

## The Effect of Thinking-Style-Based Differentiated Instruction on Achievement, Attitude And Retention<sup>1</sup>

### Düşünme Stillere Göre Farklılaştırılmış Öğretim Etkinliklerinin Erişi, Tutum Ve Kalıcılığa Etkisi

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#### Özet

#### Abstract

Bu araştırmanın amacı, öğrencilerin düşünme stillerine göre tasarlanan farklılaştırılmış öğretim etkinliklerinin öğrencilerin başarıları, Mesleki Yabancı Dil dersine yönelik tutumları ve öğrenenlerin kalıcılığı üzerindeki etkisini incelemektir. Araştırmada, deneysel desen türlerinden ön test – son test kontrol gruplu yarı-deneysel desen kullanılmıştır. Araştırma; 2014–2015 Bahar yarıyılında, Nevşehir Hacı Bektaş Veli Üniversitesi Meslek Yüksekokulu Turizm ve Otel İşletmeciliği Programı 2. sınıf öğrencileriyle Mesleki Yabancı Dil-II dersinde yürütülmüştür. Toplam 43 öğrenci çalışma grubunda yer almıştır. Araştırmada veriler; Düşünme Stilleri Ölçeği, Mesleki Yabancı Dil-II Dersi Başarı Testi ve Mesleki Yabancı Dil Dersine Yönelik Tutum Ölçeği kullanılarak elde edilmiştir. Çalışmada, düşünme stillerinin işlev, düzey ve kapsam boyutları dikkate alınmıştır. Farklılaştırma süreç boyutunda yapılmıştır. Süreç farklılaştırılırken, giriş noktaları (anlatımsal, temel, deneysel), öğrenme merkezleri, karmaşık öğretim, yönlü çalışma, istasyon ve öğrenme sözleşmeleri stratejilerinden faydalanılmıştır. Araştırma sonunda, deney grubu öğrencilerinin erişimi ve kalıcılık puanlarının kontrol grubundaki öğrencilerin puanlarına göre anlamlı derecede daha yüksek olduğu; fakat tutum ölçeğinden almış oldukları puanlar arasında anlamlı düzeyde fark olmadığı ortaya çıkmıştır.

The aim of the study is to investigate the effect of thinking-style-based differentiated instruction on achievement, attitude and retention in vocational foreign language, specifically in two units. Pre-test/post-test control group model and quasi-experimental design were used in the study. The study was carried out in Vocational Foreign Language-II course with 43 sophomores studying Tourism and Hotel Management at Nevşehir Vocational College, Nevşehir Hacı Bektaş Veli University. Data were collected using Thinking Styles Inventory, Vocational Foreign Language-II Achievement Test and Vocational Foreign Language Attitude Scale. Functions, levels and scope of thinking styles were taken into consideration. Process was differentiated in the study through entry points (narrational, foundational, experiential), learning centres, complex instruction, orbital studies, stations and learning contracts. According to the results of the study, it was found out that achievement and retention scores of the students in the experimental group were significantly higher than the ones in the control group; however, there was no significant difference between groups' attitude scores towards the course.

**Anahtar Kelimeler:** Düşünme stilleri, farklılaştırılmış öğretim, erişim, tutum, kalıcılık.

**Keywords:** Thinking styles, differentiated instruction, achievement, attitude, retention.

## 1. Introduction

Foreign language teaching (teaching English) starts in the second year of primary school in Turkey and continues to tertiary education. It includes teaching language areas and skills. However, as students study just for passing exams, they become passive recipients of the language and efforts of teachers to use student-centred activities fail. When students get older, there occur changes in their interests, which results in differences in their foreign language levels. In tertiary education, scope of compulsory foreign language courses is the same as in primary and secondary education. Therefore, students get bored of studying the same curricula; they start to exhibit negative feelings and behaviours against the language and learning it. In addition, students with level difference study together in the same classroom, so lecturers have difficulty in making the language teaching level appropriate for all students. It is quite obvious in vocational colleges.

Vocational colleges are institutions in tertiary education lasting 2 years and giving associate degree to train qualitative labour force for specific professions. Vocational foreign language courses are taken generally in the second year after compulsory foreign language (I and II) courses. The aim of the courses is to teach students and help them gain needed language in their profession. However, low level of language, lack of background knowledge and negative attitudes towards the language generally cause students fail in the course.

