*Ahi Evran Üniversitesi Eğitim Fakültesi Dergisi, Cilt 12, Sayı 2, Haziran 2011Özel Sayı, Sayfa 1-22*

# Improving a Database Management Systems Course Through Student Learning Styles: A Pilot Study*

**Adem UZUN[1], Semiral ÖNCÜ[2]**

**ABSTRACT**

This is a pilot study, which aims to reorganize a course to better serve learners' learning styles. In essence, this study is a case study to improve the performance of the Database Management Systems Course in the department of Computer Education and Instructional Technologies (CEIT) at Uludag University. Learning styles of students were analyzed through Felder-Soloman's Index of Learning Styles (ILS). A part of data was conducted during the Spring 2009. The participants were the students of the respective course. Findings showed that participants were mostly visual, active and sensory type learners. They were balanced on sequential-global dimensions. No significant relationship was found between the learning styles and achievement scores. This result forms appropriate pre-study conditions for the upcoming study. It was decided for the upcoming study that different learning materials that suits characteristics of participants be developed and blended learning is proposed as a delivery method.

**KEYWORDS:** Learning Styles, Teaching Styles, Blended Learning Environments, Database Management Systems Course

# Veritabanı Yönetim Sistemleri Dersinin Öğrenme Stillerine Bağlı Olarak Geliştirilmesi: Pilot Çalışma

**ÖZET**

Bu pilot çalışmanın amacı, Veritabanı Yönetim Sistemleri dersinin, Uludağ Üniversitesi Eğitim Fakültesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü'ndeki öğrencilerin öğrenme stillerine göre yeniden yapılandırılmasını sağlamak ve öğrencilerin ders başarılarını arttırmaktır. Öğrencilerin öğrenme stillerini analiz etmek için Felder-Soloman Öğrenme Stilleri Envanteri kullanılmıştır. Çalışmanın verileri 2009 bahar yarıyılında bu dersi alan öğrenciler üzerinden toplanmıştır. Araştırmanın sonunda, katılımcıların çoğunun görsel, aktif ve hissederek öğrenme stillerine daha yatkın oldukları sonucuna ulaşılmıştır. Ulaşılan bir diğer sonuç ise katılımcıların sıralı-bütünsel öğrenme alt boyutunda dengeli bir dağılıma sahip olmalarıdır. Öğrenme stilleri ile öğrencilerin başarıları arasındaki ilişkiye bakılmış ve anlamlı bir bağlantı bulunamamıştır. Bu da

---

* The preliminary findings of this study were discussed at a presentation in International Computer and Instructional Technologies Conference 2010 in Konya, Turkey

[1] Ph.D., Uludag Univ., Faculty of Education, The Department of Computer Education and Instructional Technology, auzun@uludag.edu.tr

[2] Assistant Professor, Uludag University, Faculty of Education, The Department of Computer Education and Instructional Technology, semiral@uludag.edu.tr

gelecekte yapılması planlanan çalışma için uygun bir başlangıç oluşturmaktadır. Araştırmada elde edilen bulgular sonucunda, dersin işleniş biçimi ve kullanılacak olan öğrenme materyalleri ile ilgili bir takım stratejik kararlar alınmıştır. İleride işlenecek olan aynı ders için, öğrencilerin öğrenme stillerine uygun farklı türden materyallerin geliştirilip, bunların karma öğrenme yöntemine uygun bir ortamda sunulmasına karar verilmiştir.

**ANAHTAR KELİMELER:** Öğrenme Stilleri, Öğretme Stilleri, Karma Öğrenme Ortamları, Veritabanı ,Yönetim Sistemleri

## INTRODUCTION

Technological improvements especially in Internet technologies offer great abilities to educators in order to support their teaching activities. In addition, educators don't need to be technology specialists to use instructional technologies effectively in their classrooms. There is a potential to enhance traditional teaching-learning activities by using a Learning Management System (LMS) and various other software tools.

Supporting traditional teaching-learning activities with web based instructional technologies is called blended learning in the literature. There are numerous definitions about blended learning. As a common definition, blended learning is a combination of face to face (FTF) and online learning to reach most effective teaching environment (Bourne, Harris and Mayadas, 2005; Marsh, McFadden and Price, 2003). Blended learning encompasses advantages of both FTF and online learning and is sometimes called as "Best of both worlds" (Young, 2002).

There are several research studies reporting advantages of blended learning. One of the most important benefits of blended learning is better support for different types of learners. Since students have flexible time outside the classroom meetings, it is possible to prepare and offer different learning materials and activities to different type of learners in blended learning environments. Therefore, blended instruction has a positive effect on individual differences of learners (Ayala, 2009; Doo Hun & Morris 2009; Osguthorpe and Graham, 2003; Vaughan, 2007).

Many researchers argue that customizing learning materials and learning modules according to different types of learners improves learning outcomes (Arslan & Babadoğan, 2005; Cengizhan, 2007; Chuang & Tsai, 2005; Liegle & Janicki, 2006; Yazıcı, 2005). Graf, Kinshuk & Liu (2009) summarize the advantages of knowing students' learning styles in order to enhance learning and teaching. They state that teachers have a deeper understanding in the preparation of learning materials that best suit the students' needs. Moreover, students can be aware of themselves knowing their strengths and weaknesses. Furthermore, students can be supported more effectively if they have any difficulties while learning.

In the light of the information given above, this study aims to reorganize a database management systems course to better serve learners' individual differences focusing on their learning styles. Database management systems course is one of the newly added courses in CEIT curriculum in Turkey, so an instructional design for that course emerged as a recent need in the department. Students' individual differences are an important factor to consider in designing the instruction for a constructivist, blended learning environment (Doo Hun & Morris, 2009) so this study holds a special value for the success of the course. This study is a pilot study and a further study will be conducted in the upcoming academic year based on the information gathered. At least two course tracks will be created effective for the students to follow. These tracks will be related to learning environment and materials created for the students and will aim to best suit their learning styles.

**What is a Learning Style?**

There are numerous definitions about learning styles in the literature. These definitions vary depending on the perspective of the researchers. Grasha and Riechmann (1974) measure learning styles as personal qualities that influence a student's ability to acquire information, to interact with peers and the teacher, and to participate in learning experiences. According to Kolb (1985), learning style is a reflection of how thought is processed. James and Gardner (1995) suggest that the ways individual learners react to the overall learning environment make up the individual's learning style. In general, researchers use the term "learning style" to classify the ways that people prefer while learning.

Felder and Silverman's Models of Learning Style is one of the widely used models in the literature. Felder and Silverman (1988) define the learning style as the way a person receive and process the information. This model is a bit different than many other models because the other models classify the learners as belonging to one of the groups given in respective models. On the other hand, Felder and Silverman Learning Style Model describes learning style in more detail, focusing on the preferences of learners on four dichotomous dimensions. Learners are not exact members of a learning style in the model. For instance, a learner with strong preference on active learning style can be thought as having weak preference on reflective learning style and that learner can act sometimes differently according to this model. Therefore, this model is more flexible than most other models (Graf, Liu, Kinshuk, Chen & Yang, 2009).

