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The Effect of Constructivism on Attitudes towards Lessons: A Meta–Analysis Study

Çetin TORAMAN‡

Engin DEMİR§

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Abstract

Problem Statement: A number of recent studies on constructivism that have been conducted separately (independently) have arrived at very different results. Throughout the ten-year period in which the constructivist approach has been applied, there have been studies that have researched the effect of the newly–introduced approach on student attitudes towards lessons. In such situations, there exists a pressing need to look at all previous studies so that new studies approach subjects from a more developed and advanced perspective and arrive at more scientifically reliable results. For this reason, there is a critical need for a more comprehensive and detailed approach to the subject under research so as to interpret, contrast, and provide better access for researchers with regard to the studies already conducted on this topic. Meta–analysis has been accepted as a method that helps in this aim.

Purpose of Study: The goal of this study is to bring together and contrast independent studies conducted on the effect of the constructivist approach on student attitudes to lessons and to analyze their results.

Methods: This research study employs a meta-analysis method. Meta-analysis is defined as the grouping of apparently similar studies conducted on a particular topic according to specific criteria and combining the quantitative findings pertaining to these studies.

Findings and Results: The findings of this research demonstrate that students in the experimental group, in which studies were conducted

‡ Teacher, Ministry of National Education (MNE), toramanacademic@gmail.com

§ Lecturer, Karabuk University, Vocational School, Karabuk, edemirakademik@gmail.com

according to the constructivist approach, displayed many more positive attitudes towards lessons than those in the control group who were taught according to more traditional learning methods. Of the moderating factors observed in the study, only the differences in lesson subjects were seen to be of significance. This conclusion was reached when studies regarding the attitudes of students were considered. On the whole, the attitudes of students towards science and technology lessons were found to be more positive than those displayed towards mathematics and other subjects in the curriculum.

Conclusions and Recommendations: With regard to the subjects in the study, positive attitudes towards science lessons were more widespread than towards math and other subjects in which the constructivist approach was employed. This result can be attributed to the fact that the nature of science and technology lessons makes them more appropriate for the use of the constructivist approach. We suggest that the research be repeated and extended in such a way as to include literature that incorporates foreign publications.

Key Words: Constructivism, Learning, Attitude, Meta–Analysis, Moderator Analysis

Introduction

The provision of education encompasses activities that require effort and great financial cost. For this reason, such undertakings need to be conducted in a planned, systematic, and serious manner. The ultimate goal of education should be that knowledgegained by the student should be both permanent and tangible. By trying to apply the suggestions of institutional research studies, educators and researchers have made great efforts to try to reach the goals of educational programs in a more effective way. The contructivist approach is one philosophy that attempts to offer concrete guidance in education. By providing meaning to knowledge, students learn in such a way that they are able to construct what they have learnt more effectively so as to avoid mere memorization.

While constructivism may, at first regard, be considered a theory of teaching, it has in fact emerged as a concept associated with the nature of a knowlege and endeavours to explain how the individual constructs it. According to Arslan (2007), constructivism, when considered as a theory of teaching, is the name of an approach that observes how people learn and is a concept that philosophically is closely related to epistimology. In Shunk's view (2012), those who have adopted the constructivist approach do not consider knowledge an absolute reality. Knowledge may only be created from within and may not be taken (simply) from external sources. As the individual creates knowledge himself, this knowledge does not carry any intrinsic accuracy or correctness. This situation stems from the fact that knowledge is formed from the individual's very different experiences and beliefs.

The constructivist learning approach that supports the thinking that knowledge should be created by the student himself through an active learning process has led to a number of false perceptions on the part of students as to what the philosophy actually involves (Kaya, 2015; Ozmen, 2004). This approach offers important guidance on what needs to be done through the application of effective teaching methods to bring about conceptual changes within students (Izci, 2008). The increase in interest in the theoretical principles and applications of the constructivist approach has led to the incorporation of this approach into more practically focused learning and teaching programs and the development of a number of revised learning strategies (Aslan & Aydin, 2015).

In order to provide a more effective learning system, one in which students can acquire specific abilities underpinned by the emotional and social aspects of personal development, the constructivist approach that incorporates student–centred learning activities was taken to be the basis of the reformed educational system to replace the previous teacher-centred system. The related changes were included in the teaching programs that came into effect in the 2004–2005 academic year in Turkey. During the course of the ten years in which these programs have been applied, a number of academic studies have been conducted that have monitored the progress of these reforms.

