

The Effects of the Constructivist Learning Approach on Student's Academic Achievement: A Meta-Analysis Study

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ABSTRACT

In this research, a meta-analysis study was conducted in order to determine the effects of constructivist learning approach on students' academic achievement. Master's thesis, doctoral dissertation and articles in national and international databases, which are realized between the years of 2003–2014, appropriate to the problem and which can be included in a work of meta-analysis with important statistical data, have been studied by scanning in Turkish and English. At the end of the literature review, a total of 53 studies about effects of constructivist learning approach on student's academic achievement have been included in the meta-analysis study. Meta-analysis study determined that the constructivist learning approach, compared to traditional teaching methods, has positive effects on the student's academic achievement. After using a random effects model with a 0.910 and 1.402 interval of the confidence, the overall effect of constructivist learning approach in relation to academic achievement of students is found 1.156 (95% CI, SE=0.125). 50 of the 53 studies included in the study have positive results, though only 3 of them show negative effect. As a result of moderator analyzes, we see that the highest effect values are observed in the master's thesis, in the teaching of science and at the college level.

Keywords: Constructivist learning approach, traditional learning, academic achievement, meta-analysis, effect size

INTRODUCTION

At the age of information, the rapid changes occurring in technology make obsolete the newly produced informations and change them in a very short time. Every society, institutions and individuals are usually obliged to keep up with these changes. This is the reason that faces to all these changing institutions and changing situations, the self-renewal and development have become now a necessity. In this case, instead of learning by heart informations, individuals have the responsibility of producing new informations and products based on this ancient knowledge. This obligation for individuals led by the age of information has also affected education systems and institutions. Now, a system where learner receive all information as ready from the teacher is considered inadequate, but instead, it is necessary to pass a system where, the learners are active in their educational environment, configurate the old information in mind with new information, and use this information in order to produce new information. Because of this necessity, many countries change their traditional education system and adopt the constructivist learning approach and they organized their institutions of education accordingly. Due to the situations discussed above, in the researches and discussions about the education, the constructivism is, now, more and more, used in a remarkable way (Cunningham and Duffy, 1996). The constructivism is finding its place in the studies in different fields. The constructivism, which is a training theory and which is based on knowledge of the age of Socrates, is not only a concept of education. The constructivism, which is, at the same time, an epistemological theory and a concept, is knowledge and learning approach (Haney and McArthur, 2002). In terms of education, the constructivism is seen as an educational framework that appears very often in the studies of educational literature (Kinnucan-Welsch and Jenlink, 1998). According to this theory, learning is a process of establishing a link between the new information and the information that exists in individuals, during this process. The individual information is not piled on; individual establishes the basis of information by adding his own comment. By this aspect, teachers have an important role in the constructivist approach in which the core of learning system is the learner. With this approach, teachers do not directly transfer the information to the students; but they guide and help learners to reach the information and to construct it (Bryant, Kastrup, Udo, Hislop, Shefner and Mallow, 2013). As an intermediary between the students and education programs, teachers help them to learn and to develop their self (Holt-Reynolds, 2000). Teachers organize the learning process according to students' interests and needs, to incite to ask questions, to produce the new ideas, to make estimations and observations, to work in collaboration and to test their ideas (Kim, 2005). In relation with these aspects, constructivism requires the regulation of the academic environment which must be different from the traditional classroom environment.

A teaching and learning environment dominated by the constructivist approach is different from a teaching and learning environment dominated by the traditional approach. In an academic environment dominated by the traditional approach, information is given directly to students and there are no activities in which students can be active learners. In the constructivist learning environment, debates, and activities for the interests and needs of learners, a certain uncertainty and collaboration to provide creative thinking are organized for the learners (Taylor, Fraser and Fisher, 1997). In such an environment, students are motivated and directed to solving the problem with collaborative work. While doing these works, students' experiences are taken into account (Rice and Wilson, 1999). In the constructivist learning environment, the technology is used at the highest level. In the technology-assisted classrooms, project-based training, methods and techniques based on the collaborative work are used in order to make learners active (Means and Olson, 1995). In terms of these aspects, the constructivist approach proposes radical changes in teaching and learning environment unlike the traditional educational approach. In an environment, in a relaxed manner without being under any pressure, using students' past experiences and ideas acquired by a variety of sources, working on real-life problems by doing researches and interrogations, continuing teaching outside of the classroom, and where students are responsible for their own learning, it is seen that these learning approaches have a positive influence on students' academic achievement (Tenenbaum, Naidu, Jegede and Austin, 2001, Maypole and Davies, 2001). All of these in mind, in an educational environment dominated by constructivist learning, learning will be realized in a high level of efficiency and durability (Taşpınar, 2012).