According to Felder and Silverman's Models of Learning Style, students' learning styles are represented in four sub dimensions in a dichotomous format, namely active-reflective, sensory-intuitive, visual-auditory and sequential-global.

Sensory type learners like to learn facts and study on concrete materials. They are more patient with details, more practical than intuitive learners and they tend to relate the learning material to the real world. Intuitive learners prefer to learn

theories and study on underlying meanings of those theories. They like abstract learning materials. They are more innovative and more creative than the sensory type learners.

Active learners like to work with the learning materials actively. They prefer application and they want to discover something by trying. They like to communicate and discuss with the peers so they like group working. Reflective learners like to work alone and they prefer to think about the material theoretically.

Visual learners remembers best what they see, auditory learners remembers best what they hear. Visual learners prefer pictures, diagrams and flow charts, auditory learners prefer written and spoken materials. Auditory learners prefer discussions and verbal explanations.

Sequential learners follow linear reasoning processes while learning and solving problems. Global learners want to see the big picture first and then the steps. Sequential learners learn the materials in small incremental steps. Global learners learn the materials in large leaps. They tend to absorb the learning material randomly without seeing the connections. After they learn enough the material, they suddenly get the big picture.

**The Relationship between Learning Styles and Student Achievement**

Charkins, O'Toole, and Wetzel (1985) states that teaching students according to their preferred learning styles affects their learning. Many studies show a linkage between students' learning styles and their academic performance if the students are taught in line with their learning styles. The following studies are a summary of the findings from the literature in this perspective.

Mitchell (2000) conducted a study on teaching, customized towards teaching of women in a web-based distance education course. Subjects who were taught according to their learning styles performed better in comparison to subjects that were not taught to their learning styles. Not only the subjects' achievement scores improved but also they had more positive attitudes if they were taught with care to their learning styles.

Brown (2003) differentiates between adult learners and young learners. In light of Miller (2001) and Stitt-Gohdes (2003), Brown indicates that learning styles are a determinant of motivation and achievement for young learners – that are highschool and below. But then, she also reports that styles may not be as good a determinant for the adult learners (Spoon & Schell, 1998).

Young, Klemz and Murphy (2003) conducted a study that suggests use of learning styles to improve student behaviors. They claim that good behaviors, in turn, are an indication for students' better grades. Their study showed that

teaching according to students' preferred teaching method (which is another way of observing learning styles) improved three different learning outcomes, namely learning performance, pedagogical affect, and course grade.

Many other studies investigate similar concepts. Examples of these include Scribner and Anderson (2005), Ester (1994), Lenehan, Dunn, Ingham, and Signer (1994), Nelson et al. (1993), Booth and Kamal (1993), Mickler and Zippert (1987), and Domino (1971).

**Studies Conducted in Turkey on the Relationship between Learning Styles and Achievement**

Because this study was conducted in Turkey, the literature on learning styles was also sought to cover the Turkish context. There are many studies that were conducted to investigate the relationship between learning styles and student achievement. For example, in one of the latest studies, Alşan (2009) used Grasha-Riechmann Learning Style Inventory on freshmen undergraduate students taking the introductory chemistry class to identify their learning preferences. The results showed that avoidant students were less successful in comparison to students who were dependent or independent competitive learners. Alşan states that independent learners enjoy working alone and thinking about their own work, they like having many options when studying. Although the laboratories (through which the chemistry course is primarily offered) do not offer any special conditions for the competitive students, it practically meets the independent learners' expectations. This was the logic behind the judgment of the student success.

Grasha-Riechmann Learning Style Inventory was used in another recent study on success in chemistry class again (Tüysüz, & Tatar, 2008). Student attitudes towards chemistry were also surveyed. Students in general had high competitive and collaborative learning styles, and low avoidant, participant, dependent and independent learning styles. Independent and participant learning styles positively correlated with student attitudes towards chemistry whereas avoidant learning style had a negative correlation. Moreover, collaborative and participant learning styles were positively correlated with student achievement whereas avoidant learning style was negatively correlated. These results mean that participant and avoidant learning styles have the relatively higher impact in terms of total effect on students because both have implications for attitude and achievement.

Gencel (2008) used Kolb's Learning Styles Inventory III to test the possible connections with 7$^{th}$ grade students' attitudes, retention, and achievement. She manipulated an instructional lesson to teach according to the preferences of learners, which were identified through the learning style survey. Based on the results, experiential learning, which was designed and tested in an experimental setting based on the learning styles, affected students' attitudes, retention and achievement in a

positive way. The learning styles however were not effective in determining a difference in achievement.

Kolb's Learning Styles Inventory was tested on undergraduate students enrolled in various departments and faculties, as well. Kılıç and Karadeniz (2004) surveyed 67 students from Ankara University on learning styles, navigation strategies, gender, and achievement. Similar to the study on elementary school students reported above, the learning styles laid no significant difference on student achievement, nor did they on navigation strategies. Kolb's inventory categorizes styles based on a learning theory concentrating on observations and reflections in the learning environment. He consequently divides the styles into four categories of diverging, assimilating, converging, and accommodating. It is interesting that both studies – shown in this paragraph and in the previous paragraph – imply that Kolb's inventory fail to classify learners according to their learning performance.

Peker's (2005) study concentrated on undergraduate mathematics students' performances in relation to learning styles. His approach to achievement was different than the studies that have been presented in this paper so far – one that is after the fact. He identified students learning styles and compared students from different styles according to their past exam scores. The exam he used was called ÖSS, which is a standardized test conducted nationwide and used to admit students to university. He determined based on the results that certain types of learners had higher achievement scores.

This study utilizes Felder-Soloman's Index of Learning Styles. There are many studies in Turkey based on this index or using this index such as Ekici (2008), Ekici (2009), Bulut Özek, Akpolat, & Orhan (2010). They investiga various aspects of educational context but few have focused on the effect of Felder Soloman's Index of Learning Styles on student achievement. As shown above there are significant linkages between diverce traits of learning styles and students' academic success. All in all, it can be said that courses can be improved based on the characteristics of learners in terms of their learning styles. Therefore, teaching strategies should be geared towards those styles. The following section gives a glimpse towards how to link those two concepts.

**Matching Teaching and Learning Styles**

As the purpose of the study is to provide a base for teaching according to student preferences, it would be useful to examine the ways to link those two concepts. Beck, (2001), for example, illustrates how these concepts can possibly be linked and how those correspond to learners' physical brain lobes (hemispheres). Table 1 is a synthesis of Beck's review.