Focusing functions of the language instead of its structure, designing the curricula more communicative and appropriate for students' needs may serve students' success (cognitive), appreciation (affective) and active participation (psychomotor) in language courses. In order to achieve the goal, differentiation in instruction is needed. Sternberg et al. (2008) claim that teaching becomes more effective through style-differentiated instruction and they offer teachers at any level, no matter they are young, children, adolescents, or adults, to render and differentiate instruction using their thinking styles. At least, some of instruction should match their styles of thinking. Thus, students can maximally benefit from instruction and assessment. It is hard to advocate a perfect match all the time and students have to learn that the world does not always provide them with a perfect match to their preference of doing things. On the one hand, in differentiated instruction, flexibility is as crucial for students as for teachers. On the other hand, if teach-

1. The study was developed from the doctoral dissertation of the first author.

hers want students to show what they can really do, a match of instruction to styles is essential. Consequently, the study was carried out with the idea in mind that determining students' thinking styles and differentiating instruction in terms of their styles will provide students more effective learning environments. Moreover, it will help them learn easily and permanently, and have positive attitude towards the course, language and other foreign languages.

The theory of thinking styles is based on mental self-government. The styles can be explained in terms of constructs of government. In other words, types of governments in the world have not occurred randomly, because they are external reflections of ways people can organize or govern themselves. Thinking styles are not skills, but they refer to the ways how to use skills. Thinking style means what individuals prefer to do, and how they like to do it (Sternberg, 1997; Zhang and Sternberg, 2005). Thinking styles fall into five dimensions, as functions, forms, levels, scope and leanings.

There are three functions of thinking styles: legislative, executive and judicial. Legislatively oriented individuals like doing things in their own ways and they prefer to create, formulate and plan. Executively oriented individuals like problems organized before and they prefer to perform. Judicially oriented individuals like analyzing and evaluating things and they prefer to criticize, judge and express their opinions (Sternberg, 1997). The forms of thinking styles are divided into four sub-dimensions: monarchic, hierarchic, oligarchic and anarchic. Monarchically oriented individuals like one thing at a time and they prefer to determine priority among responsibilities. Hierarchically oriented individuals like forming a hierarchy to reach their goals. Oligarchically oriented individuals like doing things of the same importance at a time. Anarchically oriented individuals like doing things providing flexibility (Sternberg and Zhang, 2005). There are two levels of thinking styles: local and global. Locally oriented individuals like details and concrete issues, so they usually overlook the main idea. Globally oriented individuals like abstract issues and do not like details (Sternberg, 1997). The scope of thinking styles fall into two sub-dimensions: internal and external. Internally oriented individuals like doing things independently and they are introverted. Externally oriented individuals like interacting and they are extraverted (Sternberg et al. 2008). There are two leanings of thinking styles: liberal and conservative. Liberally oriented individuals like going beyond procedures and rules, they prefer change and ambiguity. Conservatively oriented individuals like procedures and rules and they dislike and avoid change and ambiguity (Sternberg, 1997).

When it comes to differentiated instruction, Tomlinson (1999) described it as an approach that helps teachers to plan strategically to meet the needs of all students. The approach asserts that there are differences among learners, and teachers should adjust instruction accordingly. Teachers can differentiate content, process and product taking into account students' readiness levels, interests, and learning profiles. In the study, process was differentiated and students' thinking styles, as they are crucial elements in their learning profiles, were considered. While differentiating instruction, 6 instructional strategies that support differentiation were used.

Stations are places in the classroom where students do distinct tasks on the same subject simultaneously. All students move to the stations to learn different concepts and skills in each station. Complex instruction is a substantial strategy especially in academically, culturally, and linguistically heterogeneous classrooms. It gives equal opportunity to all students through using small instructional groups. Orbital studies look like projects but students carry out their projects individually, rather than in groups. Centres are places in the classrooms where students in groups work on a different aspect of a subject. They do not need to rotate among all centres. Entry points address varied intelligence profiles. Narrational entry point includes telling a story or narrative about the topic or concept. Foundational entry point involves investigating the philosophy and vocabulary about the topic or concept. Experiential entry point contains providing practical approach where the student can work directly on materials that represent the topic or concept. These materials help students make connections with their personal experiences. Learning contracts are negotiated agreements between teacher and students independently. They provide students some freedom in gaining skills and understanding what teacher gives importance at a given time. Student can choose what is to be learned, working conditions, and how information will be applied or expressed (Tomlinson, 1999; Tomlinson, 2001).