In the constructivist approach that allowed a different perspective on education, we see also different measurement and evaluation activities. In this approach, learners are very active in the teaching and learning activities. Exams which do not allow thinking and commenting, which measures the knowledge and skills in the bottom rung of the cognitive level with multiple choice and short answer quizzes will be inadequate and insufficient. That is why, in the constructivist approach, in place of product-oriented learning, focusing on the process of learning by exhibition, project work, portfolio, scoring key diagnostic tree, checklists, performance evaluation, self-assessment, alternative assessment tools such as peer reviews should be used. Here, which is evaluated is not the product of learning but the learning process and that students continue learning throughout the assessment and evaluation studies. Considering all of this information, it can be concluded that the constructivist learning approach which use a different view in learning activities, have an important contribution on the academic achievement of students and on the durability of the informations learned.

Problem

Today, we see an increasing number of scientific studies. Different results made on a specific issue, are obtained from studies realized independently from each other. Even though studies enable comprehensive generalizations themselves, they can not provide a comprehensive description because of limitations such as sample size, time, transportation, number of practitioners. Because of the nature of the sciences of the education, in the research, the events and the facts are examined in their environment. The researcher try to explain and to comment on the events and on the facts intervened in their own environment (Yıldırım and Şimşek, 2011). In the researches for the social sciences, we see that the researches are not continued until obtaining a concrete solution (Karasar, 2005). To interpret knowledge in the social sciences and open the way to various researches, comprehensive and reliable top quality works are necessary (Akgöz, Ercan and Kan, 2004).

In order to make a more general description, important works obtained after scanning of literature works are benefited from many other studies (Cooper, 2010). This idea is the basis of the literature and the purposes of meta-analysis. Major studies through gathering synthesized individual work allow to the policymakers and researchers to see the *big picture* providing scientific generalizations and to give the opportunity for making an overall assessment. It is scientifically proved to what extent it is important to have applicable results in the social and behavioral sciences and it is necessary to have brief, feasible works and which will have the quality to be the bases of the new works (Özcan, 2008).

Training programs in Turkey is renovated in 2005 by putting the constructivist approach in the center of system. However, the importance of this approach has increased in the teaching-learning process and it has been revealed in several studies. There are a number of studies conducted around the subject of "Constructivist Learning Approach" which attracted the attention of educators in Turkey (Aktaş, 2013; Arseven, 2010; Çelebi, 2006; Kızılabdullah, 2008; Küçükyılmaz, 2003; Turgut, 2005; Türkoğuz, 2008; Üzel, 2007; Yazgan, 2007). In these studies, the effects of the constructivist approach on academic achievement, attitude, scientific process skills, persistence, motivation and the critical thinking are examined. Researches made from different angles about the constructive learning approach are needed to be combined, synthesized and evaluated.

In spite of the existence of many studies to determine the effects of constructivist learning approaches on the academic achievement, any meta-analysis survey has been found on this subject. In this context, the question of "what are the effects of the constructivist learning approach on learners' academic achievements?" is important to answer.

Purpose

The purpose of the research is to determine the effects of constructivist learning approach compared to traditional teaching methods on students' academic achievement by using the method of meta-analysis. For this, the meta-analysis of relevant studies in the literature has been studied. In addition, various working characteristics which may alter the effectiveness of constructive learning approach are determined. These are the types of publication, courses, level of education, sample size, practice time and methods of constructivist learning approach. Under this general purpose, the characteristics of the studies included in the meta-analysis, the differences between the effect sizes of constructivist learning approaches have been precized.

METHOD

In this section; several passages such as the used research model, data collection, the criteria, the coding of the data, the analysis and interpretation of data will be treated.

