcomes because they are logical, systematic and more grounded. Therefore, the correlation with rational and intuitive decision making styles with reasoning styles confirmed this inference.

Discussion of the third question as "Is there any significant correlation among the sub-dimensions of reaoning styles, learning modalities of the students?"

When the spearman correlation was performed among the sub-dimension of the reasoning styles with learning modalities, it was found that there was a significant weak correlation among them. This indicated that to some degree, there is no preferred learning modalities for reasoning styles, but correlation among them they are related and not independet from each other. It can be seen that emprical reasoning is at the highest value for the visual learning modality so that they are compatible to each other. Similarly analogical-inductive reasoning style is also at the highest level for the visual learning modality indicating that analogical-inductive reasoning is more based on visual or emprical outcomes than others. Likewise, metaphorical-deductive reasoning is also having highest value with visual learning modalitiy indicating that visual inputs such as symbols, signs are more effective than others in terms of reasoning styles. However, interesting result where hypothetical is at highest level for physical learning modality shows contradicted result based on the conceptual chracteristics of its relation with visual and auditory information because hypothetical inferences are mostly based upon those inputs. This might be explained sample differences or other factors that don't taken into account.

Discussion of the fourth question as "Is there any significant correlation among the sub-dimensions of decision making styles, learning modalities of the students?"

When the spearman correlation was performed among the sub-dimension of the decision making styles with learning modalities, it was found that there was a significant weak correlation among rational decion making style and intuitve decision making style among physical, auditory and visual learning modalities. It should be noted that rational decion making style and intuitve decision making style are regarded as the core decision processes, hence they should be mainly related with all learning modalities to some degree. Akyürek and Güney (2018) support this data by finding learning styles and are partially effective on the decision-making styles and the locus of control is effective on the learning style of participants.

However, dependent decision making style and avoidant decion making style has only weak correlation with physical and auditory learning modalities. This is compatible with their definitions also because dependent decision making style is related with extensive advice seeking, consulting, and directions from relevant others and avoidant decision making style is related with the attempt to escape the choice situation and thereby avoid or delay the decision. Those are always mainly done in auditory and physical spheres more dominantly than the visual one.

No correlation was found among learning modalities with spontaneous decion making style. It can be inferred that because spontenous decision making style is based on sense of immediacy and desire to finish the decision process as quick as possible, it is natural to see no preferential connection between any of the modalities.

It can be seen that all the learning styles have highest values for rational and intuitive decision making styles indicating that individual having those styles are more prone to use learning modalities than the other.

6. Conclusion

Findings have strong indication regarding the content validity of reasoning styles model in this regard because the characteristics of reasoning styles model is compatible with the decision making styles and learning modalities in many ways. For intstance, if they are not compatible, the rather than positive correlation among all the dimensions of reasoning styles with rational decision making style, there should be negative or no correlation. Similarly, rather than finding no correlation was found to be among avoidant decision making style and spontaneous decion making style with all reasoning styles, it should be find positive correlation. Hence findings support the reasonign style model in this regard.

7. Recommendations

As for the future research, different samples consisting from different age groups as well as different demographic variables can be used to investigate reasoning styles.

Different design methodologies such as qualitative, quantitative or mixed designs can be used to investigate reasoning styles.

Different measurement tools or different versions of learning styles and decision making styles can be used fort he subsequent researches.

More broad scales based on reasoning style scale can be used to investigate reasoning styles.

References

Akoğlu, 2018 – *Akoğlu, H.* (2018). User's guide to correlation coefficients. *Turk J Emerg Med.*, 18(3): 91-93.

Akyürek, Guney, 2018 – *Akyürek, S., Guney, S.* (2018). Effects of Learning Styles and Locus of Control on the Decision-Making Styles of Leader Managers. *Eurasia Journal of Mathematics, Science and Technology Education,* 14(6), 2317-2328. DOI: https://doi.org/10.29333/ejmste/89515

Allwood, Salo, 2012 – *Allwood, C.M., Salo, I.* (2012). Decision-Making Styles and Stress. *International Journal of Stress Management,* 19: 34-47.