### **The Purpose and Importance of the Study**

Thinking styles and differentiated instruction are two important concepts in educational sciences literature and there are various studies about them. However, the concepts were investigated independently and in distinct aspects. To date, studies on thinking styles examined the relationship between thinking styles and learning styles (Clarke et al. 2010; Subaşı, 2010), academic achievement (Lau, 2014; Sökmen, 2013; Tunçer, 2013), critical thinking (Zhang, 2003), teaching styles (Zhang, 2008), attitude (Negari and Soleymani, 2013), cultural adaptation (Tsagaris, 2006; Yıldızlar, 2010), problem solving skills (Düzgün, 2011), multiple intelligences (Becerem and Özdemir, 2010), metacognitive strategies (Yıldız, 2010), achievement motivation (Nikoupoor et al. 2012), level of burnout (Uğurlu, 2012), mathematic anxiety (Altundal, 2013), language learning strategies (Ahmadi et al. 2014), decision-making styles (Öztabak, 2013), cognitive and implicit learning (Xie et al. 2013), learning environments (Fan and Zhang, 2014) and emotional intelligence (Karabulut, 2014). Some studies investigated predictive power of thinking styles on academic achievement (Fan et al. 2010; Richmond and Conrad, 2012), interpersonal behaviours (Yu and Chen, 2012) and metacognitive awareness (Khin and Win, 2012; Zhang, 2010). The only experimental study encountered about thinking styles investigated the effects of different online interaction designs based on thinking styles of students on academic achievement and motivation in which just the scope (internal and external) of thinking styles were taken into consideration (Güneş, 2012).

When it comes to differentiated instruction, there are numerous experimental studies carried out in different courses and educational levels (Avcı, 2015; Batdı and Semerci, 2012; Bradfield, 2012; Çalikoğlu, 2014; Demir, 2013; Güçlüer and Kesercioğlu,

2012; James, 2013; Konstantinou-Katzi et al. 2013; Maxey, 2013; Özyaprak, 2012; Sayı, 2013; Şaldırak, 2012; Taş, 2013; Umar, 2014; Üşenti, 2013; Yılmaz, 2015). However, in literature, few experimental studies of differentiation have been encountered in any courses at vocational colleges. In addition, there have not been any experimental studies examining thinking styles and differentiated instruction simultaneously. Given the lack, the study is original and important to contribute further studies because the study investigated the effect of thinking-style-based differentiated instruction on achievement, attitude and retention in vocational foreign language. The following hypotheses were formulated to reach the purpose:

- H1. There is a significant difference between students' achievement scores in experimental group where thinking-style-based differentiated instruction was applied and control group where traditional method was applied.
- H2. There is a significant difference between students' attitude scores in experimental group where thinking-style-based differentiated instruction was applied and control group where traditional method was applied.
- H3. There is a significant difference between students' retention scores in experimental group where thinking-style-based differentiated instruction was applied and control group where traditional method was applied.

## 2. Methodology

The study aimed at investigating the effect of thinking-style-based differentiated instruction on achievement, attitude and retention in vocational foreign language, specifically in two units: 'Booking at a hotel' and 'Checking in/Checking out at a hotel'. Pre-test/post-test control group model and quasi-experimental design were used in the study. The study was carried out in Vocational Foreign Language-II course with sophomores studying Tourism and Hotel Management at Nevşehir Vocational College, at Nevşehir Hacı Bektaş Veli University, in 2014-2015 Spring semester. Before the intervention, Thinking Styles Inventory was carried out to determine the neutrality of the groups and to find out students' thinking styles in the groups. Vocational Foreign Language-II Achievement Test and Vocational Foreign Language Attitude Scale were held before and after the intervention as pre-test and post-test, and Vocational Foreign Language-II Achievement Test was applied 8 weeks after the intervention as retention test. Table 1 shows the diagram of quasi-experimental design of the study.