Research Model

In order to determine the effectiveness of PBL approach in this research, the meta-analysis method is used. Meta-analysis is a statistical technique for combining the findings from independent studies. Meta-analysis is a statistical procedure application used for the synthesis and interpretation of individual studies. A meta-analysis uses a statistical approach to combine the results from multiple studies in an effort to increase power (over individual studies), to improve estimates of the size of the effect and/or to resolve uncertainty when reports disagree (Cohen, Manion and Morrison, 2007; Ergene, 1999; Glass, 1976; Hunter and Schmidt, 1990). Briefly, meta-analysis is the analysis of other analysis.

Collection of Data

Works included in this research are composed of published or not published master and doctoral dissertations about "Constructivist Learning Approach" in Turkey between the years of 2003-2014 that have the same problematic and the necessary statistical data analysis and of articles published in scientific journals.

Scanning of graduate theses held in Turkey was realized both in Turkish and in English on the website of the Thesis Center of National Council of Higher Education between 01/12/2015 and 15/02/2015. In this context, thesis including the key words "constructivism", "constructivism approach" in English and the key words "yapılandırmacı öğrenme", "yapılandırmacılık" in Turkish are listed. At the end of listing results, 46 theses respecting the criteria of our research were chosen. After the analysis, thesis having the appropriate problematic and the criteria are included in this study. Investigations were carried out in the form of examination of the full text. For restricted articles and the thesis that we did not find in the Thesis Center, we asked to be in contact with authors or the library of Universities. In this way, we reached a total of 3 theses. 2 theses could not be reached in any manner. During the examination, 28 theses on the effect of the constructivist learning approach for students' academic achievement and conforming to our topic have been found. These theses have also been included in the meta-analysis study.

In order to achieve articles published in Turkey, literature scanning is done, between January 2015 and February 2015, from ULAKBİM and ASOS databases which are generally index scientific journals in Turkey. As master's and doctoral thesis are also published in Turkey as articles, because of this situation articles and theses are mutually screened and compared. 18 articles were included in the meta-analysis at the end of screening of studies about the effect of the constructivist learning approach on learners' academic achievements.

2 of master's thesis published about the academic achievement have 3 different methods, 2 of them have 2 different methods and one of articles has 2 different methods. Therefore, these studies were reviewed separately one by one and thus they have been included in the meta-analysis. In this way, 53 works were collected in the meta-analysis.

Inclusion Criteria

The criteria used for studies that were included in the study are:

- 1) The study should be held in Turkey between 2003-2014.
- 2) The study has to be a master's or doctoral thesis written in Turkish or English, or an article published in scientific journals.

- 3) It must include experimental studies.
- 4) The constructivist learning approach must be used on experimental group and the traditional teaching approach must be used on the control group.
- 5) It should include the mean and standard deviation of academic achievement of students in control group and experimental group.
- 6) It should give the sample size of the studied groups.

Coding of data

In order to determine if the studies are conforming to the criteria of inclusion for meta-analysis and in order to make a comparison between different studies in meta-analysis, a comparison Coding Form is regulated by the researchers. Information in the form of coding are selected to determine the general characteristics of the study. Some features available in the form of coding are as follows: the title, the author of the work, the type of study, year of study publication, the person by whom the scale was prepared, duration of application, the city in which the work was realized, the educational level of the group of students to whom the work was applied, the statistical data of the work, the effect size of the study.

With the aim of guaranteeing the reliability of the study, it is important that the coding is made separately at least by two researchers. One of them having made the coding in this study have completed his PhD in educational sciences and the other one is continuing his doctoral studies. The analysis of the first and second researcher is determined by comparing the number of overlapping and non-overlapping coding. After using the formula of reliability (Miles and Huberman, 2002), it is found that the reliability of coding is 97%. The values obtained from 70% and above are considered sufficient for the reliability criteria (Yıldırım and Şimşek, 2011). Therefore, the coding can be said to be reliable. Non-overlapping coding is checked again by two researchers and is corrected by them, after a common decision.

Analysis and Interpretation of Data

In this study, in order to analyze the data, the meta-analysis of the study effect is used. In the meta-analysis of the study effect, standardized effect size indicated by Cohen *d* is used. This statistical method provides a comparison of the effect size revealed by turning a common measurement system of the data of independent operations used in multiple studies. (Borenstein, Hedges, Higgins and Rothstein, 2009; Ellis, 2010; Üstün and Eryılmaz, 2014). Besides, it is advisable to make the analysis of the power indicating the possibility that the effect size was correctly obtained.