Table 1. *Comparison of Learning Style Inventories based on Matching Teaching Strategies*

| | **4MAT System (McCarthy, 1987)** | **Dunn's Learning Style Inventory (Dunn & Dunn, 1992a, 1992b)** | **Beck's Taxonomy of Teaching Strategies (Beck, 2001)** | |
|---|---|---|---|---|
| ***Right Hemisphere*** | *Imaginative* Type Characteristics: Visual processing doing and reflecting discussing and creating wholistic understanding<br><br>*Dynamic* Type Characteristics: sensory processing generate new ideas divergent interaction flexibility and change | *Environmental* Design Element: flexible<br><br>*Emotional* Structure Element: prefers to create new structures<br><br>*Sociological* Pair and Team Elements: seeks group interaction<br><br>*Physical* Perceptual Elements: tends to be visual and kinesthetic<br><br>*Psychological* Analytic Element: left mode Reflective Element: prefers details and sequencing | *Deliberative* emphasis on an exchange of ideas and opinions<br><br>*Performative* emphasis on creative and aesthetic expression<br><br>*Associative* emphasis on task oriented group interaction | (discussion strategies, such as round table, magic circle, fish bowl, and brainstorming)<br><br>(entertaining and creative strategies, such as dramatic and fine arts, gaming and simulations)<br><br>(grouping strategies, such as interest and ability groups and cooperative learning) |
| | | | *Interrogative** emphasis on divergent and open-ended questions<br><br>*Technological** emphasis on creative and imaginative processing | (value-laden questions)<br><br>(creative software) |
| ***Left Hemisphere*** | *Analytic* Type Characteristics: sequential thinking ideas, facts, and details | *Environmental* Design Element: established<br><br>*Emotional* Structure Element: prefers an imposed | *Interrogative** emphasis on convergent and factual questions<br><br>*Technological** | (questions designed to evaluate basic skills) |

| | | | |
|---|---|---|---|
| verbal processing<br>listen and reflect<br>focus on verbal skills<br><br>*Common Sense*<br>Type Characteristics: solving problems logical processing skills oriented convergent thinking experimental testing | structure<br><br>*Sociological*<br>Self/Authority Elements: seeks routines and independence<br><br>*Physical*<br>Perceptual Elements: tends to be verbal and auditory<br><br>*Psychological*<br>Analytic Element: left mode Reflective Element: prefers details and sequencing | emphasis on factual and detailed information<br><br>*Expositive*<br>emphasis on structure and verbal processing<br><br>*Investigative*<br>emphasis on inductive and sequential processing<br><br>*Individualistic*<br>emphasis on mastery and self-paced processing | (Internet searches for factual information)<br><br>(explanatory strategies, such as lectures, readings, oral or written reports)<br><br>(inductive and systematic strategies, inquiry and experimenting)<br><br>(personalized strategies, such as independent study, mastery and programmed learning) |

Table synthesized from Beck (2001).
* Interrogative and Technological techniques are applicable for both of the hemispheres.

In his study, Beck claims that he "designed a taxonomy of teaching strategies to provide a uniform and comprehensive structure" (p. 2) after examining several different educational textbooks. He grouped his findings under 8 categories as listed in Table 1, under the column of Taxonomy of Teaching Strategies.

After creating the taxonomy, he matched those instructional methods with the learning style inventories developed by McCarthy (1987), and Dunn and Dunn (1992a, 1992b). In his article, Beck provided justifications for how the styles can be associated with the two hemispheres of the brain. Based on McCarthy's (1987) 4MAT System, he claims that "students have major learning styles and hemispheric processing preferences … [and] instruction and learning improve when teachers use multiple teaching strategies in a systematic framework to address these preferences" (p. 4). Based on these premises, he categorized the learning styles and the teaching strategies through their correspondence to the spheres as labeled on the first column of Table 1. The second and the third columns of the table list the learning styles given in McCarthy (1987), and Dunn and Dunn (1992a, 1992b). Short descriptions of those styles are also quoted from Beck (2001).

As stated previously, the column called the Taxonomy of Teaching Strategies lists Beck's instructional methods. Short descriptions of the methods are provided underneath each style and examples are given on the last column. Deliberative, performative, and associative techniques were associated with the right hemisphere. Expositive, investigative, and individualistic techniques were associated with the left hemisphere. Additionally, the interrogative and technological techniques were considered to be applicable to the styles of both hemispheres with certain inclinations. For example, one of the *technological* techniques suggested for the right hemisphere is utilizing creative software to emphasize creative and imaginative processing of information; whereas the one suggested for the left hemisphere is to engage students in Internet searches for finding factual information.

In short, teaching can be geared toward the learning styles of students. Beck's (2001) work is one of the most comprehensive models to match the styles and instructional techniques, but it is out of the scope of this paper to explain all details of the model. The respective articles can be referred for more information.

Another model having the same purpose is the model of Felder and Silverman (1988). The following section discusses this model and how it facilitates the current study.

**Teaching to the Learning Styles**

Like a learning style model classifies students' inclinations in which they receive and process information, a teaching style model classifies instructional methods appropriate for the corresponding learning styles.

Felder and Silverman's Models of Learning and Teaching Styles are exemplary models (Table 2). While pairing up the models, they match four dimensions, called sub-dimensions, information receiving process and teaching component. It has been seen so far that there are four main learning styles in their model. The sensory-intuitive learning style is related to students' perception of information. Sensory-type students like facts and intuitive students like theories. Therefore concrete contents are suitable for sensory students, whereas abstract contents are suitable for intuitive learners. A teaching method targeting sensory-intuitive students must concentrate on the content area of instruction.

Table 2. *Felder and Silverman's (1988) Models of Learning and Teaching Styles*

| **Preferred Learning Style** | | **Corresponding Teaching Style** | |
|---|---|---|---|
| **Sub Dimensions** | **Information Receiving Process** | **Sub Dimensions** | **Teaching Components** |
| Sensory-Intuitive | Perception | Concrete-Abstract | Content |
| Visual-Auditory | Input | Visual-Verbal | Presentation |

| | | | |
|---|---|---|---|
| Active-Reflective | Processing | Active-Passive | Participation |
| Sequential-Global | Understanding | Sequential-Global | Perspective |

The visual-auditory learning style considers how the learner keys in (inputs) information. Visual students like pictures, diagrams, videos and so forth, while auditory students like words and sounds. This prescribes that teaching targeting this type of students should focus on the presentation of information. Consequently, visual presentation techniques should be stressed for visual learners and verbal presentation techniques should be stressed for auditory learners.

The active-reflective learning style is about processing of information. Active learners prefer to be engaged in physical activities. On the other hand, reflective learners prefer examining information introspectively. It appears that teaching that seeks to satisfy active or reflective students should put more emphasis on the participation dimension of instruction. Instructional strategies that stimulate active participation would be required for the active learners. For the reflective learners, though, designers should provide more opportunities for students to make oral presentation while designing instruction.