**Table 1. Diagram of quasi-experimental design of the study**

Groups	Pre-test	Method	Post-test	Retention
G <sub>E</sub>	O <sub>1</sub>	X	O <sub>2</sub>	O <sub>3</sub>
G <sub>C</sub>	O <sub>1</sub>		O <sub>2</sub>	O <sub>3</sub>

### Participants

Experimental and control group were determined randomly between two classes with students studying Tourism and Hotel Management and taking Vocational Foreign Language-II course at the Vocational College, in 2014-2015 Spring semester. There were 25 students in experimental group and 18 students in control group. Differentiation was applied in terms of functions, levels and scope of thinking styles of students in experimental group. Traditional method was applied in control group.

### Thinking Styles of the Students in the Groups

Table 2 displays thinking styles of the students. With regard to functions, 14 students were legislatively, 7 students were executively and 4 students were judicially oriented in experimental group while 10 students were legislatively, 6 students were executively and 2 students were judicially oriented in control group. For levels, 13 students were globally and 12 students were locally oriented in experimental group whereas 9 students were globally and 9 students were locally oriented in control group. When it comes to scope, 13 students were internally and 12 students were externally oriented in experimental group and 10 students were internally and 8 students were externally oriented in control group.

**Table 2. Thinking styles of the students in the groups**

	Experimental	Control		Experimental	Control		Experimental	Control
Fuctions	f	f	Levels	f	f	Scope	f	f
Legislative	14	10	Global	13	9	Internal	13	10
Executive	7	6	Local	12	9	External	12	8
Judicial	4	2						
Total	25	18		25	18		25	18

### Neutrality of the Groups

Normality plots with tests (Shapiro-Wilk) and homogeneity of variance test (Levene f test) were found to be non-significant ( $p > 0.05$ ) for functions, levels and scope of Thinking Styles Inventory, Vocational Foreign Language-II Achievement Test and Vocational Foreign Language Attitude Scale (pre-tests). Therefore, groups were analyzed by independent-samples t-test for neutrality in terms of thinking styles, achievement test and attitude scale and they are displayed in Table 3, Table 4 and Table 5, respectively.

**Table 3. Independent-samples t-test results regarding thinking styles of students in the groups**

Thinking Styles	Subscales	Group	N	X	SS	SD	t	p
Functions	Legislative	Experimental	25	27.00	6.671	41	.144	.887
		Control	18	26.72	5.634			
	Executive	Experimental	25	24.00	4.601	41	-.577	.567
		Control	18	24.89	5.476			
	Judicial	Experimental	25	23.32	4.337	41	-.599	.552
		Control	18	24.22	5.537			
Levels	Global	Experimental	25	22.76	3.609	41	-1.350	.184
		Control	18	24.61	5.392			
	Local	Experimental	25	22.68	3.923	41	-.678	.502
		Control	18	23.61	5.089			
Scope	Internal	Experimental	25	22.80	3.162	41	-1.057	.297
		Control	18	23.89	3.563			
	External	Experimental	25	23.68	4.497	41	.160	.874
		Control	18	23.44	5.102			

Given Table 3, t values were estimated (legislative  $t(41)=.144$ ,  $p=.887$ ; executive  $t(41)=-.577$ ,  $p=.567$ ; judicial  $t(41)=-.599$ ,  $p=.552$ ; global  $t(41)=-1.350$ ,  $p=.184$ ; local  $t(41)=-.678$ ,  $p=.502$ ; internal  $t(41)=-1.057$ ,  $p=.297$ ; external  $t(41)=.160$ ,  $p=.874$ ). All subscale scores were found to be non-significant ( $p>0.05$ ) and the groups were considered to be neutral in terms of their thinking styles.

**Table 4. Independent-samples t-test results regarding pre-test achievement test scores of students in the groups**

Group	N	X	SS	SD	t	p
Experimental	25	8.44	4.407	41	.355	.725
Control	18	8.00	3.378			

As seen in Table 4, independent-samples t-test results for achievement (pre-test) test ( $t(41)=.355$ ,  $p=.725$ ,  $p>0.05$ ) was non-significant; in other words, the groups were neutral.

