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# Effect of Learning Styles on AcademicAchievement: A Meta-Analysis

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**Abstract**

The purpose of this study is to determine the effect levels of experimental studies in which the effects of learning styles on academic achievement are examined and to synthesize the findings of there search. Forth is purpose, experimental studies related to learning styles were examined and 18 studies that employed the learning-style based instruction and provided the data required for meta-analysis were included in the study. According to the fixed effect model of the studies, the overall effect size of the studies is d = 779, the Standard error value is SE = 0.056. In homogeneity tests, Q =110,686 was found. The absence hypothesis of homogeneity was rejected because the Q value exceeds its equivalent in the X2 table. I2 statistic value (83.738) was found to indicate high level of heterogeneity. By looking at the combined effect size value according to the random effects model (E ++ = 0.926), it is seen that the learning-style based instruction has a positive effect on academic achievement.

**Keywords:** Learning styles, meta-analysis, academicachievement

## Introduction

From the moment of birth, human beings are interested in understanding and making sense of their environment. Individuals perceive the environment they are in with their own subjective personalities and reconstruct it in their minds. People's styles of obtaining information, ways of solving problems, organizational abilities, and methods of producing a product may differ. One of the qualities that make human beings a social entity and distinguish them from other living things is the ability to learn. There are many explanations about how learning occurs, but in general, it can be explained as the change in behaviors as a result of an individual's interaction with his environment (Seven & Engin, 2008; Yılmaz, 2009). Learning which is shaped by and shapes the social, physical and mental characteristics of people; begins with birth and continues throughout life. Described as both an active process and a product learning, differs among individuals (Can, 2011; Felder; 1996). One of the reasons for these differences is learning styles (Çelenk & Karakış, 2007; Kurt & Ekici, 2013).

Learning style is the whole of the cognitive, affective, and kinesthetic characteristics of the student which effects how the students perceive the environment in which learning takes place relatively consistently, how they communicate and how they answer questions (Ahmed, 2013). Described as general attitudes, behaviors, and patterns that direct and facilitate students' learning, learning styles have been classified by many theorists. The main learning style models used in the literature are the learning styles models of Kolb, Gregorc, Dunn and Dunn, Felder and Silverman (Vaishnav & Chirayu, 2013). In today's rapidly developing and changing conditions, one of the main objectives of education systems is to nurture individuals who adapt to change, learn to learn, have individual awareness, and are open to innovation. One of the healthiest ways to achieve these goals will be through instruction taking into account individual learning differences among students (Mutlu, 2008; Kabadayı, 2004). The idea which lays the foundations of the learning style-based instruction is that the classroom environments created by taking individual differences into consideration present richness for students (Demir, 2008).

Since the concept of learning styles, which emerged as a result of the study of students' individual differences, expresses students' learning preferences, it is necessary to take into account the individual differences of students and to create educational environments and teaching in this context (Ataseven & Oğuz, 2015; Bulut & Hasırcı, 2014; Kaf -Hasırcı, 2006; Kaplan & Kies, 1995). When the studies examining the effectiveness of instructional activities based on students' learning styles are

examined; It has been concluded that learning style-based instruction makes the course richer, increases student success, enables more permanent learning, and helps students to learn faster and easier (Arslan & Babadoğan, 2005; Bozkurt & Aydoğdu, 2009; Fer, 2011; Gelbal, 2010; Güven, 2004).

In the literature, many researchers have conducted studies on learning styles in various dimensions with different methods. Ataseven and Oğuz (2015) examined the theses written on learning styles with document review method. Studies on learning styles aiming to determine the effect of learning styles on academic achievement (Ekici, 2013; Kaf-Hasırcı, 2006; Koç, 2020), aiming to determine the relationship with various variables (Duman, 2008; Gülbahar, 2005; Güven, 2004; Kılıç & Karadeniz, 2004) ), and the studies conducted in the descriptive survey model (Biçer, 2010; Mutlu, 2008; Şendil, 2011) were examined. Dinçöz (2007) worked on the learning styles of high school students in physics subject. Some of these studies (Arı, 2008; Arslan, 2012; Cengizhan & Özer, 2016; Çömek, 2009; Gökova, 2010; İnal 2013; Kaf-Hasırcı, 2006; Özdemir 2015) were conducted to determine whether the teaching conducted on different student groups based on learning styles has an effect on academic achievement; Science is a phenomenon that progresses in a cumulative way, there is a need for higher-level research with extensive coverage to interpret the knowledge accumulated by science in that field and to shed light on new studies (Akgöz, Ercan, & Kan, 2004). It is important to act from the knowledge accumulated by similar scientific studies in the respective field, to internalize this accumulation and to create a new foundation based on its contribution to the field. Glass (1976) stated that it is difficult and inadequate to generalize research in social sciences. The meta-analysis method combines the results of previous similar studies and facilitates generalizations in social sciences (Dinçer, 2014; Şahin & Tekdal, 2005). By using the meta-analysis method, more precise judgments and generalizations can be reached, because a single scientific study on a scientifically researched subject may be insufficient and incomplete in solving a problem, so combining the results of similar studies is important for the research area (Başol Göçmen, 2004; Dinçer, 2014; Çelik, 2013; Günhan Okursoy, 2009). From this point of view, since there is no research that examines the studies aimed at revealing whether learning styles have an effect on academic achievement or not, this study was needed, and the problem statement of the research was expressed as follows. "Does the education and instruction designed to accommodate the learning styles have an effect on the academic achievement of the student?"