The last style, sequential-global, is related to how students understand information. What matters to instruction pursuing these learners is the perspective in which the information is seen. Most traditional lessons serve best to the sequential learners as they prefer step by step progression. Instructions from simple to complex will do fine for those learners. For global learners, however, instruction should be out of the ordinary, introducing the big picture before minimally progressing to the end. In fact, many instructors are already leaning to this trend, which is getting popular in the name of constructivist theory and principles.

## METHODOLOGY

The study was conducted during the spring semester of 2009-2010 academic year. All of the students taking database management systems course in Spring 2009 participated in this study. There were a total of 88 students from Uludag University, Faculty of Education, the Department of CEIT.

### *Instrument*

In order to determine the learning styles of the students enrolling in the course, Index of Learning Styles (ILS) developed by Felder and Soloman (1994) was used as an instrument. ILS is an instrument consisting of 44 questions in order to analyze learning preferences of students on the four dimensions of Felder-Silverman (1988) learning style model. These dimensions are active-reflective, sensory-intuitive, visual-auditory and sequential-global. ILS has 11 questions for

each of these dimensions and answers to these questions are in a dichotomous format. In other words, each answer is either the statement "a" or "b". In order to calculate a score for a dimension, the number of "a"s and "b"s are counted and the smaller number is subtracted from the larger number. After this calculation the results range from 1 to 11 (Only odd numbers). The higher the number means the stronger the learning preference. For instance 11 "a"s represent a very strong preference for the active learning style, 11 "b"s indicate a very strong preference for the reflective learning style. Table 3 shows learning style preference levels corresponding to the calculation values.

Table 3. *Learning Style Preference Levels Corresponding to the Calculation Values for ILS*

| a-b (if a>b) | | | | b-a (if b>a) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ⇐ | | | | | | | | | | | ⇒ |
| 11 | 9 | 7 | 5 | 3 | 1 | 1 | 3 | 5 | 7 | 9 | 11 |
| Strong | | Moderate | | Balanced | | | | Moderate | | Strong | |

ILS was translated into Turkish by Keskin Samancı & Özer Keskin (2007). The alpha reliability coefficient of ILS was calculated as .70 for the whole index. The alpha reliability coefficient of sub dimensions was found as .43 for active-reflective, .54 for sensory intuitive, 0.59 for visual-auditory and .32 for sequential-global sub dimensions.

Student achievement scores were also obtained to look for any potential linkage to the learning styles of the participants. The scores a participant could take would range from 0 to 100. The minimum score in the classroom was 50 and the maximum score was 100. The mean achievement score was about 74.

### *Data Analysis*

Simple descriptive statistics were utilized to find out about the learning styles of the students. Frequencies were reported based on the data gathered from participants. Following that, correlation and regression analyses were conducted to explore the potential relationships among the variables of the study.

## RESULTS and FINDINGS

In order to analyze students' learning styles, distribution of the students' ILS scores for each sub dimension was examined by frequency analysis. Frequencies of the students can be seen for active-reflective dimension of the ILS in Figure 1, for sensory-intuitive dimension in Figure 2, for visual-auditory dimension Figure 3 and for sequential-global dimension in Figure 4.

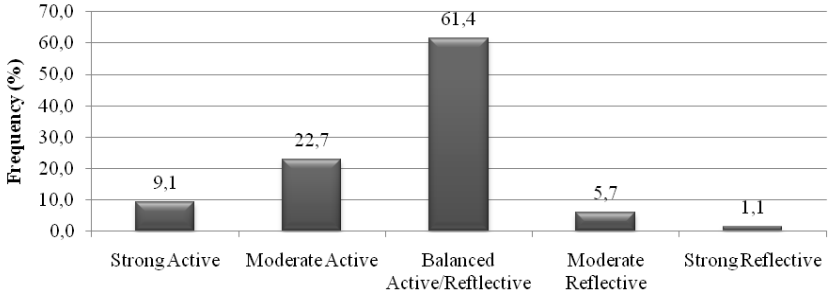


*Figure 1.* Frequencies of Students' Scores on Active-Reflective Dimensions of the ILS

As seen in Figure 1, most of the participants were well balanced on active-reflective dimension of ILS. There were a few students having moderate and strong preference on active learning style and very few students having moderate and strong reflective learning style.

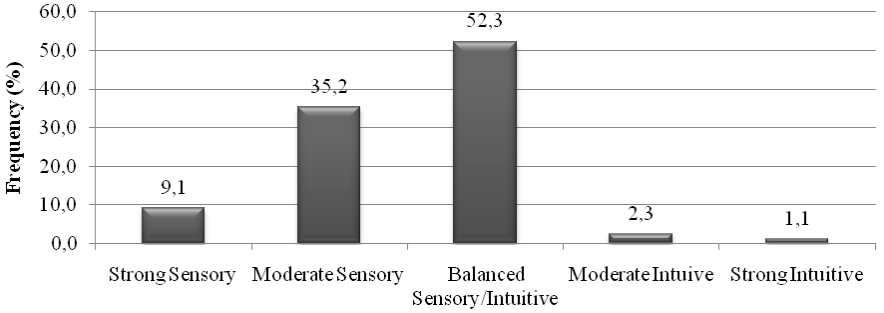


*Figure 2.* Frequencies of Students' Scores on Sensory-Intuitive Dimensions of the ILS

Figure 2 indicates that very few participants were intuitive style learners. Over 50% of participants were balanced on sensory-intuitive dimension and over 40% are sensory students. In other words, sensory students were dominant in participants.

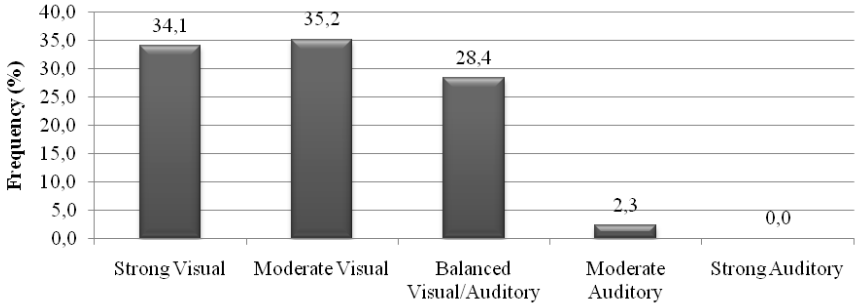


*Figure 3.* Frequencies of Students' Scores on Visual-Auditory Dimensions of the ILS

According to Figure 3, most of the participants had moderate and strong preference on visual learning style. This dimension appears to be the most unbalanced figure among the dimensions.