There are a large number of academic studies that focus on the effect of the constructivist approach on lessons within the Turkish educational system. The content of these articles concentrate mainly on science and mathematics teaching. Some of the principal themes, methods, and strategies discussed in the 28 theses/dissertations and 15 articles that were used as sources of data for this research are as follows: Cooperative Learning, The 5E Learning Model, The 7E Learning Model, Problem-Based Learning, Drama, Reflective Thinking, Creative Thinking, Research-Based Learning, and Mind-Based Learning. According to the results of the final tests conducted with the experimental group, 35 of the 43 studies show that the constructivist approach increased positive attitudes towards lessons. In eight studies (Akbas, 2011; Akin, 2007; Andac, 2007; Bulut, 2009; Inan, 2013; Kaplan, 2010; Karaduman, 2005; Tarhan, 2007), there had been no statistical change with regard to student attitudes towards lessons. In order to arrive at a common result from these research studies from which very different conclusions were reached, it is very important to expand on the findings of these studies in which very similar data collection and scientific/statistical methods were employed.

One of the most important characteristics in education that needs to be closely monitored, and that is one of the most problematic to define, is that of 'success'. This need develops because, as an extension of well-planned and well-scheduled activities, an increase in student rates of success is extremely important. To increase success, students need to have a high level of motivation and have positive attitudes and an interest towards the lesson. Because it is an important factor in success, attitude is an important characteristic in education. Attitude is an important overall psychological characteristic that defines the object of attitude, the feelings towards that object and positive and negative tendencies with regard to feelings, beliefs, and

behaviors. For this reason, we have made the effect of the constructivist approach on student attitudes the subject of this study.

The aim of this study is to bring together and contrast independent studies on the effect of the constructivist approach on student attitudes to lessons and to analyze their results. Some recent studies on the topic have been conducted separately (independently) and have arrived at very different results (Aydin, 2014). The hundreds of studies already conducted on constructivist education are a good example of this phenomenon. So as to interpret, contrast, and provide better access for researchers regarding - to the studies already conducted on this topic, there is a pressing need for a more comprehensive and detailed approach to the subject (Yurtseven & Altun, 2014). Meta–analysis has been accepted as a method that helps in this aim. There is overwhelming agreement in academic circles that meta–analysis research synthesis is one of the most widespread methods for the aim in this study (Lipsey & Wilson, 2001; Schulze, 2007, p.87). This method unifies the results obtained from small–scale studies conducted by individuals at different times and places to present a variety of facts on the topic. By widening the number of samples, the quantitative results derived from various studies are emphasized. This process ensures that the researcher obtains information that is more precise. In our analysis of the existing academic literature, we encountered only one meta–analysis study that examined the effect of the constructivist approach on attitudes towards lessons (Semerci & Batdi, 2015). Semerci and Batdi (2015) allocated space in their research to 28 studies on the topic. The constructivist approach was examined according to three principal moderating factors: academic success, retention, and attitude. In this study, by contrast, we have examined the effect of the constructivist approach on lessons by referencing 43 existing studies in which we have observed five moderating factors: the level of education, the lesson in which the research was applied, the type of publication, the geographical region in which the research was conducted, and the year of publication.

At different educational levels, the ages of the children, their levels of knowledge, and the fact that viewpoints towards lessons may change were thought to be moderating factors in these studies. Because the manner in which the constructivist approach is applied may differ due to the nature of the lesson, the type of lesson should be regarded as a moderating variable. The type of publication (article, doctoral thesis, master's-level thesis) may be used as a moderating factor because of the sensitvity shown to the research. The various geographical regions influence the types of samples used, and the university with which the researcher is affiliated also makes a difference. For this reason, geographical region is considered an appropriate moderating factor. In particular, the constructivist approach that entered the Turkish educational system as a result of reforms to educational programs carried out in the 2004-2005 academic year has affected the nature of the studies that were conducted. The constructivist approach that was already being researched prior to 2005 attracted increased interest after that year. However, there were fewer topics related to the constructivist approach in the research after 2010. This situation meant that the year was considered a moderating variable.

A particular subject may often be studied by different researchers through the use of different sample groups. In a similar fashion, a topic that had already been studied by other researchers, namely "the effect of the constructivist approach upon attitudes towards lessons", was taken as the focus of this study. In studies on a particular topic, it is possible for researchers to arrive at sometimes similar and sometimes contrasting results. In such situtations, there exists a critical need to look at all existing studies so that new studies approach subjects from a more developed and advanced perspective and arrive at more scientifically reliable results. In response to this need, the meta–analysis (approach) is proposed as a solution. In accordance with the aim of this research, the constructivist approach is defined in relation to traditional methods. In keeping with this aim the following hypotheses were tested.