This study was conducted to examine the effects of educational environments designed according to learning styles on academic achievement. Within the framework of this general purpose, it is aimed to determine the independent variables influencing learning styles and the effect sizes and directions of these variables by examining the scientific studies in this field.

Within the framework of the main purpose stated above, the answers to the following questions were sought within the scope of the study.

I. What is the effect of planned instruction according to learning styles on academic achievement?

II. Examined studies; Is there a significant difference between effect sizes according to course type, publication type and education level variables?

## Method

This research is based on meta-analytical survey method. Meta-analysis study method is a variety of literature survey. It is a method that aims to make a holistic analysis by bringing together the results of quantitative studies (Durlak, 1995). In meta-analysis, it is aimed to calculate an integrated sample and a general effect size based on the samples and effect sizes of individual studies (Dinçer, 2014; Rothstein, Sutton, & Borenstein, 2005).

By examining the previous meta-analysis studies conducted in the field and considering the recommendations of the books accepted as reference in the field, the criteria for including and excluding the studies to be selected for this research were determined (Akgöz, Ercan & Kan, 2004; Çarkungöz & Ediz, 2009; Dinçer, 2014; Kaya & Kaya, 2013; Şahin & Tekdal, 2005) These inclusion & exclusion criteria are as follows;

Table 1. *Inclusion and exclusion criteria*

| Inclusion criteria | Exclusion criteria |
|---|---|
| The sample size is specified. | Not using quantitative methods. |
| Arithmetic mean, standard deviation and t values for academic achievement are stated. | The article or paper being derived from a thesis |
| A reliable measurement tool to measure academic achievement is utilized. | Lack of data required to calculate effect size. |
| The selected study group is located within Turkish borders. | Absence of control group |
| Being conducted on the basis of one of the experimental research designs. | Not examining academic achievement |
| Published between 2006 and 2020. | |
| The experiment group receives instruction in accordance with their learning styles. | |

As a result of the screening made in the light of the inclusionand exclusion criteria, 18 scientific studies were found to be suitable for this study. The flow chart showing the process of identifying the included studies is given below.

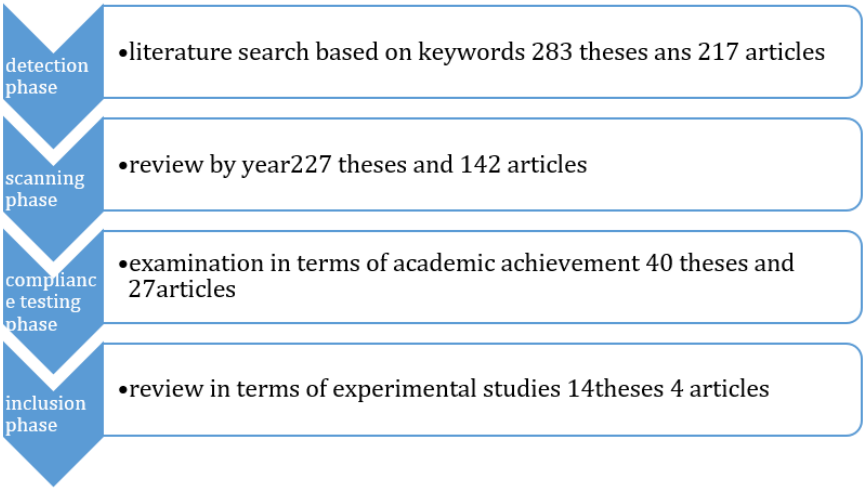


*Figure 1*. Prizma flowdiagramfor meta-analysis

### Data Analysis

While analyzing the studies included in the study, first the individual effect sizes and variances of the studies were calculated and listed in a sample data table. Then, the moderator variables to be examined in the meta-analysis study were selected and the required data were transferred to the data table. The data in the sample data table has been transferred to the CMA (Comprehensive Meta-Analysis) program. After the data were entered into the program, the main effect size of the studies, bias analysis and heterogeneity test were analyzed with the program. Then, the effect sizes of the moderator variables were analyzed for significance, and the resulting data were transferred to the study.

### Ethical Permits of Research

In this study, all the rules specified to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were complied with. None of the actions specified under the heading "Actions Contrary to Scientific Research and Publication Ethics", which is the second part of the directive, have been taken. Since this study was a meta-analysis study, ethics committee approval was not required.

## Findings

In this section, the findings of the study are presented.

Table 2 contains descriptive information about the studies included in the study.