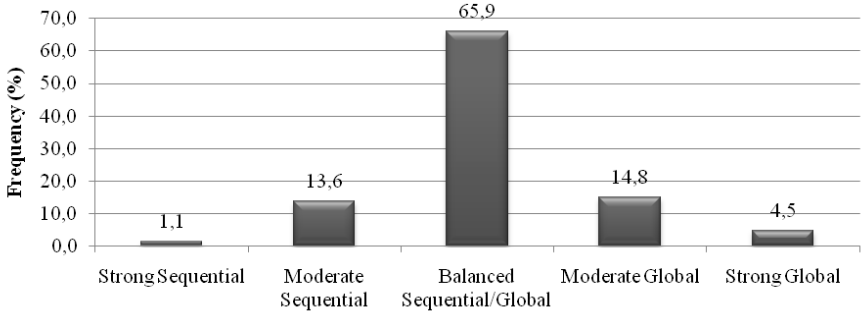


*Figure 4.* Frequencies of Students' Scores on Sequential-Global Dimensions of the ILS

As seen in Figure 4, participants didn't have a strong preference on sequential-global dimension of ILS. In other words, most of them were well balanced on that dimension and it can be said that this dimension was the most balanced among the other dimensions.

In Table 4, whether there is a relationship between the learning styles and student achievement. Such a relationship could potentially associate a certain style with a better success. It was found that no significant relationship exists between the styles and success (R=.289, ANOVA: F=1.894, df=4, p>.05). Because teaching strategies were not purposefully manipulated, such a finding is an expected and a worthy one. The basis for this finding is speculated in the discussion section.

Table 4. *Predicting Student Achievement from Student Learning Styles: Regression Analysis Coefficients*

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|
| **Model** | **B** | **Std. Error** | **Beta** | **t** | **Sig.** |
| (Constant) | 78.37 | 5.15 | | 15.23 | .00 |
| Active | 2.74 | 1.34 | .23 | 2.04 | .04 |
| Sensory | -2.05 | 1.49 | -.17 | -1.37 | .17 |
| Visual | -1.69 | 1.14 | -.16 | -1.48 | .14 |
| Sequential | -1.02 | 1.54 | -.08 | -.67 | .51 |

In previous sections, it was found that students tended to favor active, sensory and visual learning. These three styles of the students were further analyzed to compare and categorize, and therefore to better understand the student profiles. The following correlation table seeks to identify such relationships.

Table 5. *Correlation Analysis Results Showing the Relationship Between the Learning Styles (N=88)*

| | | **Active** | **Sensory** | **Visual** |
|---|---|---|---|---|
| **Active** | Pearson | 1.00 | .32* | .15 |
| | Sig. (2-tailed) | | .01 | .16 |
| **Sensory** | Pearson | .32* | 1.00 | .03 |
| | Sig. (2-tailed) | .01 | | .80 |
| **Visual** | Pearson | .15 | .03 | 1.00 |
| | Sig. (2-tailed) | .16 | .80 | |

*Shows significant correlations at the 0.01 level (2-tailed).

As the correlation table shows a slight association between active and sensory categories, a further analysis was conducted to show how one of these styles can be predicted from the other. A regression analysis was run and the following results were obtained (Table 6). The dependent variable was chosen as the active learning style. The results show that students who identified themselves as active learners could significantly be predicted ($R = .319$, $R^2 = .102$, ANOVA: $F=9.715$, $df=1$, $p<.01$) from the students who call themselves as sensory learners (an expected result considering the correlation results). This result also shows that 10% of the population's active learning style can be predicted from the sensory learning style in over a 99% confidence interval.

Table 6. *Predicting Active Learning Style from Sensory Learning Style: Regression Analysis Coefficients*

| | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|
| **Model** | **B** | **Std. Error** | **Beta** | **t** | **Sig.** |
| (Constant) | 1.84 | .28 | | 6.65 | .00 |
| Sensory | .33 | .11 | .32 | 3.12 | .01 |

Dependent Variable: Active

## DISCUSSION

The aim of this study is to analyze the learning styles of the students and therefore to help improve the performance of the future Database Management Systems Course in the department of CEIT at Uludag University. In essence, students' learning styles were investigated by using ILS developed by Felder and Soloman (1994) in order to reorganize an instructional design to better serve learners' individual preferences and differences. When the literature is reviewed it can be seen that there is a considerable interest among researchers for identifying students' learning styles to improve learning activities. From the findings of this study, the following conclusions can be drawn according to participants' learning preferences with regard to dimensions of ILS.

1. Participants were mostly balanced on active-reflective dimension of ILS but there were more active students than reflective students.

2. Participants were mostly balanced on sensory-intuitive dimension of ILS but there were also sensory students in that group.

3. Participants were strongly visual style learners in general with regard to their scores on visual-auditory dimension of ILS.

4. Participants were well balanced on sequential-global dimension of ILS. There were also a few sequential and a few global style learners in that group.

As the results showed that there was no significant relationship between the student achievement scores and the learning style scores and that the course instructor did not specifically teach according to any of the styles, it can be said that students' learning styles are randomly distributed in terms of achievement. It can also be said that (whether intentionally or not) the course was taught with equal care to the student learning styles and so a balanced result was obtained. Such a finding is an expected and a worthy one because the researchers of this study plan to teach a further, modified course to examine a potential relationship. In that course, the researchers plan to purposefully manipulate the instructional methods according to the learning styles. Because there is no relationship in regular – that is not manipulated – conditions, any change in student achievement may more confidently be attributed to the teaching methods.

Some of the learning styles were slightly correlated with the other styles. This link was sought for the three styles that were identified to have unbalanced number of students. According to those associations, it can be said that students in the active and the sensory learning style groups show coherence. This coherence can also be referred from the definitions of the corresponding styles. For example, students that are inclined to have the active learning style tend to prefer conducting experiments and working in groups. Students that are inclined to have the sensory learning style tend to prefer hands on studies and more so to concretize what they study. The similarity in the distribution of students to these two learning styles may therefore be explained with the similarity that is discussed above.

A further analysis on the similarity of the mentioned two styles enabled us to predict one of them from the other. For about 10 percent of the population a prediction on the active learning style can be made from the sensory learning style scores. An opposite prediction can also be prescribed if the nature of regression is considered. The consequences of this relationship were discussed above. Other than that, it can be said that if this connection had been significantly stronger, it would not be any meaningful to include both styles in the prediction of the student achievement scores because one of the underlying assumptions in regression is that the independent variables are truly independent of each other. As the connection is weak, this risk is reduced. Nonetheless, if any attribution is made to the student achievement scores as a result of student learning styles, the impact of the sensory learning style on achievement may be as high as the impact of the active learning style.