Altıparmak, 2009 – *Altıparmak, M.* (2009). Alan bağımlı ve alan bağımsız bilişsel stillere sahip öğrencilerin kuvvet ve hareket konularındaki başarıları ile başarıyı ölçmek için kullanılan testlerin içeriği ve formatı arasındaki ilişkinin araştırılması, Unpublished Master Thesis. [Electronic resouce]. URL: https://tez.yok.gov.tr sayfasından erişilmiştir.

Atasoy, 2004 – *Atasoy, B.* (2004). Bilgisayar destekli öğretim ortamlarında farklı bilişsel stillere sahip öğrencilerin öğrenme stratejilerini kullanma durumlarının akademik başarıya etkisi. Unpublished Master Thesis. [Electronic resouce]. URL: https://tez.yok.gov.tr sayfasından erişilmiştir

Balkıs, ve Işıker, 2003 – *Balkış, M., ve Işıker B.G.* (2003). Üniversite öğrencilerinin düşünme stilleri ile kişilik tipleri arasındaki ilişkinin çeşitli değişkenler açısından incelenmesi. Unpublished Doctoral Dissertation. [Electronic resouce]. URL: https://tez.yok.gov.tr sayfasından erişilmiştir

Coşkun, 2011 – *Coşkun, N.* (2011). The achievement and anxiety level of primary school students in math lesson according to their learning styles. Unpublished Master's Thesis. [Electronic resouce]. URL: http://tez2.yok.gov.tr/ (date of access: 08.05.19).

Çağlayan, 2007 – *Çağlayan, H.S.* (2007). Investigating the relationship between learning modality and problem solving skills of physical education and sports students. Unpublished Doctoral Dissertation. [Electronic resouce]. URL: http://tez2.yok.gov.tr/ (date of access: 08.05.19).

Çakan, 2003 – *Çakan, M.* (2003). Cross-Cultural Aspect of the Group Embedded Figures Test: Norms for Turkish Eighth Graders. *Perceptual and Motor Skills*, 97, 499-509.

Çakan, 2005 – *Çakan, M.* (2005). Bilişsel Stiller İle Yabancı Dil Başarısı Arasındaki İlişki: 8. Sınıf Fransızca Örneği. *İlköğretim Online,* 4(1): 53-61.

Çubukçu, 2004 – *Çubukçu, Z.* (2004). Öğretmen adaylarının düşünme stillerinin belirlenmesi. *Trakya Üniversitesi Sosyal Bilimler Dergisi,* 5(2): 87-106.

Çubukçu, 2004a – *Çubukçu, Z.* (2004). Öğretmen Adaylarının Düşünme Stillerinin Öğrenme Biçimlerini Tercih Etmelerindeki Etkisi, XIII. Ulusal Eğitim Bilimleri Kurultayı, 6-9 Temmuz 2004 İnönü Üniversitesi, Eğitim Fakültesi, Malatya.

Duran, 2014 – *Duran, V.* (2014). Öğretmen Adaylarının Hipotetik-Yaratıcı Akıl Yürütme Becerilerinin, Bilimsel Epistemolojik İnançları, Öğrenme Stilleri Ve Demografik Özellikleri Açısından İncelenmesi. Unpublished Master's Thesis, Muğla Sıtkı Koçman Üniversitesi/Eğitim Bilimleri Enstitüsü/Eğitim Programları ve Öğretimi Anabilim Dalı/Eğitim Programları ve Öğretim Bilim Dalı, Muğla.

Duran, 2017 – *Duran, V.* (2017). Program Geliştirme Modelleri, Çeşitli Mantık Yaklaşımları ve Karmaşık Sistemler, Vii. Mantik Çaliştayi Kitabi, Mantık Derneği Yayınları, İstanbul.