As the scales used for the researches included in the study were not the same and as we can have studies with values contrary to research, in order to test the differences between the groups to whom constructivist learning approach is applied and to whom it is not applied, in acceptable standards, standardized arithmetic averages adapted to the statistics of meta-analysis are used (Cohen, 1988; Huffcutt, 2002; Hunter and Schmidt, 1990; Lipsey and Wilson, 2001; Rosenthal, 1991; Schulze, 2004; Wolf, 1986). Various researches are in the contents of the works integrated into this research. Effect sizes obtained in studies using different tests on different samples were calculated separately. Weight is calculated as the relative weight of the work.

While interpreting the importance of effect sizes obtained by results of meta-analysis, some classifications are used. Effect size classified as follows according to Cohen, Manion and Morrison (2007):

- $0 \leq \text{Effect size value} \leq 0.20$ poor,
- $0.21 \leq \text{Effect size value} \leq 0.50$ modest,
- $0.51 \leq \text{Effect size value} \leq 1.00$ moderate,
- $1.01 \leq \text{Effect size values}$, strong has an important effect.

In this meta-analysis research, the effects of constructivist learning approach are compared to the effects of traditional learning methods. In the study, constructivist approach and traditional learning methods are considered as independent variable and the students' academic achievement is considered as dependent variable. In the moderator analysis, the test of analogue ANOVA is used.

Comprehensive Meta-Analysis (CMA), MetaWin and Excel are used in order to analyze the data. For the overall effect size, sub-group analysis, publication bias, forest plot and funnel plot are used; for normal distribution graph, Meta Win is used; and for power analysis, Excel is used.

FINDINGS

In this section, the findings of the meta-analysis are studied. The result of analysis obtained by merging of problems of the research with meta-analysis and their interpretations are studied.

Findings of Overall Effect Size

The findings of our meta-analysis about the effects of constructivist learning approach on students' academic achievement and about the effects of traditional teaching methods on students' attitudes are presented below.

In order to calculate the effect size, first of all, we should determine the meta-analysis model which will be used. Firstly, the fixed effects model (SEM) and a random effects model (REM) is required for testing the homogeneity of the study. The findings concerning the homogeneity of studies and findings about overall effect size are represented in table 1 below.

Table 1: Findings about homogeneity and about overall effect size

Model	Value of average effect-size	Degrees of freedom	Homogeneity value	Chi-Square table value	Standard error	%95 confidence interval for the effect-size	
						Lower limit	Upper limit
SEM	0.927	52	531.540	69.832	0.038	0.852	1.002
REM	1.156	52	62.440	69.832	0.125	0.910	1.402

From table χ^2 , at the significance level of 95% and with fifty-two degrees of freedom, the critical value was found to be 69.832. When homogeneity value of work has been included in the survey calculated based on the fixed effects model $Q = 531.540$, while the random effects model was found to be $Q = 62.440$. The value of homogeneity found by the random effects model seems not to exceed the critical value. That is why, it is said that the value of effect size of studies is prepared according to the random effects model by taking into account their homogeneous feature.

As a result of the analysis made by the random effects model, the average effect size value was found to be 1.156 with a standard error of 0.125. At the 95% confidence interval, the lower limit of the effect size is found to be 0.910, the upper limit is calculated to be 1.402. When looking at the statistical significance, Z is found to be 9.222 and p is calculated as 0.000. That is why the obtained results can be said to be statistically significant. As a result of the power analysis, the value is found as 0.972. This is a high value and we can say that this work is about to determine an actual effect in a right way.

The fact that the effect size value is found to be a positive value (+1.156) shows that the process effect is in favor of the experimental group. Therefore, the constructivist approach has more positive effects on the students' academic achievement than traditional teaching methods. This influence level is considered in a strong level according to the classification of Cohen and his friends (2007).

Findings regarding the effect size of the study are shown in Figure 1.