According to the results concluded above, some strategic decisions were taken about Database Management System Course. These decisions were related to the learning medium and the learning materials, which are specified as follows:

1. Blended learning was selected as a learning medium of the prospective course because in traditional learning activities, it is very hard and time consuming to perform the activities that are suitable for all kinds of learners. Blended learning provides better support for different learning styles (Ayala, 2009; Osguthorpe and Graham, 2003) since instructors can use variety of instructional methods and students can control the pace of their learning (Vaughan, 2007). The students do this by selecting the materials and managing their own time. Moodle was chosen as the prospective LMS because Moodle is a free and open source content management system that was developed in light of the social constructivist mindset.

2. Since the participants of this study were learners with different styles, the envisioned blended learning environment is intended to address all learner needs (as time, resources, and energy of the instructor and the instructional designers

allow). Learning materials and activities should better support individual learning styles.

3. Participants were balanced on active-reflective dimensions but there were more active students than reflective students. The active learners prefer learning by doing, interacting with the learning materials and they like discussing what they do with others, while the reflective learners prefer thinking about what they do and they like working alone (Felder & Silverman, 1988). Therefore it was decided that self-paced learning materials and assignments would be suitable for the reflective learners, and incorporating discussion forums would be suitable for the active learners in blended learning environment.

4. There were very few intuitive learners among the participants; most of them were balanced, moderate and strong sensory learners. Sensory learners prefer to learn facts, and they like courses having connection to the real world. They are good on memorizing facts and doing hands-on work (Felder & Silverman, 1988). These suggest designing the Database Management System Course directly related to the real world problems by assigning the students select projects applicable to real situations which they may encounter after they graduate. Additionally, there shall be hands-on laboratory activities in instruction.

5. According to the results of the study, the visual style learners were dominant among the participants. Visual learners think they remember best what they see. They prefer pictures, diagrams, demonstrations and videos (Felder & Silverman, 1988). Consequently, the prospective blended learning environment was decided to contain visual learning objects such as animated screen captures, illustrations and graphics.

6. Participants were mostly balanced on sequential-global dimensions. Sequential learners prefer to follow linear and logical steps while learning. Global learners want to see the big picture first so they can absorb the concepts randomly without seeing the connections between linear steps. Moodle provides a learning environment, which is naturally suitable for global learners because students can jump from one material to the other freely. It was decided to prepare learning materials which sequential learners can follow in a linear fashion and with logically connected steps, but this intervention will be put as the last item of the to do list because this style scale show a balanced student distribution.

A future study, which is going to be designed according to the strategic decisions taken in this study is planned to explore the effectiveness of the blended learning environment in this setting. Students' course achievement levels and their opinions about the learning environment will be examined in light of their learning styles. An improved achievement score and high course satisfaction is expected as the outcome of the forthcoming study.

## REFERENCES


Alşan, E. U. (2009). Temel kimya laboratuarı dersinde öğretmen adaylarının başarılarına öğrenme stili tercihlerinin etkisi. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi (EFMED), 3*(1), 117-133.

Arslan, B., & Babadoğan, C. (2005). İlkögretim 7. ve 8. Sınıf Ögrencilerinin Ögrenme Stillerinin Akademik Başarı Düzeyi, Cinsiyet ve Yas ile İlişkisi. *Eurasian Journal of Educational Research* , 35-48.

Ayala, J. (2009). Blended Learning as a New Approach to Social Work Education. *Journal of Social Work Education, 45*(2), 277-288. Retrieved from Academic Search Complete database.

Beck, C. R. (2001). Matching teaching strategies to learning style preferences. *Teacher Educator, 37*(1), 1-15.

Booth, B. F., & Kamal, F. (1993). Matching teaching strategies with learning styles in an undergraduate sport history course. / (Le raccordement de strategies d'enseignement avec les methodes dans un seminaire d'histoire sportive chez des etudiants du debut des etudes.). *International journal of physical education (Schorndorf), 30*(3), 29-37.

Bourne, J., Harris, D., & Mayadas, F. (2005). Online Engineering Education: Learning Anywhere, Anytime. *Journal of Engineering Education* , 131-146.

Brown, B. L. (2003). *Teaching style vs. learning style. Myths and realities* (ERIC Clearinghouse on Adult, Career, and Vocational Education No. 26). Ohio: Center on Education and Training for Employment

Bulut Özek, M., Akpolat, Z. H., & Orhan, A. (2010). Web Tabanlı Akıllı Öğretim Sistemlerinde Tip-2 Bulanık Mantık Kullanarak Öğrenci Öğrenme Stili Modelleme. *Fırat Üniv. Mühendislik Bilimleri Dergisi, 22*(1), 37-44.

Cengizhan, S. (2007). Proje Temelli ve Bilgisayar Destekli Öğretim Tasarımlarının; Bağımlı, Bağımsız ve İşbirlikli Öğrenim Stillerine Sahip Öğrencilerin Akademik Başarılarına ve Öğrenme Kalıcılığına Etkisi. *Türk Eğitim Bilimleri Dergisi , 5* (3), 377-401.

Charkins, R. J., O'Toole, D. M., & Wetzel, J. N. (1985). Linking teacher and student learning styles with student achievement and attitudes. *Journal of Economic Education, 16*(2), 111-120.

Chuang, S. C., & Tsai, C. C. (2005). Preferences toward the constructivist Internet-based learning environments among high school students in Taiwan. *Computers in Human Behavior* (21), 255-272.

Domino, G. (1971). Interactive effects of achievement orientation and teaching style on academic achievement. *Journal of Educational Psychology, 62*(5), 427-431.

Doo Hun, L., & Morris, M. (2009). Learner and Instructional Factors Influencing Learning Outcomes within a Blended Learning Environment. *Journal of Educational Technology & Society, 12*(4), 282-293. Retrieved from Academic Search Complete database.

Dunn, R., & Dunn, K. (1992a). *Teaching elementary students through their individual learnings tyles: Practical approaches for grades 3-6* Needham Heights, MA: Allyn & Bacon.

Dunn, R., & Dunn, K. (1992b). *Teaching secondary students through their individual learnings tyles: Practical approaches for grades 7-12* Needham Heights, MA: Allyn & Bacon.

Ekici, G. (2008). Öğretmen Adaylarının Öğretmenlik Meslek Bilgisi Derslerine Yönelik Tutumları ile Öğrenme Biçimlerinin Belirlenmesi. *Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi, 5*(1), 111-132.

Ekici, G. (2009). Meslek Lisesi Öğretmenlerinin Öğretim Biçimleri. *Eğitim ve Bilim, 34*(151), 104-116.

Ester, D. P. (1994). CAI, lecture, and student learning style: The different effects of instructional method. *Journal of Research on Computing in Education, 27*(2), 129.

Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. *Journal of Engineering Education , 78* (7), 674-681.

Felder, R.M. & Soloman, B.A. (1994). Index of Learning Styles. Retrieved August 10, 2009, from http://www.engr.ncsu.edu/learningstyles/ilsweb.html

Gencel, İ. E. (2008). The effect of instruction based on Kolb's experiential learning theory on attitude, achievement and retention in social studies. *Elementary Education Online, 7*(2), 401-420.