Table 2. *Descriptive information about scientific studies included in the study*

| Variable | Value | (f) | (%) |
|---|---|---|---|
| Publication type | Master's thesis | 7 | 38.9 |
| | Doctoral dissertation | 7 | 38.9 |
| | Article | 4 | 22.2 |
| Stage | Elementary School | 3 | 16.7 |
| | Middle School | 4 | 22.2 |
| | High School | 4 | 22.2 |
| | Undergraduate | 7 | 38.9 |
| Subject area | Science | 8 | 42.2 |
| | Computer Science | 1 | 5.3 |
| | Mathematics | 3 | 15.8 |
| | Social studies | 3 | 15.8 |
| | English | 1 | 5.3 |
| | Life sciences | 2 | 10.6 |
| | Math + Science | 1 | 5.3 |

When the data in Table 2 are examined, it is seen that 7 studies were drafted as master's theses and doctoral dissertations and 4 studies were drafted as articles. The studies included in the study were mostly conducted at the undergraduate stage (f: 7). When we look at the variable of course subject area, most of the studies (f: 8) were conducted under the title of science.

Table 3 contains information about the combined sample size.

Table 3. *Overall sample size*

| Sample Size Obtained from Studies Included in the Meta-Analysis Study | |
|---|---|
| Experiment (N) | Control (N) |
| 738 | 727 |

When the data in Table 3 are examined, the overall experiment group size of the 18 studies included in the study consists of 738 individuals and the overall control group size consists of 727 individuals.

Table 4 contains information on individual effect sizes, variances, and standard error values of the studies.

Table 4. *Individual effect size of studies, variance value and standard error values*

| Effect Size | Study | Effect Size | Variance | Standard Error |
|---|---|---|---|---|
| Small effect | Arslan (2012) | 0.069 | 0.133 | 0.365 |
| | Kaf (2006) | 0.190 | 0.150 | 0.387 |
| | Azar (2008) | 0.200 | 0.055 | 0.235 |
| | İnal (2013) | 0.238 | 0.035 | 0.187 |
| | Önder (2012) | 0.434 | 0.085 | 0.292 |
| Medium effect | Ermurat (2013) | 0.554 | 0.094 | 0.307 |
| | Özdemir (2015) | 0.598 | 0.040 | 0.200 |
| | Gökova (2010) | 0.601 | 0.110 | 0.012 |
| | Öztürk, (2017) | 0.789 | 0.038 | 0.195 |
| Large effect | BaşveBeyhan (2013) | 0.874 | 0.066 | 0.257 |
| | Ö. Kaf (2006) | 0.875 | 0.178 | 0.422 |
| | Gencel (2006) | 0.891 | 0.088 | 0.195 |
| Very large effect | Arı (2008) | 1.034 | 0.038 | 0.364 |
| | Cengizhan ve Özer (2016) | 1.076 | 0.124 | 0.352 |
| | Elçi (2008) | 1.238 | 0.073 | 0.270 |
| | Usta (2006) | 1.309 | 0.367 | 0.135 |
| | Çömek (2009) | 1.318 | 0.281 | 0.079 |
| | Önder (2006) | 2.188 | 0.108 | 0.329 |
| | Çakıroğlu (2014) | 3.772 | 0.163 | 0.404 |

When the individual effect levels of the studies in Table 4 are examined, it is seen that 5 studies have small effect size, 4 studies have medium effect size, 3 studies have large effect size, and 7 studies have very large effect size.

Publishing Bias

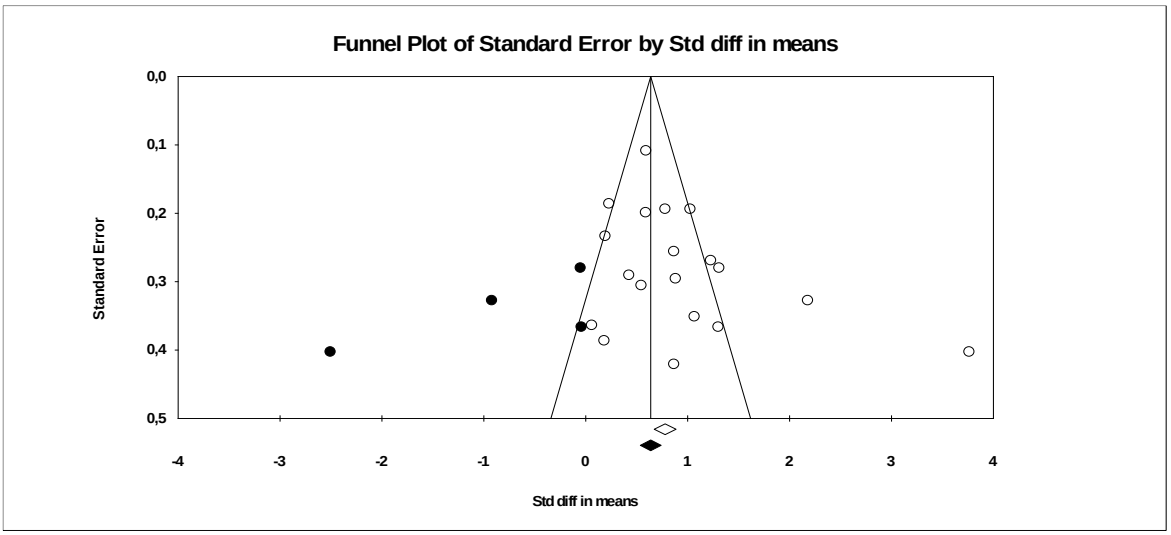


*Figure 2*. Funnel plot

Figure 2 shows that 19 effect sizes obtained from 18 studies have a symmetrical distribution. Vertical line in the graph shows the overall effect size in the absence of publication bias. The fact that

the distribution in the chart shows symmetrical features with respect to the vertical line indicates that there is no display of publication bias. In order to make more detailed comments on publication bias, it is necessary to look at the statistical value of Begg and Mazumder rank correlations.