Meta Analysis

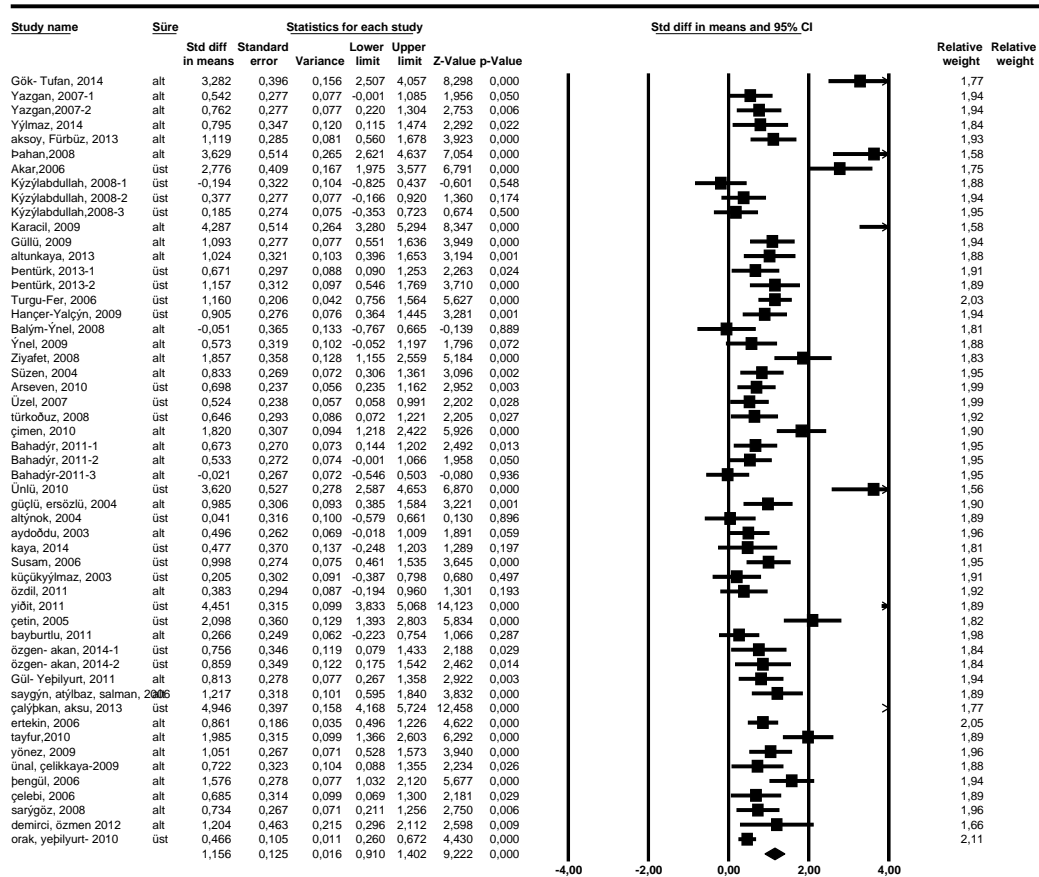


Figure 1. Effect Size values of Studies

The squares in the graph show the effect size of their study. The lines on both sides of the squares indicate the upper and lower limits of the effect size at the 95% confidence interval. The area of squares shows the weight in the overall effect size of studies where they belong. Diamond located in the rhombus shape below precises the overall effect size of the study.

While the examination of these studies' effect sizes, the smallest effect size value is calculated as -0.194 and the highest effect size value is determined as 4.946. Referring to the studies' effect sizes, we see that 50 of the 53 studies showed a positive effect size and 3 of them have negative effects. Whereas 50 studies with a positive effect are in favor of the experimental group of constructive approach, 3 studies with negative effects has an effect in favor of the control group to whom the teaching methods are applied.

Normal distribution graph of studies' effect size included in the research are shown in Figure 2.