**Table 5. Independent-samples t-test results regarding pre-test attitude scale scores of students in the groups**

Group	N	X	SS	SD	t	p
Experimental	25	99.08	16.330	41	-.168	.867
Control	18	99.94	16.986			

Table 5 represents that the groups were also neutral in terms of attitude (pre-test) scores because values estimated after independent-samples t-test ( $t(41)=-.168$ ,  $p=.867$ ,  $p>0.05$ ) were found to be non-significant.

## Instrumentation

### *Thinking Styles Inventory*

Thinking Styles Inventory developed by Sternberg and Wagner and adapted to Turkish by Sünbül (2004) was used in the study. The Turkish version, a five-point Likert scale, included 94 items and was divided into 13 sub-scales. The reliability and validity of the inventory were tested and proved to be reasonable by Sünbül (2004). Students in experimental group were classified into categories with their highest orientation in a sub-scale and instruction was differentiated accordingly.

### *Vocational Foreign Language-II Achievement Test*

A multiple-choice test was prepared to evaluate students' achievement for two units, 'Booking at a hotel' and 'Checking in/Checking out at a hotel', taking into consideration the objectives of the units. There were 5 choices for each question. The draft test was checked by 3 lecturers of English, 2 academicians from department of curriculum and instruction and 1 academician from department of assessment and evaluation. The draft test was conducted with students who had learnt the units and were similar to the participants of the study. Item discrimination and difficulty were analyzed after the pilot implementation of the test. Questions with higher item discrimination than .30 were kept in the test. Questions with lower item difficulty than .20 and higher than .80 were excluded. After the procedures, the achievement test included 35 questions. The average item discrimination and difficulty were found to be .47 and .56, respectively. KR-20 reliability was .92.

### *Vocational Foreign Language Attitude Scale*

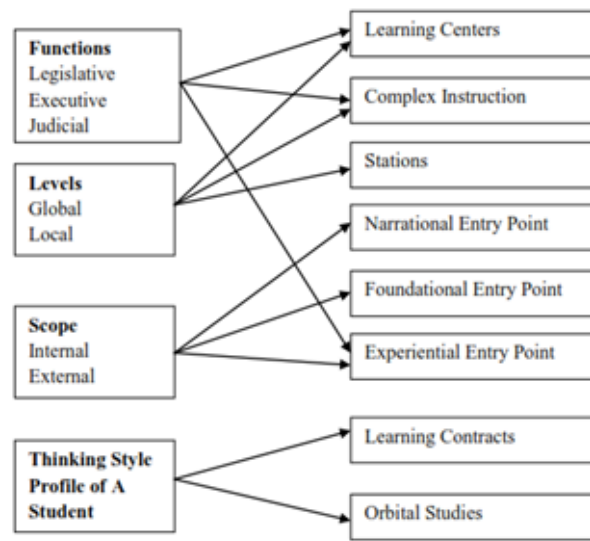
Vocational Foreign Language Attitude Scale was developed for the study. Students studying Tourism and Hotel Management and Tourism and Travel Services and having taken Vocational Foreign Language I and II at the Vocational College, in 2013-2014 academic year wrote their opinions and feelings about the course. The most repeated ideas were chosen and statements were written for the scale. Three lecturers of English, 1 academician from department of assessment and evaluation, and 1 academician from

department of curriculum and instruction checked the scale for content validity and 2 lecturers of Turkish controlled it for accuracy. Twelve items were excluded and scale was composed of 28 statements (17 positive and 11 negative) rated on five-point Likert scale. 158 voluntary students similar to the groups filled in the scale and some analyses were made. Total item correlations of the items were between .61 and .82. KMO was .953 and Barlett test was 0.00. After explanatory factor analysis, the scale was considered to have one factor. Reliability of the instrument was measured by Cronbach alpha and it was  $\alpha = .96$  (Özer, 2016).

Since the scale has a one-factor structure, confirmatory factor analysis was carried out for the scale in another study carried by the authors to test one-factor structure of the scale and convenience of the model proposed after explanatory factor analysis. 331 students participated in the study. The results of the analyses indicated that the model had acceptable fit indices (Özer and Yılmaz, 2016).