Table 5 contains detailed information about Begg and Mazumder rank correlations statistics.

Table 5. *Statistics of Begg and Mazumdar rank correlations*

| Begg and Mazumdar rank correlations | |
|---|---|
| Kendal's S statistics (P-Q) | 44.0000 |
| Kendal's Tau without continuity correction | |
| Tau | 0.25731 |
| z- value for tau | 1.53937 |
| P-value (1-tailed) | 0.06186 |
| P-value (2-tailed) | 0.12372 |

Upon examination of the data in Table 5, the P-value (2-tailed) being greater than 0.05 reveals that there is no publication bias in the meta-analysis (Dinçer, 2014). Table 6 contains information on the Classic Fail-Safe N value regarding the publication bias of the research.

Table 6. *Classic fail-safe N value*

| Variable | Value |
|---|---|
| z value of the observed study | 14.75018 |
| p value of the observed study | 0.00000 |
| Alfa | 0.05000 |
| Number of observed studies | 19 |
| Number of studies to be included for p> alfa | 1058 |

When the data in Table 6 are examined, the number of studies that should be included in meta-analysis is 1058 in order for the p value to exceed the significance level of 0.05. It can be concluded that there is no publication bias, since it is unlikely to access 1058 more studies that test the effect of learning styles on academic achievement with experimental designs.

Table 7 includes the findings calculated according to the fixed and random effects model of the studies.

Table 7. *Results of the studies according to the fixed effect and random effects model and heterogeneity test results*

| Model | Effect size and 95% confidence interval | | | | | | Null Hypothesis | | Heterogeneity | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of ... | Effect size | Standard error | Variance | Lower limit | Upper limit | Z-value | P | Q-value | Df (Q) | I2 |
| Fixed | 19 | 0.779 | 0.055 | 0.003 | 0.672 | 0.886 | 14.229 | 0.000 | 110.686 | 18 | 83.738 |
| Random | 19 | 0.936 | 0.144 | 0.021 | 0.644 | 1.208 | 6.438 | 0.00 | | | |

When the data in Table 7 are examined, the general effect size of the studies included in the study according to the fixed effect model is d = 779, the standard error value is SE = 0.056, the upper limit of the confidence interval is 0.886 and the lower limit is 0.672. When the results of the homogeneity test were examined, the value of Q = 110.686 was found. In order to interpret the Q value, the X2 table was looked at and it was found that the equivalent in 18 degrees of freedom at the 95% significance level was 8.231. The value of the Q statistic (110.686) with 18 degrees of freedom was found to exceed the equivalent value in the chi-square table (8.231) therefore the null hypothesis of homogeneity was

rejected according to the fixed effect model. In other words, it exhibits a heterogeneous feature according to the fixed effect model. The I2 statistic, which reveals the ratio of the overall effect size of the studies to the total variance, reveals a sharper result regarding the heterogeneity of the study (Popay vd, 2006). When interpreting the data for the I2 statistic, it is assumed that 25% heterogeneity is low, 50% is moderate, and 75% is at a high level (Dinçer, 2014). It was seen that the I2 statistic value (83.738) in Table 5 indicates a high level of heterogeneity. Homogeneity tests (Q statistic value and I2 statistic value) showed that the studies have heterogeneity. Due to heterogeneity, the operating model of the study was accepted as random effects.

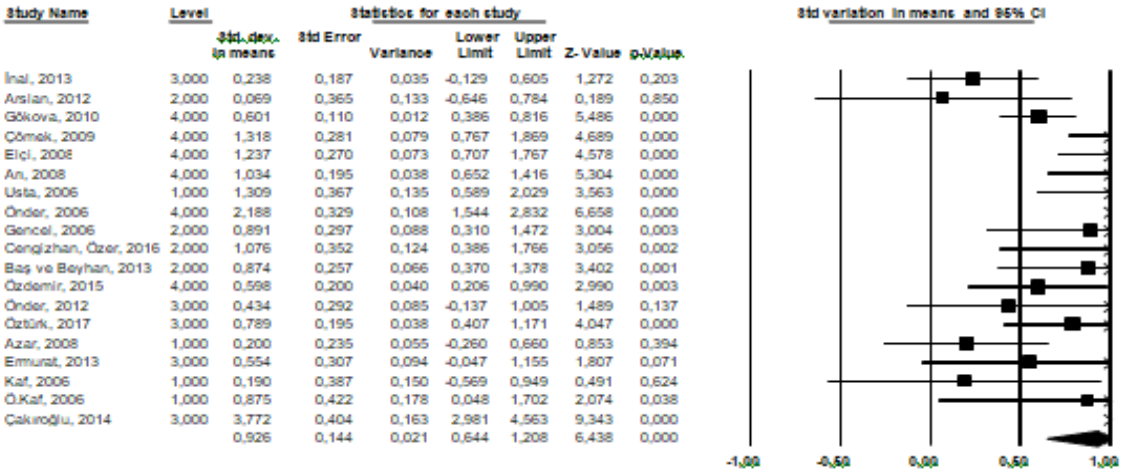


*Figure 3.* Effect sizes of studies in random effects model

When the data in Figure 3 are examined, looking at the combined effect size value (E ++ = 0.926), it is seen that the effect of learning style-based instruction on academic achievement is positive. According to the combined effect size value (0.926), it can be said that there is a high level of positive effect.