Duran, 2019 – *Duran, V.* (2019). Öğretmen Adaylarının Akıl Yürütme Stilleri, Bilişsel Çarpıtmaları Ve Eleştirel Düşünme Eğilimlerinin İncelenmesi (Ondokuz Mayıs Üniversitesi Eğitim Fakültesi Örneği), Unpublished Doctoral Dissertation, Gazi Üniversitesi/Eğitim Bilimleri Enstitüsü/Eğitim Programları ve Öğretimi Anabilim Dalı/Eğitim Programları ve Öğretim Bilim Dalı, Ankara.

Duran, Özer, 2017 – *Duran, V., Özer, B.* (2017). Investigation of The Reasoning Styles of The University Students, *Disiplinlerarası Eğitim Araştırmaları Dergisi*, (1), 1

Duran, Şentürk, 2019 – *Duran, V., Şentürk, Ş.* (2019). Development of Reasoning Styles Scale. *Universal Journal of Educational Research,* 7(5): 1205-1215. DOI: 10.13189/ujer.2019.070506

Durdukoca, 2011 – *Durdukoca, F.Ş.* (2011). Öğretmen adaylarının düşünme stillerinin çeşitli değişkenlere gore incelenmesi. *2 Nd International Conference On New Trends İn Education And Their Implications*. 27-29 Nisan, Antalya, pp. 1719-1724.

Egitim.sdu – Egitim.sdu [Electronic resouce]. URL: http://egitim.sdu.edu.tr/tr/ogrenci-sayilari/ogrenci-sayilari-9375s.html (date of access: 27.05.19).

Ehtiyar R.V. ve Tekin A.Ö. (2010). Yönetimde karar verme: Batı Antalya Bölgesindeki beş yıldızlı otellerde çalışan farklı departman yöneticilerinin karar verme stilleri üzerine bir araştırma. *Yaşar Üniversitesi Dergisi*, 20 (5), 3394- 3414.

Erol Öngen, 2014 – *Erol Öngen, D.* (2014). Vocational identity status among Turkish youth: Relationships between perfectionisms and decision making style, *Procedia – Social and Behavioral Sciences,* 116: 472-476.

Gacar et al, 2015 – *Gacar, A., Altungül, O., Nacar, E.* (2015). Examination of thinking styles of trainers from different branches. *Annals of Applied Sport Science*, 3(4): 01-08.

Gettinger et al., 2013 – *Gettinger, J., Kiesling, E., Stummer, C., Vetschera, R.* (2013). A comparison of representations for discrete multi-criteria decision problems. *Decision Support Systems*, 54: 976-985.

Horzum, ve Alper, 2006 – *Horzum, M.B., ve Alper, A.* (2006). Fen bilgisi dersinde olaya dayalı öğrenme yöntemi, bilişsel stilin ve cinsiyetin öğrenci başarısına etkisi. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi*, 39 (2): 151-175.

Jahanshahi, Ebrahimi Gavam, 2006 – *Jahanshahi F., Ebrahimi Gavam S.* (2006). A comparative study of the relationship between thinking style with age, gender, field of study and education level of teachers in three elementary, middle and high schools. *Edu. Psychol.*: 58-37.

Kadim, 2017 – *Kadim, M.* (2017). Düşünme stilleri açısından meslek yüksekokulu öğrencileri. *Uluslararası Sosyal Araştırmalar Dergisi*, 10(50): 530-540.

Kurban, 2015 – *Kurban, C.* (2015). Bireysel Algılarına Göre Okul Yöneticilerinin Karar Verme Stilleri. Unpublished Master's Thesis. [Electronic resouce]. URL: http://tez2.yok.gov.tr/ (date of access: 08.05.19).

Loo, 2000 – *Loo, R.* (2000). A psychometric evaluation of the general decision-making style inventory. *Personality and Individual Differences*, 29: 895-905.

Mahdavi Shakib, 2011 – *Mahdavi Shakib A.* (2011). The relationship between thinking style of administrators in primary schools with their transformational leadership style based on Bass and Avolio model. *J. Educational Leadership and Management*, 6(4): 26-39.