### *Intervention in Experimental Group*

Intervention was carried out by the first author of the study. The students in experimental group were classified into categories regarding dominant functions (legislative, executive, judicial), levels (local, global) and scope (internal, external) of their thinking styles. Process was differentiated in the study through entry points (foundational, narrational, experiential), learning centres, complex instruction, orbital studies, stations and learning contracts. Figure 1 shows the model of thinking styles and differentiated instructional strategies used in the study.



**Figure 1. The Model of Thinking Styles and Differentiated Instructional Strategies Used in the Study**

Instructional lesson plans and activities were prepared by the first author and checked by 4 academicians from department of curriculum and instruction. Experimental research was carried out for 7 weeks, 6 periods a week, and totally 42 periods. Each period was designed differently. For example, in one period, students were categorized into 3 groups regarding functions as legislative, executive and judicial, and learning centres were implemented as the instructional strategy. In another period, students were categorized into groups each containing both global and local students (levels), and instruction was differentiated using complex instruction. In some periods, students were grouped into scope of their thinking styles, and foundational, narrational or experiential entry points were used as the instructional strategies. Table 6 displays thinking styles and differentiated instructional strategies used in the study.

**Table 6. Thinking styles and differentiated instructional strategies used in the study**

Units	Thinking Styles	Differentiated Instructional Strategies	Period	
Booking at a Hotel	Scope	Entry Points	1*45 minutes	
	<ul style="list-style-type: none"> <li>• Internal</li> <li>• External</li> </ul>	<ul style="list-style-type: none"> <li>• Foundational Entry Points</li> </ul>		
	Functions	Learning Centres	1*45 minutes	
	<ul style="list-style-type: none"> <li>• Legislative</li> <li>• Executive</li> <li>• Judicial</li> </ul>			
	Levels			
	<ul style="list-style-type: none"> <li>• Global</li> <li>• Local</li> </ul>	Learning Centres	1*45 minutes	
	Thinking styles profile of the students	Learning Contracts	1*45 minutes	
	Scope	Entry Points	2*45 minutes	
	<ul style="list-style-type: none"> <li>• Internal</li> <li>• External</li> </ul>	<ul style="list-style-type: none"> <li>• Narrational Entry Points</li> </ul>		
	Levels	Complex Instruction	2*45 minutes	
	<ul style="list-style-type: none"> <li>• Global</li> <li>• Local</li> </ul>			
	Functions			
	<ul style="list-style-type: none"> <li>• Legislative</li> <li>• Executive</li> <li>• Judicial</li> </ul>	Complex Instruction	2*45 minutes	
	Functions	Entry Points	2*45 minutes	
<ul style="list-style-type: none"> <li>• Legislative</li> <li>• Executive</li> <li>• Judicial</li> </ul>	<ul style="list-style-type: none"> <li>• Experiential Entry Points</li> </ul>			
Thinking styles profile of the students	Orbital Studies	2*45 minutes		
Levels	Learning Centres	2*45 minutes		
<ul style="list-style-type: none"> <li>• Global</li> <li>• Local</li> </ul>				
Levels	Stations	6*45 minutes		
Checking in/Checking out at a hotel	Scope	Entry Points	2*45 minutes	
	<ul style="list-style-type: none"> <li>• Internal</li> <li>• External</li> </ul>	<ul style="list-style-type: none"> <li>• Experiential Entry Points</li> </ul>		
	Functions	Entry Points	2*45 minutes	
	<ul style="list-style-type: none"> <li>• Legislative</li> <li>• Executive</li> <li>• Judicial</li> </ul>			<ul style="list-style-type: none"> <li>• Experiential Entry Points</li> </ul>
	Levels			
	<ul style="list-style-type: none"> <li>• Global</li> <li>• Local</li> </ul>	Complex Instruction	2*45 minutes	
	Functions	Learning Centres	2*45 minutes	
	<ul style="list-style-type: none"> <li>• Legislative</li> <li>• Executive</li> <li>• Judicial</li> </ul>			
	Scope			
	<ul style="list-style-type: none"> <li>• Internal</li> <li>• External</li> </ul>	Entry Points	2*45 minutes	
	<ul style="list-style-type: none"> <li>• Global</li> <li>• Local</li> </ul>	<ul style="list-style-type: none"> <li>• Experiential Entry Points</li> </ul>		
	Levels	Learning Centres	2*45 minutes	
	Scope	Entry Points	2*45 minutes	
	<ul style="list-style-type: none"> <li>• Internal</li> <li>• External</li> </ul>	<ul style="list-style-type: none"> <li>• Experiential Entry Points</li> </ul>		
Functions	Learning Centres	2*45 minutes		
<ul style="list-style-type: none"> <li>• Legislative</li> <li>• Executive</li> <li>• Judicial</li> </ul>				
Levels				
<ul style="list-style-type: none"> <li>• Global</li> <li>• Local</li> </ul>	Complex Instruction	2*45 minutes		