Table 8 contains information about the moderator variable analysis of the studies.

Table 8. *Moderator analysis*

| Variable | Value | N | Effect Size | Standard Error | Df | Confidence Interval | | Qb | P |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper | | |
| Type of Publication | Master thesis | 7 | 1.232 | 0.350 | 6 | 0.546 | 1.919 | 1.974 | 0.373 |
| | Doctoral dissertation | 7 | 0.807 | 0.169 | 6 | 0.475 | 1.139 | | |
| | Article | 5 | 0.712 | 0.129 | 4 | 0.460 | 0.964 | | |
| Stage | Elementary School | 4 | 0.607 | 0.280 | 3 | 0.059 | 1.156 | 2.762 | 0.430 |
| | Middle School | 4 | 0.757 | 0.197 | 3 | 0.370 | 1.144 | | |
| | High School | 5 | 1.111 | 0.462 | 4 | 0.204 | 2.017 | | |
| | Undergraduate | 6 | 1.104 | 0.207 | 5 | 0.699 | 1.509 | | |
| Subject Area | Science | 8 | 0.636 | 0.174 | 7 | 0.294 | 0.978 | 63.733 | 0.000 |
| | Computer Science | 1 | 0.601 | 0.110 | 0 | 0.386 | 0.816 | | |
| | Mathematics | 3 | 1.497 | 0.335 | 2 | 0.840 | 2.154 | | |
| | Social studies | 3 | 0.731 | 0.126 | 2 | 0.484 | 0.979 | | |
| | English | 1 | 0.874 | 0.257 | 0 | 0.370 | 1.378 | | |
| | Life sciences | 2 | 0.512 | 0.342 | 1 | -0.158 | 1.182 | | |
| | Math + Science | 1 | 3.772 | 0.404 | 0 | 2.961 | 4.563 | | |

Examination of the data in Table 7 reveals that the type of publication variable did not play a moderator role (Qb = 1.974; p = 0.373), and the education stage variable did not play a moderator role (Qb = 2.762; p = 0.430). The subject area variable plays a moderator role between learning styles and academic achievement (Qb = 63.733; p <0.05).

## Discussion and Conclusion

The number of studies on learning styles is increasing quantitatively, as in any field of science which progresses cumulatively. This situation has made it necessary to combine similarly patterned/designed studies aiming for the same goal, analyze them according to a certain systematic and present them to the reader (Sağlam & Yüksel, 2007; Üstün & Eryılmaz, 2014). In this study, a meta-analysis was conducted to investigate the effect of learning-style based instruction on academic achievement. Inclusion and exclusion criteria were established in line with the purpose of the study, and the studies were examined according to these criteria. As a result of the screening, 18 studies were included in the meta-analysis study and the total control group comprised 727 individuals and the experiment group comprised 738 individuals. 19 different individual effect sizes were obtained from 18 studies included in the meta-analysis, and all of these effect sizes were found to be positive. As a result of the analysis, the combined effect size was calculated as (E ++ = 0.779) (lower limit 0.672; upper limit 0.886; p = 0.000 at 95% confidence interval). Data obtained from the results of the homogeneity test (Q = 110.686; df: 18, p = 0.000 and I2 = 83.738%) the hypothesis that the calculated effect sizes are homogeneous was rejected, the analyzes were made according to the random effects model. The combined effect size calculated according to the random effects model was calculated as (E ++ = 0.926) (lower limit 0.644; upper limit 1.208; p = 0.000 at 95% confidence interval). This calculated effect size is a highly statistically significant according to Cohen (1988)'s effect size classification (Dinçer, 2014). It has been seen that these results are compatible with similar studies conducted earlier in the literature. Dunn, Griggs, Gorman, Olson, & Beasley examined 42 studies focusing on the effect of learning styles on academic achievement and calculated the joint effect size as (E++=0.755). Similarly, Lovelace (2005) reached the result of a high level of positive effect in a meta-analysis study in which he examined studies prepared according to the Dunn and Dunn learning model. However, it is seen that there are studies that do not coincide with these results. For example, Slemmer (2002) calculated the effect size in 48 experimental studies (d=0.13) in which he examined the effect of learning styles on academic achievement. Similarly, Kavale and Fortness (1987) examined 39 studies on this subject and calculated the overall effect size (d=0.14).