Morris et al., 2005 – *Morris, M.G., Venkatesh, V., Ackerman, P.L.* (2005). Gender and age differences in employee decisions about new technology: an extension of the theory of planned behavior. *IEEE Transactions on Engineering Management,* 52: 69-84.

Murphy et al., 1997 – *Murphy, H.J., Casey, B., Day, D.A., Young, J.D.* (1997). Scores on the Group Embedded Figures Test by undergraduates in information management. *Perceptual and Motor Skills*, 84: 1135-1138.

Önkuzu, 2013 – *Önkuzu, E.* (2013). Hazırlık sınıfı öğrencilerinin öğrenme ve düşünme stilleri ile yabancı dilde kelimenin anlamını tahmin etme başarıları arasındaki ilişki (Yüksek Lisans Tezi). [Electronic resouce]. URL: https://tez.yok.gov.tr sayfasından erişilmiştir

Özbaş, ve Uluçınar Sağır, 2014 – *Özbaş, N., ve Uluçınar Sağır, Ş.* (2014). Sınıf öğretmenlerinin düşünme stilleri ve kullandıkları ölçme-değerlendirme yöntemleri arasındaki ilişkinin incelenmesi. *Ondokuz Mayıs Üniversitesi Eğitim Fakültesi* Dergisi, 33(1): 305-321.

Pithers, 2002 – *Pithers R.T.* (2002). Cognitive learning style: a review of the field dependentfield independent approach. *Journal of Vocational Education & Training*, 54(1): 117-132. DOI: 10.1080/13636820200200191

Pour Kayani, Shahilou, 2010 – *Pour Kayani M., Shahilou F.* (2010). Relationship of management styles in the trap of time. *Case study of Gimmick:* 60-64.

Riding, Agrell, 1997 – *Riding, R., Agrell, T.* (1997). The effect of cognitive style and cognitive skills on school subject performance. *Educational Studies*, 23, 311-323.

Scott, Bruce, 1995 – *Scott, S., Bruce, R.* (1995). Decision-making style: the development and assessment of a new measure. *Educational and Psychological Measurement*, 55: 818-831.

Shokri et al., 2006 – *Shokri O., Kadivar P., Farzad V., Daneshpour Z.* (2006). The relationship between thinking styles and learning approaches with students' progress. *New Cognitive Sci.*, 8(2): 52-44.

Spicer, Sadler-Smith, 2005 – *Spicer, D., Sadler-Smith, E.* (2005). An examination of the general decision making style questionnaire in two UK samples. *Journal of Managerial Psychology*, 20: 137-149.

Tabachnick, ve Fidell, 2007 – *Tabachnick, B.G., ve Fidell, L.S.* (2007). Using multivariate statistics, Fifth Edition. Boston: Pearson Education, Inc.

Taşdelen, 2002 – *Taşdelen, A.* (2002). Öğretmen adaylarının farklı psiko-sosyal değişkenlere göre karar verme stilleri. (Yayınlanmamış doktora tezi). Dokuz Eylül Üniversitesi Eğitim Bilimleri Enstitüsü, İzmir.

Thunholm, 2004 – *Thunholm, P.* (2004). Decision-making style: habit, style or both? *Personality and Individual Differences*, 36: 931-944

Tinajero, Paramo, 1997 – *Tinajero, C., Paramo, M.F.* (1997). Field-dependence and Independence and Academic Achievement: A Re-examination of their Relationship. *British Journal of Educational Psychology*, 67, 199-212.

Yamane, 2010 – *Yamane, T.* (2010). Temel örnekleme yöntemleri. Literatür Yayıncılık: İstanbul.

Yaşar, Ve Erol, 2015 – *Yaşar, M., Ve Erol, A.* (2015). Okul Öncesi eğitimi öğretmen adaylarının empatik eğilim düzeyleri ile düşünme stilleri arasındaki ilişkinin belirlenmesi. *International Journal Of Assessment Tools In Education*, 2(2): 38-65.