### 3. Findings and Comments

The findings were analyzed in terms of hypotheses of the study in this section whether there was a significant difference in achievement, attitude and retention scores between experimental and control groups.

*Hypothesis 1.* There is a significant difference between students' achievement scores in experimental group where thinking-style-based differentiated instruction was applied and control group where traditional method was applied.

As experimental and control groups were neutral in terms of achievement pre-test, independent-samples t-test was used to find out whether there was a statistically significant difference between groups for achievement test scores after the intervention. Table 7 shows the findings.

**Table 7. Comparison regarding achievement scores of students in the groups)**

Groups	Pre-test			Post-test		Achievement		t	p
	N	X	SS	X	SS	X	SS		
Experimental	25	8.44	4.40	21.56	7.76	13.12	5.26	2.565	.014
Control	18	8.00	3.37	17.00	6.25	9.00	5.09		

As shown in Table 7, the result was statistically significant ( $t(41)=2.565$ ;  $p=.014<0.05$ ), which revealed a statistically significant difference between groups in achievement test scores. Therefore, the first hypothesis was accepted.

*Hypothesis 2.* There is a significant difference between students' attitude scores in experimental group where thinking-style-based differentiated instruction was applied and control group where traditional method was applied.

Because experimental and control groups were neutral in terms of attitude pre-test, independent-samples t-test was used to find out whether there was a statistically significant between groups for attitude scores after the intervention. Table 8 shows the findings.

**Table 8. Comparison regarding attitude scores of students in the groups**

Group	N	X	SS	SD	t	p
Experimental	25	112.04	14.149	41	1.045	.302
Control	18	106.83	18.558			

As displayed in Table 8, the result was statistically non-significant ( $t(41)=1.045$ ;  $p=.302>0.05$ ). Thus, it revealed that there is no statistically significant difference between groups in attitude scores. Thus, the second hypothesis was rejected.

*Hypothesis 3.* There is a significant difference between students' retention scores in experimental group where thinking-style-based differentiated instruction was applied and control group where traditional method was applied.

As experimental and control group were neutral in terms of achievement pre-test, independent-samples t-test was used to find out whether there was a statistically significant difference between groups for retention test scores carried out 8 weeks after the intervention. Table 9 shows the findings.

**Table 9. Comparison regarding retention scores of students in the groups**

Group	N	X	SS	SD	t	p
Experimental	25	18.40	6.658	41	2.534	.015
Control	18	13.61	5.248			

As seen in Table 9, the result was statistically significant ( $t(41)=2.534$ ;  $p=.015<0.05$ ), which reflected that there was a statistical significant difference between groups in retention test scores. Therefore, the third hypothesis was accepted.

### 4. Discussion

The study yields significant findings for literature of both thinking styles and differentiated instruction. The first hypothesis asserted that there was a significant difference between experimental and control group students' achievement scores after the intervention. The results revealed a statistically significant difference in favour of experimental group and the first hypothesis was accepted. In other words, thinking-style-based differentiated instruction enabled students in experimental group to be more successful in achievement test than the ones in control group. The finding is congruent with abundant literature on differentiated instruction (Avcı, 2015; Avcı and Yüksel, 2011; Çalikoğlu, 2014; Demir, 2013; Dosh, 2011; Gilbert, 2011; Güçlüer and Kesercioğlu, 2012; James, 2013; Konstantinou-Katzi et.al 2013; Mergen, 2011; Oden, 2012; Sayı, 2013; Şaldirak, 2012; Taş, 2013; Üşenti, 2013; Yılmaz, 2015). However, few studies (Cummings, 2011; Kesteloot, 2011; Maxey, 2013) found that there was not a significant effect of differentiation on achievement.