The fact that teaching activities designed in accordance with learning styles have a positive effect on academic achievement, has been concluded by many previous studies (Aslan & Babadoğan, 2005; Ataseven & Oğuz, 2015; Azar, 2006; Baş & Beyhan, 2013; Elçi, 2008; Ermurat, 2013; Gökova, 2010; Önder, 2006; Kaf, 2006; Özdemir, 2015). The conclusion of this meta-analysis study stating that learning styles have a positive significant effect on academic achievement; in this respect, has been supported by the results of previous studies.

Publication bias for 19 effect sizes obtained from 18 studies was calculated with funnel plot, Begg and Mazumdar rank correlation value and Classic Fail-Safe N statistics, and by looking at the statistical values found, it was concluded that there was no publication bias. This result shows great similarities with the results of the study by Kanadlı (2016).

As a result of the meta-analysis, the effect size difference for the publication type moderator variable is not statistically significant (Qb = 1.974; p = 0.373). Likewise, the effect size difference of the education stage moderator variable is not statistically significant (Qb = 2.762; p = 0.430). In other words, it has been determined that the publication type (master's thesis, doctoral dissertation or article) of the studies included in the meta-analysis did not cause a differentiation in the effect size of learning-style based instruction on the progress of academic achievement. Likewise, the education stage (primary school, secondary school, high school or undergraduate), did not cause a differentiation in the effect size of learning-style based instruction on the progress of academic achievement. According to Kök (2018), in order to make broader generalizations for variables that do not cause differentiation in meta-analysis studies, new studies to be conducted in this field are required.

However, a significant difference was found between the mean effect sizes according to the subject area variable (science, computer science, mathematics, social studies, English, life science, mat + science) (Qb = 6.733; p = 0.000). This result contradicts with the results of the meta-analysis study conducted by Kanadlı (2016). This contradiction is thought to be due to the fact that, after 2016, the studies that meet the inclusion criteria of this research are mostly focused on 'Science'. It is thought that this differentiation will disappear if similar numbers of studies are conducted in other fields. Because it is supported by the results of the experimental studies that learning-style based instruction makes a positive contribution to academic success in every field (Arslan, 2012; Azar, 2008; Ermurat, 2013; Gökova, 2010; İnal; 2013; Kanadlı, 2016; Kaf-Hasırcı, 2006; Önder, 2012; Özdemir, 2015; Öztürk, 2007).

## Recommedations

Standard scores (such as p and z values) and effect sizes can be reported in studies to facilitate comparison of experimental studies.

The overall effect size of learning styles on academic achievement is calculated as (E ++ = 0.926). It may be suggested to conduct meta-analysis studies in this area at certain time intervals.

In this study, three types of moderator variables were examined (Publication type, Education stage and subject area). Other variables can be examined in similar studies.

Studies conducted with experimental designs are included in the meta-analysis in this study. A meta-analysis may also be recommended on correlational studies conducted in the same field.

In this study, the general effect of learning-style based instruction on academic achievement was calculated by meta-analysis method. Meta-analysis studies can be conducted on other dimensions of learning styles.

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There is no material or individual organic connection with the people or institutions involved in the research and there is no conflict of interest in the research.

# Genişletilmiş Türkçe Özet

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# Öğrenme Stillerinin Akademik Başarı Üzerindeki Etkisi. Bir Meta-Analiz

## Giriş

Öğrenme stili; öğrencilerin nispeten istikrarlı bir şekilde öğrenmenin gerçekleştiği ortamı nasıl algıladığı, nasıl iletişim kurduğu ve sorulara nasıl cevap verdiğini etkileyen ve öğrencinin bilişsel, duyuşsal ve devinimsel özelliklerinin bütünüdür (Ahmed, 2013). Öğrencilerin bireysel farklılıklarının araştırılması sonucunda ortaya çıkan öğrenme stilleri kavramı, öğrencilerin öğrenmeye karşı tercihlerini ifade ettiğinden dolayı, öğrencilerin bireysel farklılıklarının göz önünde tutulması ve bu bağlamda eğitim öğretim ortamlarının oluşturulması ve öğretimin gerçekleştirilmesi gerekmektedir. Öğrencilerin öğrenme stilleri dikkate alınarak yapılan eğitim faaliyetlerinin etkililiğini inceleyen çalışmalar incelendiğinde; öğrenme stiline dayalı eğitimin dersi daha zengin hale getirdiği, öğrenci başarısını artırdığı, daha kalıcı öğrenmelerin gerçekleşmesini sağladığı, öğrencilerin daha hızlı ve kolay öğrendiği gibi olumlu sonuçlara ulaşılmıştır (Arslan ve Babadoğan, 2005; Bozkurt ve Aydoğdu, 2009; Fer, 2011; Gelbal, 2010; Güven, 2004).

Alanyazında, öğrenme stilleri ile ilgili çeşitli boyutlarda farklı yöntemlerle birçok araştırmacı tarafından çalışmaların yapıldığı görülmüştür (Ekici, 2013; Kaf-Hasırcı, 2006; Koç, 2020). Bilim birikimli olarak ilerleyen bir olgudur, bilimin o alanda oluşturduğu bilgi birikimini yorumlamak ve yeni çalışmalara ışık tutmak için geniş kapsayıcılığa sahip üst araştırmalara gereksinim vardır (Akgöz, Ercan ve Kan, 2004). İlgili alandaki benzer bilimsel çalışmaların ortaya koyduğu bilgi birikiminden hareket etmek, bu birikimi özümsemek ve yeni bir temel oluşturmak, alana yapacağı katkıdan dolayı önem arz etmektedir.