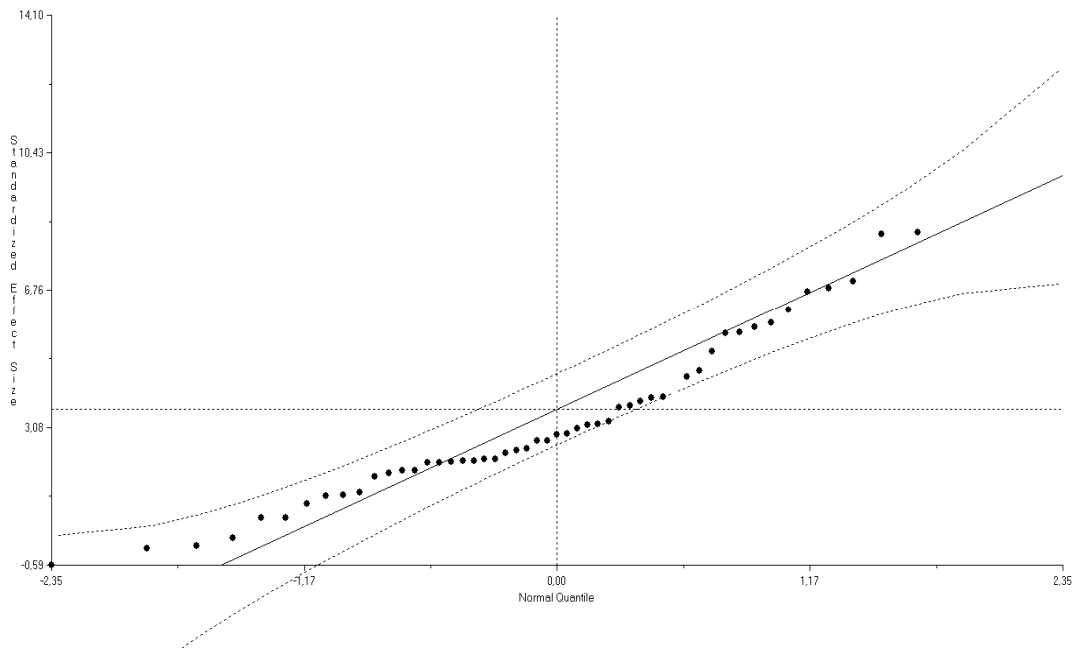


Figure 2. Graph of the normal distribution about effect sizes

When looking at normal distribution graph of studies' effect sizes, it is seen that the effect sizes are actually near to normal distribution and it is seen that they do not exceed the specified limits. Therefore, it is determined that studies included in the research show the normal distribution.

The overall effect size value about constructivist learning approach on students' academic achievement is calculated as being 1.156, which can be considered as a strongly high level. In order to reduce the effect size value from 1.156 to 0.01, the required number of 4860 is found, the effect size value of this number is zero. We can say by looking at the several numbers of studies that the results obtained from the analysis are reliable and that their publication bias is low. Besides, with the aid of the Funnel Plot graph (Funnel Chart), we can interpret if there is a publication bias or not.