Given that literature on thinking styles, the finding is similar with various studies that thinking styles have a predictive power

(Ahmadi et al. 2014; Çatalbaş, 2006; Richmond and Conrad, 2012; Zhang, 2005) and a significant effect (Güneş, 2012) on achievement of students. On the contrary, a study by Tunçer (2013) found out that thinking styles do not have a predictive power on achievement. Thus, the finding revealed that thinking-style-based differentiated instruction improved student success.

The second hypothesis claimed that there was a significant difference between experimental and control group students' attitude scores after the intervention. Although the increase for attitude scores in experimental group was more than that in control group, the results revealed that there was not a statistically significant difference. Thus, the second hypothesis was rejected. Namely, thinking-style-based differentiated instruction did not make a significant difference in attitudes of students in experimental group when compared to control group.

There are both congruent (Avcı, 2015; Çalikoğlu, 2014) and contradictory (Cheng, 2006; Karadağ, 2010; Kesteloot, 2011) studies in literature on differentiated instruction. Regarding literature on thinking styles, the finding is similar to various studies; that is, thinking styles do not have a predictive power (Çatalbaş, 2006; Nikoupoor et al. 2012; Tunçer, 2013) and a significant effect (Güneş, 2012) on attitude. The finding of the study may be resulted from that students had taken Vocational Foreign Language-I course in fall semester and that they had already developed positive attitudes towards the course before the intervention.

The third hypothesis argued that there was a significant difference between experimental and control group students' retention scores 8 weeks after the intervention. The results revealed a significant difference in favour of experimental group and the third hypothesis was accepted. In other words, thinking-style-based differentiated instruction enabled students in experimental group to be more successful in retention test than the ones in control group. The finding is congruent with abundant literature on differentiated instruction (Avcı, 2015; Batdı and Semerci, 2012; Demir, 2013; Gümüş, 2009; Mergen, 2011; Yılmaz, 2015).

With respect to literature on thinking styles, the finding is similar with various studies; specifically, there is a relationship between thinking styles and success (Ahmadi et al. 2014; Çatalbaş, 2006; Richmond and Conrad, 2012; Zhang, 2005). Moreover, the research by Güneş (2012) revealed that students having studied in the learning environment that provided interaction design based on external thinking style were found to be more successful. Hence, the finding revealed that thinking-style-based differentiated instruction enabled retention in learning.

The findings of the research displayed that thinking-style-based differentiated instruction improved student success, not only in achievement but also in retention test in Vocational Foreign Language. Teaching and learning become more effective through thinking-style-based differentiated instruction. It is not easy to provide a perfect match for all students and all the time, but students can excessively benefit from instruction if some of instruction matches their thinking styles. As they think and comprehend differently, there are differences among students. In addition, differentiated instruction helps teachers to plan strategically to meet the needs of all students.

Another finding of the research revealed that there was not a significant difference though the increase for attitude scores in experimental group was more than in control group. Thinking-style-based differentiated instruction did not make a significant difference in attitudes of students in experimental group when compared to control group. It may be derived from that students had taken Vocational Foreign Language-I course previous semester and that they had already developed positive attitudes towards the course before the intervention.

Given that the literature on the effect of thinking-style-based differentiated instruction on achievement, attitude and retention is fairly scarce, the findings of the present study will provide significant implications for future research. Thinking-style-based differentiated instruction should be used in teaching foreign language, specifically vocational foreign language to improve student success. Long-term teaching through thinking-style-based differentiated instruction may enable students develop more positive attitudes towards vocational foreign language course.

The study has some limitations as other studies in social sciences. In the research, functions, levels and scope of thinking styles were taken into consideration to differentiate instruction. Further pre-test/post-test control group model and quasi-experimental design research can be used for differentiation through forms and leanings of thinking styles in order to fully explore the effects of all thinking styles on achievement, attitude and retention. Instruction was differentiated in process in the study; thus, further studies can differentiate content and/or product. Entry points (foundational, narrational, experiential), learning centres, complex instruction, orbital studies, stations and learning contracts strategies were implemented in the research. Other strategies not used in the study can be implemented in teaching foreign language and vocational foreign language.

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