Meta-analiz yöntemi, daha önce yapılan benzer çalışmaların sonuçlarını birleştirerek, sosyal bilimlerde de genellemelerin yapılmasını kolaylaştırmaktadır (Dinçer, 2014). Meta-analiz yöntemi kullanılarak daha kesin yargılara ve genellemelere varılabilir, çünkü bilimsel olarak araştırılan bir

konuda tek bir bilimsel çalışmanın önem arz eden bir problemin çözümünde yetersiz ve eksik kalabileceğinden dolayı benzer çalışmaların sonuçlarının harmanlanması araştırılan alan için önemlidir (Başol Göçmen, 2004). Bu noktadan hareketle öğrenme stillerinin akademik başarıya etkisinin olup olmadığını ortaya koymaya yönelik çalışmalarımeta analitik yöntemle inceleyen bir araştırmaya rastlanmadığından bu araştırmaya gereksinim duyulmuş ve araştırmanın problem cümlesi şu şekilde ifade edilmiştir. "Öğrenme stillerine uygun olarak düzenlenen eğitimin ve öğretimin öğrencinin akademik başarısı üzerindeki etkisivar mıdır?" Bu amaç çerçevesinde şu sorulara yanıt aranmıştır:

- Öğrenme stilleri ile akademik başarı arasındaki ilişkinin etki büyüklüğü ve yönü nedir?
- Yapılan çalışmaların uygulandığı ders türleri arasında öğrenme stillerine göre düzenlenen eğitimin etki büyüklükleri arasında anlamlı bir fark var mıdır?
- Araştırmaların yayın türü değişkenine göre öğrenme stillerine göre düzenlenen eğitimin etki büyüklükleri arasındaki fark anlamlı mıdır?
- Öğretim kademesine göre öğrenme stillerine göre yapılan eğitimin etki büyüklükleri arasında anlamlı bir fark var mıdır?

## Yöntem

Bu araştırma meta-analitik tarama yöntemi esas alınarak yapılmıştır. Meta analiz çalışmaları bir tür alanyazın tarama yöntemidir. Nicel çalışmaların sonuçları bir araya getirilerek bütünsel bir analiz yapmayı hedefleyen bir yöntemdir (Durlak, 1995). Meta analizde bireysel çalışmaların örneklemleri ve etki büyüklüklerinden yola çıkarak bütünleştirilmiş bir örneklem ve genel bir etki büyüklüğünün hesaplanması amaçlanmaktadır (Dinçer, 2014; Rothstein, Sutton ve Borenstein, 2005). Alanda yapılmış daha önceki meta-analiz çalışmaları incelenerek ve alanda referans kabul edilen kitapların önerileri dikkate alınarak bu araştırma için seçilecek çalışmaları araştırmaya dahil etme ve araştırmadan hariç tutma kriterleri şu şekilde belirlenmiştir.

Dahil edilme kriterleri

- Örneklem sayısının belirtilmiş olması.
- Akademik başarıya için ortalama, ss ve t değerlerinin verilmiş olması.
- Akademik başarıyı ölçmeye yönelik bir ölçme aracının kullanılmış olması.
- Çalışma grubunun Türkiye sınırları içerisinden seçilmiş olması.
- Deneysel araştırma desenlerinden biri esas alınarak yürütülmüş olma.
- Deney gurubuna öğrenme stillerine uygun düzenlenmiş eğitim verilmiş olma.

Hariç tutulma kriterleri

- Nicel yöntemlerin kullanılmamış olması
- Tezden türetilmiş makale veya bildiri olması
- Etki büyüklüğünü hesaplamak için gerekli olan verilerin sunulmamış olması
- Kontrol grubunun olmaması
- Akademik başarıyı incelemiyor olması

Araştırmaya dahil edilen çalışmalara analiz edilirken, önce araştırmaların bireysel etki büyüklükleri ve varyansları hesaplanarak örnek bir veri tablosuna eklenmiştir. Daha sonra meta analiz çalışmasında incelenecek olan moderatör değişkenler seçilmiş ve veri tablosuna gereken veriler aktarılmıştır. Örnek veri tablosundaki veriler CMA (Compherensive Meta-Analiz) programına aktarılmıştır. Daha sonra hem gene letki büyüklüğü hem de moderatör analizleri yapılmıştır.

**Araştırmanın Etik İzinleri**

Yapılan bu çalışmada "Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi" kapsamında uyulması belirtilen tüm kurallara uyulmuştur. Yönergenin ikinci bölümü olan "Bilimsel Araştırma ve Yayın Etiğine Aykırı Eylemler" başlığı altında belirtilen eylemlerden hiçbiri gerçekleştirilmemiştir.