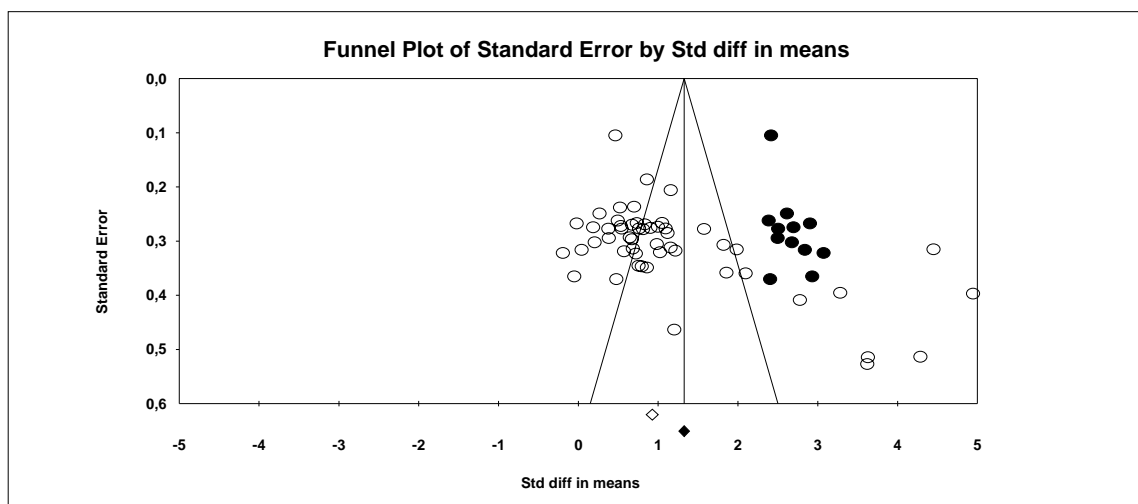


Figure 3. Funnel Plot Chart about effect sizes

In case of there is a publication bias on the Funnel chart, the effect sizes take place in an asymmetric way. In case of the lack of publication bias, they will take place in a symmetrical distribution. Referring to Figure 3, it can not be said that the effect sizes are distributed in a symmetrical structure. In the graph of Duval and Tweedie created by the trimm and fill method, if 12 studies are placed at the right side of the graph, it will be a fully

symmetric structure work. Nevertheless, it can be said that, for a study that combined with the aid of the meta-analysis of 53 publications, it is a low publication bias.

Findings about the problems

In terms of academic achievement; findings about the effect sizes according to the moderators are presented in Table 2.

Table 2: Effect of size differences by moderators

Variables	Homogeneity Value between groups (Q_B)	p	n	ES	ES (%95 CI)		Standard Error (SE)
					Min.	Max.	
Publication type	7.437	0.024					
Master's thesis			25	1.341	0.985	1.697	0.182
Ph.D.			9	0.420	-0.165	1.004	0.298
Article			19	1.272	0.861	1.682	0.209
Courses	40.167	0,000					
Computer			2	2.621	1.431	3.812	0.607
Biology			7	1.014	0.410	1.617	0.308
Geography			1	1.985	0.383	3.586	0.817
Religion			3	0.127	-0.787	1.041	0.466
Science			2	2.890	1.761	4.018	0.576
Learning							
Physics			11	0.559	0.084	1.034	0.242
English			2	2.743	1.621	3.865	0.573
Chemistry			6	1.002	0.348	1.657	0.334
Math			10	0.858	0.357	1.360	0.256
Music			2	1.861	0.689	3.032	0.598
Social sciences			4	1.385	0.563	2.207	0.419
Turkish			3	1.872	0.919	2.825	0.486
Educational level	9.838	0.020					
Primary			14	0.936	0.473	1.398	0.236
Secondary			26	0.996	0.656	1.337	0.174
High School			8	1.363	0.746	1.984	0.315
University			5	2.254	1.478	3.029	0.396
Sample Size	1.007	0.316					
1≤N≤29			30	1.043	0.709	1.377	0.170
30≤N			23	1.299	0.926	1.672	0.190
Practice time	0.173	0.678					
1≤s≤19			31	1.113	0.786	1.440	0.167
20≤s			22	1.220	0.832	1.608	0.198
Method	11.416	0.576					
4Mat			2	0.807	-0.562	2.177	0.699
5E			12	1.303	0.748	1.858	0.283
7E			1	-0.051	-2.000	1.898	0.994
Computer-based learning			2	1.438	0.092	2.784	0.687
Scientific Letters			2	0.255	-1.080	1.591	0.681
Invention			1	2.776	0.794	4.758	1.011
Drama			2	2.544	1.147	3.942	0.713
Realistic math education			1	0.524	-1.348	2.396	0.955
Visual			1	0.646	-1.256	2.548	0.970
Solidarity			15	1.086	0.592	1.580	0.252
Concept map			1	1.024	-0.894	2.943	0.979
Problem-based learning			3	1.415	0.284	2.547	0.577

Constructivism	8	1.112	0.443	1.780	0.341
Structured	2	0.913	-0.436	2.263	0.689
Homework					

There could find a statistically significant difference between groups which formed for publication types, courses and educational levels. There could not find a statistically significant difference between other groups.

CONCLUSIONS

A total of 53 studies about effects of constructivist learning approach on students' academic achievement are brought together. The total number of samples is 3271 (number of samples of control group and the experimental group). According to the random effects model, the overall effect of studies are between 0,910 and 1,402 interval of the confidence and according to the effect size classification of Cohen and his friends, they have a strong level of effect. According to the results of research made in order to analyze the effects of constructivist learning approach on students' academic achievements compared to the traditional learning method, we observe positive effects. This effect is seen on a strong level. While 50 of 53 studies are in a positive way, 3 of them give negative results. 3 studies with negative effects do not explain why exactly they have results in favor of traditional learning methods. In order to reduce to 0.01 the effect size value of 53 studies merged with meta-analysis method, we need to have at least 4860 studies which have zero as effect size value. By looking at the important number of studies, we can say that analysis results are reliable and that they have a low publication bias.