Graf, S., Kinshuk, & Liu, T.-C. (2009). Supporting Teachers in Identifying Students' Learning Styles in Learning Management Systems: An Automatic Student Modelling Approach. *Educational Technology & Society, 12* (4), 3–14.

Graf, S., Liu, T.-C, Kinshuk, Chen, N.S, & Yang, S.J.H. (2009). Learning styles and cognitive traits – Their relationship and its benefits in web-based educational systems. *Computers in Human Behavior, 25*, 1280–1289.

Grasha, A. F., & Riechmann, S. W. (1974). A Rational Approach to Developing and Assessing the Construct Validity of a Student Learning Style Scales Instrument. *The Journal of Psychology , 87*, 213-223.

James, W. B., & Gardner, D. L. (1995). Learning Styles: Implications for Distance Learning. *New Directions for Adult and Continuing Education* (67), 19-32.

Keskin Samancı, N., & Özer Keskin, M. (2007). Felder ve Soloman öğrenme stili endeksi: Türkçeye uyarlanması ve geçerlik-güvenirlik çalışması. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi , 8* (2), 37-54.Kolb, D. (1985). *Learning Style Inventory*. Boston, MA: McBer and Co.

Kılıç, E., & Karadeniz, Ş. (2004). Cinsiyet ve öğrenme stilinin gezinme stratejisi ve başarıya etkisi. *Gazi Eğitim Fakültesi Dergisi, 24*(3), 129-146.

Lenehan, M., Dunn, R., Ingham, J., & Signer, B. (1994). Effects of learning-style intervention on college students' achievement, anxiety, anger and curiosity. *Journal of College Student Development, 35*(6), 461-466.

Liegle, J. O., & Janicki, T. N. (2006). The Effect of Learning Styles on The Navigation Needs of Web-based Learners. *Computers in Human Behavior* , 885-898.

Marsh, G. E., McFadden, A. C., & Price, B. (2003). Blended Instruction: Adapting Conventional Instruction for Large Classes. *Online Journal of Distance Learning Administration , 6* (4).

McCarthy, B. (1987). *The 4MAT system: Teaching to learning styles with right/left mode techniques*. Barrington, IL: Excel Inc.

Mickler, M. L., & Zippert, C. P. (1987). Teaching strategies based on learning styles of adult students. *Community/Junior College Quarterly of Research and Practice, 11*(1), 33-37.

Miller, P. (2001). *Learning styles: The multimedia of the mind. Research Report (ED 451 140)*

Mitchell, J. L. (2000). The Effect of Matching Teaching Style with Learning Style on Achievement and Attitudes for Women in a Web-based Distance Education Course. *DAI-A, 61*(04), 1370-1370.

Nelson, B., Dunn, R., Griggs, S. A., Primavera, L., Fitzpatrick, M., Bacilious, Z., et al. (1993). Effects of Learning Style Intervention on College-Students Retention and Achievement. *Journal of College Student Development, 34*(5), 364-369.

Osguthorpe, T. R., & Graham, R. C. (2003). Blended learning environments. *Quarterly Review of Distance Education, 4* (3), 227–233.

Peker, M. (2005). İlköğretim matematik öğretmenliğini kazanan öğrencilerin öğrenme stilleri ve matematik başarısı arasındaki ilişki. *Eğitim Araştırmaları Dergisi, 21*, 200-210.

Scribner, S. A., & Anderson, M. A. (2005). Novice drafters' spatial visualization development: Influence of instructional methods and individual learning styles. *Journal of Industrial Teacher Education, 42*(2), 38-60.

Spoon, J. C., & Schell, J. W. (1998). Aligning student learning styles with instructor teaching styles. *Journal of Industrial Teacher Education, 35*(2), 41-56.

Stitt-Gohdes, W. L. (2003). Student teachers and their students: Do their instructional and learning preferences match? *Business Education Forum, 57*(4), 22-27.

Tüysüz, C., & Tatar, E. (2008). Öğretmen adaylarının öğrenme stillerinin kimya dersine yönelik tutum ve başarılarına etkisi. *Mustafa Kemal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 5*(9), 97-107.

Vaughan, N. (2007). Perspectives on Blended Learning in Higher Education. *International Journal on E-Learning , 6* (1), 81-94.

Yazıcı, H. J. (2005). A Study of Collaborative Learning Style and Team Learning Performance. *Education + Training , 47* (3), 216-229.

Young, J.R., 2002. Hybrid teaching seeks to end the divide between traditional and online instruction. *Chronicle of Higher Education 48* (28), A33–A34.

Young, M. R., Klemz, B. R., & Murphy, J. W. (2003). Enhancing learning outcomes: The effects of instructional technology, learning styles, instructional methods, and student behavior. *Journal of Marketing Education, 25*(2), 130.

## GENİŞLETİLMİŞ ÖZET

Veritabanı Yönetim Sistemleri dersi, Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü müfredatına yakın zamanda eklenmiştir. Bu yüzden bu derse yönelik bir öğretim tasarımı yapma ihtiyacı ortaya çıkmıştır. Bu pilot çalışmanın amacı, Veritabanı Yönetim Sistemleri dersinin, Uludağ Üniversitesi Eğitim Fakültesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü'ndeki öğrencilerin öğrenme stillerine göre yeniden yapılandırılmasını sağlamak ve öğrencilerin bu dersteki başarılarını arttırmaktır.

Günümüzde araştırmacıların üzerinde çalıştığı önemli konulardan bir tanesi de öğrencilerin öğrenme stilleridir. Literatürde öğrencilerin öğrenme tercihlerine göre tasarlanan öğrenme ortamları ve hazırlanan öğrenme materyallerinin, öğrencilerin başarısına olumlu etkisi üzerine birçok çalışma bulunmaktadır. Bu çalışma öğrencilerin öğrenme stillerini analiz etmeye yönelik bir pilot çalışma niteliğindedir. Çalışmadan elde edilen bulgular doğrultusunda, ileride işlenecek olan aynı ders için, öğrencilerin öğrenme stillerine uygun farklı türden materyaller geliştirilip, bunlar uygun bir öğrenme ortamda sunulacak, öğrencilerin öğrenme stillerine göre oluşturulmuş öğretim ortamının ve öğretim tekniklerinin, öğrencilerin ders başarılarına olan etkisi araştırılacaktır.