## Bulgular

Bu araştırmada öğrenme stillerine uygun olarak yapılan eğitimin akademik başarı üzerindeki etkisinin araştırmak için meta-analiz yapılmıştır. Çalışmanın amacı doğrultusunda dahil edilme ve hariç tutulma kriterleri oluşturulmuş ve bu kriterlere göre araştırmalar incelenmiştir. Yapılan tarama sonucunda 18 çalışma meta-analiz çalışmasına dahil edilmiş ve 738 kişilik deney ile 727 kişilik kontrol grubu büyüklüğüne ulaşılmıştır. Meta-analize dahil edilen 18 çalışmadan 19 ayrı bireysel etki büyüklüğü elde edilmiştir, bu etki büyüklüklerinin tamamının pozitif yönde olduğu tespit edilmiştir. Yapılan analiz sonucunda birleştirilmiş etki büyüklüğü (E++ =0,779) olarak hesaplanmıştır (%95 güven aralığında alt limit 0,672; üst limit 0,886; p=0,000). Homojenlik testi sonuçlarından elde edilen veriler ile (Q=110,686; df:18, p=0,000 ve I2= %83, 738) hesaplanan etki büyüklüklerinin homojen olduğuna ilişkinhipotez reddedilmiştir, rastgele etkiler modeline göre analizler yapılmıştır. Rastgele etkiler modeline göre hesaplanan birleştirilmiş etki büyüklüğü ise (E++ =0,926) olarak hesaplanmıştır (%95 güven aralığında alt limit 0,644; üst limit 1,208; p=0,000). Hesaplanan bu etki büyüklüğü Cohen (1988)'in etki büyüklüğü sınıflamasına göre yüksek düzeyde istatistiksel olarak anlamlı bir etki büyüklüğüdür (Dinçer, 2014).

Yapılan meta-analiz sonucunda yayın türü moderatör değişkenine ait etki büyüklüğü farkı istatistiksel olarak anlamlı değildir ($Q_b$= 1,974; *p*= 0, 373). Aynı şekilde eğitim kademesi moderatör değişkenlerine ait etki büyüklüğü farkı da istatistiksel olarak anlamlı değildir ($Q_b$= 2,762; *p*=0, 430). Diğer bir deyişle meta-analize uygulanan araştırmaların yayın türünde; (yüksek lisans tezi, doktora tezi ya da makale) öğretim stillerine göre düzenlenmiş öğretim uygulamalarının akademik başarı gelişiminde etki büyüklüğü bakımından bir farklılaşmaya etki etmediği saptanmıştır. Öte yandan ders türü moderatörüne göre ise anlamlı bir sonuç elde edilmiştir.

## Tartışma ve Sonuç

Öğrenme stillerine uygun olarak tasarlanan öğretim etkinliklerinin akademik başarıya olumlu etki yaptığı, daha önce yapılmış olan (Ataseven ve Oğuz, 2015; Özdemir, 2015; Baş ve Beyhan, 2013; Ermurat, 2013; Gökova, 2010; Elçi, 2008; Önder, 2006; Kaf, 2006; Azar, 2006; Aslan ve Babadoğan, 2005) birçok çalışma tarafından saptanmıştır. Bu meta-analiz çalışmasından elde edilen, öğrenme stillerinin akademik başarı üzerinde pozitif anlamlı etkisi olduğu yönündeki sonuç; bu bakımdan daha önce yapılmış olan araştırmaların sonuçlarıyla desteklenmiştir. Moderatör değişkenler bakımından ders türü değişkenine göre (fen, bilgisayar, matematik, sosyal, İngilizce, hayat bilgisi, mat+fen) ortalama etki büyüklükleri arasında anlamlı bir fark bulunmuştur (Qb= 63,733; p=0, 000). Bu sonuç Kanadlı, (2016) tarafından yapılmış olan meta-analiz çalışmasının sonuçları ile çelişmektedir. Bu çelişki, 2016 yılından sonra, bu araştırmanın dahil edilme kriterlerine uyan çalışmaların daha çok 'Fen' alanında yoğunlaşmış olmasından kaynaklandığı düşünülmektedir.

## Öneriler

Yapılan deneysel çalışmaların daha kolay karşılaştırılabilmesi için standart puanlar (p ve z değeri gibi) ve etki büyüklükleri araştırmalarda rapor edilebilir.

Öğrenme stillerinin akademik başarı üzerindeki genel etki büyüklüğü (E++ =0,926) olarak hesaplanmıştır. Belli zaman aralıklarında bu alanda meta-analiz çalışmaları yapılması önerilebilir.

Bu araştırmada üç tür moderatör değişken incelenmiştir (Yayın türü, Okul seviyesi ve ders türü). Benzer çalışmalarda başka değişkenler de incelenebilir.

Bu çalışmada deneysel desenlerle yürütülen çalışmalar meta-analize dahil edilmiştir. Aynı alanda yapılan korelasyonel çalışmalar üzerinde de meta-analiz yapılması önerilebilir.

Bu çalışmada öğrenme stillerine uygun yapılan eğitimin akademik başarı üzerindeki genel etkisi meta-analiz yöntemiyle hesaplanmıştır. Öğrenme stillerinin başka boyutları üzerinde de meta-analiz çalışmaları yapılabilir.