According to the results of analysis by type of publication, significant differences are detected. The highest effect size values are found in the thesis (ES=1.419) and in articles (ES=1.272). The effect size value seems to be in a small level for PhD thesis (ES=0.420).

When the results of the analysis are carried out according to the course, significant differences are obtained. The highest effect size values are found in the courses of science education of (ES=2.890), English (ES=2.743) and computer (ES=2.621) seems to be on course. However, the few number of studies about courses poses a problem with the probability of generalization of the results. Besides, courses like geography, biology, chemistry, music, social studies and Turkish seem to have important effect size values. The lowest effect size values are found in course of religion (ES=0.127), and it is determined that it is a weak level.

When we look at the results of analysis made according to students' educational level, significant differences have been identified. All bottom variables have high effect size values. However, because of the huge difference between the effect size value of the University which has the highest effect size (ES=2.254) and the effect size value of primary first level which has the lowest value (0.936), significant differences can be seen.

When we look at the results of analysis made according to the size of the sampling work group, any significant difference has been identified. The effect size value of both bottom variables are on strong levels. By contrast, the highest effect size values are found for people who are 30 years old and above (ES=1.299), the lowest effect size value is found for people who are between 1 and 29 years old (ES=1.043).

Concerning the results of analysis made according to the application time, significant difference has not been identified. The effect size value of both bottom variables is seen to be on strong levels. By contrast, the highest effect size values are found for application time with 20 and above (ES=1.220), the lowest effect size value is found for application time between 1 and 19 (ES=1.113).

For the results of analysis made according to the method used, significant difference has not been identified. The highest effect size values are found for invention (ES=2.776) and for drama (ES=2.544). However, the few number of studies about methods poses a problem with the possibility of generalization of the results. The lowest effect size values are found for the methods of 7E (ES=-0.051) and for scientific letter (ES=0.255). It has been determined that the other methods have high effect size values.

Based on the results obtained in this study, the following suggestions can be made for practitioners, the program developers and researchers:

1. As a result of a meta-analysis study conducted to determine the effects of constructivist learning approach on students' academic achievement; it was concluded that the constructivist learning approach makes more significant contribution to learners' academic achievement than traditional learning methods. Therefore, teachers can use the constructivist learning approach to improve student academic achievement.

2. It has been found that the use of constructivist learning approach in different lessons and subjects has a high effect size for students' academic achievements, except the lesson of religious instructions. That is why, the constructivist learning approach can be used in almost all areas.
3. When analyzing the effect size of constructivist learning approach on students' academic achievement according to learners' educational level, it is determined that the highest effect size values are found for college and high school level. According to this result; in order to improve students' academic achievement, constructivist learning approach can be especially used for these educational levels.
4. When analyzing the effect size of constructivist learning approach on students' academic achievement according to the sample size, the effectiveness of constructivist learning approach is proved for every class. According to this result; in order to increase students' academic achievement, constructivist learning approach can be used effectively in classrooms with different class sizes.
5. After studying the effect size of constructivist learning approach on students' academic achievement according to implementation period, any significant difference has been found. Therefore, constructivist learning approach can be applied in different implementation periods.
6. In order to increase the academic achievement of the students, methods based on constructivist learning approach, except scientific letter methods and 7E methods can be used.
7. Because of its effectiveness and its positive effects on students' academic achievement, constructivist learning approach can be more involved in education programs. In the curriculum other than religious instruction be given more space. More importance can be given to the constructivist learning approach in every lesson except religious instructions.
8. Constructivist learning approach can be more used in university's and high school's programs.
9. Studies that have different effect size levels can be examined one by one and we can try to determine by which factors these studies may be affected.
10. The effect sizes of the Master's thesis and articles have been found to be higher compared to the doctoral thesis. The reasons of this may be researched and explored.
11. According to the meta-analysis' results, by examining the studies which have a negative effect size value, we can try to search which factors are in the origin of this negative effect size.
12. Further studies about constructive learning approach can be realized by using a smaller number of variables.

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