Araştırmanın katılımcıları, 2009-2010 Eğitim ve Öğretim Yılı Bahar Yarıyılı'nda Uludağ Üniversitesi Eğitim Fakültesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü'nde öğrenim gören toplam 88 öğrencidir. Katılımcıların öğrenme stillerini belirlemek üzere Felder ve Soloman (1994) tarafından geliştirilen Öğrenme Stilleri İndeksi kullanılmıştır. Bu indeks Felder ve

Silverman (1988) tarafından geliştirilen öğrenme ve öğretme kuramı üzerine geliştirilmiş olup, öğrencilerin öğrenme tercihlerini 4 adet iki kutuplu alt boyuta ayırmaktadır. Bu alt boyutlar yaparak-düşünerek, hissederek-sezgisel, görsel-işitsel ve sıralı-bütünsel olarak belirlenmiştir. Bu indeks dersin başında öğrencilere uygulanmıştır. Dersin sonunda öğrencilere uygulanan başarı testinde öğrencilerin aldıkları 0-100 arası notlar da veri olarak değerlendirilmiştir.

Araştırmada toplanan veriler üzerinde öğrencilerin öğrenme stillerine yönelik betimsel analizler yapılmış, öğrenme stillerinin dağılımı frekans analizi ile tespit edilmiştir. Araştırmada ayrıca değişkenler arasındaki olası ilişkiyi belirlemek amacıyla korelasyon ve regresyon analizi de kullanılmıştır.

Öğrencilerin öğrenme stillerini belirlemek amacıyla yapılan analizler sonucunda, öğrencilerin yaparak-düşünerek alt boyutundaki tercihlerinin dengeli, fakat daha çok yaparak öğrenme stiline yakın olduğu tespit edilmiştir. Öğrencilerin hissederek-sezgisel alt boyutundaki tercihlerinin hissederek öğrenme yöntemine daha yakın olduğu bir diğer bulgudur. Öğrenme alt boyutlarından en belirgin olanı görsel-işitsel alt boyutu olarak tespit edilmiştir. Katılımcıların görsel öğrenme stiline yönelik güçlü bir tercihinin olduğu söylenebilir. Son alt boyut olan sıralı-bütünsel öğrenme alt boyutunda ise öğrencilerin tercihi iki uca da eşit mesafede olacak şekilde dengeli çıkmıştır. Özetle öğrencilerin yaparak, hissederek ve görsel öğrenme yöntemlerine daha yatkın oldukları söylenebilir.

Öğrencilerin ders başarıları ile öğrenme tercihleri arasındaki ilişkiyi belirlemek için yapılan regresyon analizi sonucunda bu değişkenler arasında anlamlı bir ilişkinin olmadığı tespit edilmiştir. Öğrencilerin öğrenme tercihleri olan yaparak, hissederek ve görsel öğrenme stillerinin birbiriyle ilişkisini araştırmak amacıyla yapılan korelasyon analizi, yaparak ve hissederek öğrenme stillerinin, çok güçlü olmasa da birbirleriyle pozitif ilişkili oldukları sonucunu üretmiştir (R=.32). Bu iki öğrenme stili arasındaki ilişkiyi daha detaylı incelemek amacıyla regresyon analizi gerçekleştirmiş ve yaparak öğrenme stiline sahip öğrencilerin %10'unun, hissederek öğrenme stili skorlarına bakılarak, %99'un üzerinde bir ihtimal ile tahmin edilebileceği sonucuna ulaşılmıştır.

Araştırmanın bulgularında da belirtildiği gibi, öğrencilerin öğrenme stilleri skorları ile ders başarı notları arasında anlamlı bir ilişki bulunamamıştır. Bu bulgular, araştırmacıların dersi, özellikle bir veya birkaç öğrenme stiline yönelik olarak işlememeleri, tüm öğrenme stillerine eşit özeni göstermeleri ve dolayısıyla öğrencilerin başarı notlarının, öğrenme tercihleri arasında rastlantısal olarak dağılması şeklinde yorumlanabilir. Bundan dolayı bu sonuç beklenen bir sonuçtur. Aynı zamanda bu sonuç, araştırmanın bundan sonraki adımları için de uygun ortamı hazırlar niteliktedir. Araştırmacılar bundan sonraki uygulamada, bilinçli olarak öğrencilerin öğrenme stillerine göre öğretim metotlarını ve öğretim materyallerini düzenlemeyi ve bu durumun öğrenci başarısına etkilerini araştırmayı planlamaktadırlar.

Araştırmada elde edilen bir diğer bulgu da öğrencilerin yaparak, hissederek ve görsel öğrenme stillerine daha yatkın olması ve bu öğrenme stillerinden yaparak ve hissederek öğrenme stillerindeki skorlarının arasında düşük te olsa bir ilişkinin bulunmasıdır. Bu ilişki bu iki öğrenme stiline sahip öğrencilerin öğrenme tercihlerinin birbirine benzemesi olarak ta açıklanabilir. Örnek olarak, yaparak öğrenme stiline sahip öğrenciler deneyler yapmayı ve grup çalışmasını tercih ederlerken, hissederek öğrenme stiline sahip öğrenciler de uygulama yapmayı ve yaptıkları uygulamayı somutlaştırmayı tercih etmektedirler. Öte yandan ilişkinin çok güçlü olmaması, öğrenme stilleri indeksinin ayırt ediciliğini ve güvenirliğini de arttırıcı bir etken olarak yorumlanabilir.

Araştırma sonucunda elde edilen bulgular ışığında yapılması planlanan diğer araştırmanın öğrenme ortamı, öğretim teknikleri ve öğrenme materyalleri için bir takım stratejik kararlar alınmıştır. Bunlardan bir tanesi öğrenme ortamının seçilmesi ile ilgilidir. İlerideki araştırma için karma öğrenme ortamının kullanılması düşünülmektedir. Karma öğrenme ortamlarında öğrencilerin öğrenme tercihlerine hitap edecek olan öğrenme ortamını oluşturmak, geleneksel öğrenme ortamlarına göre daha kolaydır. Öğrenciler kendi öğrenme stillerine göre tercih edebilecekleri değişik öğrenme materyallerini, zaman kısıtlaması olmadan bu ortamdan takip edebileceklerdir.
Bir diğer stratejik karar hazırlanacak olan öğrenme materyalleri ile ilgilidir. Yaparak öğrenme stiline sahip öğrenciler için kendi kendine öğrenme materyalleri, deneme testleri hazırlanması planlanmaktadır. Hissederek öğrenme yöntemine sahip öğrenciler için gerçek yaşam problemlerinden alınan projeler ve ders için uygulama yaprakları hazırlanması uygun olacaktır. Öğrencilerin büyük bir çoğunluğu güçlü görsel öğrenme stiline sahip olmasından dolayı, resimler, şekiller ve hareketli görüntülerden oluşan öğrenme materyalleri ile mevcut dersin görsel açıdan desteklenmesi planlanmaktadır.

Bir sonraki çalışma yukarıda açıklanan hedefler doğrultusunda gerçekleştirilerek, mevcut planlamanın öğrencilerin dersteki başarılarına etkisi araştırılacaktır.