Hypothesis 1: There exists a general difference in attitudes toward lessons between students who have undergone a process of learning and teaching based on the constructivist approach and those who have experienced a learning and teaching process based on traditional teaching methods.

Hypothesis 2: There exists a difference in the attitudes toward lessons among students at different levels of the education system who have undergone a process of learning and teaching based on the constructivist approach and those of corresponding levels who have experienced a learning and teaching process based on traditional teaching methods.

Hypothesis 3*:* There exist (large) differences in the attitudes toward lessons in different subjects between students who have undergone a process of learning and teaching based on the constructivist approach and those who have experienced a learning and teaching process based on traditional teaching methods.

Hypothesis 4: In educational publications, differences in attitudes toward lessons are reported to exist between students who have undergone a process of learning and teaching based on the constructivist approach and those who have experienced a learning and teaching process based on traditional teaching methods.

Hypothesis 5: In varying geographical regions, there exist differences in attitudes toward lessons between students who have undergone a process of learning and teaching based on the constructivist approach and those who have experienced a learning and teaching process based on traditional teaching methods.

Hypothesis 6: During different years there have existed differences in attitudes toward lessons between students who have undergone a process of learning and teaching based on the constructivist approach and those who have experienced a learning and teaching process based on traditional teaching methods.

Method

Research Design

This research study employs a meta-analysis method. Meta-analysis is defined as the grouping of apparently similar studies conducted on a particular topic according

to specific criteria and combining the quantitative findings pertaining to these studies (Dincer, 2014, p.4; Hunter, Jackson & Schmidt, 1991, cit. Erkus, 2013, p.109). Cohen, Manion, and Morrison describe meta-analysis in simple terms as the 'analysis of analyses'. Glass (1976) and Petitti (2003, p.13) explain meta–anlysis as the observation of the extent or size of the effects of a phenomenon that has already been reported in research articles (cit. Chambers, 2004). Through this method, an advanced perspective of the research on the topic to which the meta-analysis is applied can be gained, which allows opportunities for the formation of new models and theories (Erkus, 2013, p.109).

Research Instrument and Procedure

The scientific studies included within this research were selected in accordance with specific criteria. Those studies that did not meet the criteria outlined above were not included within the study. With every study included in this research, researchers were careful to ensure:

- That all participants in the experimental group were studied within an educational environment set up and organized in accordance with the constructivist approach.
- That all participants in the control group were studied within an educational environment set up and organized in accordance with traditional teaching methods (no constructivist approach).
- A clear definition of the participants' attitudes with regard to lessons.
- A careful recording of the posttest results of both the experimental and control groups.
- A measurement of attitude as a proven tool of validity and reliability.
- A clarification of the arithmetical averages, standard deviations, and participant numbers of the experimental and control groups.
- The composition of the article or thesis that was produced at the end of the scientific research.
- That all studies analyzed were conducted in Turkey.
- That factors such as the educational rank and seniority of participants, the lesson for which attitudes were assessed, the type of publication that published the study, the geographical region from which the study originated, and the year of the study's publication were all carefully taken into account.

Research Sample

The studies included in the research were taken from the following scientific databases: Pro Quest Citations, EBSCO, Google Academic, National Thesis Search System of the Higher Education Instititution (in Turkish YOK). Twenty-eight theses/dissertations and 15 articles containing the required information were included in this study. The 43 studies mentioned were all conducted between 2004 and 2015.

Data Analysis

The studies that satisfied the criteria stipulated were then uploaded into the "Comprehensive Meta-Analysis" (CMA) software, and analysis was carried out. The standard unit of measurement in the meta-analysis is the 'effect size' or 'influence quantity'. By determining the size of the effect of each individual study, there is an attempt to arrive at a common effect size that combines those of all studies. In calculations of the effect size, "accuracy, incidence and precision are considered the significant factors". The effect size is influenced by factors such as accuracy, variance, standard error, the homogenity of the sample, the size of the sample, and the research model (Borenstein, Hedges, Higgins & Rothstein, 2009, p.3, p.50). At this point, the most important question is which method one should employ to calculate the effect size. In the subject literature, two effect models are employed. These are the fixed effect model and the random effect model.

Just as in all other statistical analyses, extreme data that may affect the analysis should be avoided. Thus, in meta–analysis, researchers try to avoid extreme studies that appear at first to contain data that may be considered heterogenous. All studies that incorporate the fixed effect model within the meta–analysis conducted assume that the true effect size must be the same and that the true effect size is shared (Borenstein, Hedges, Higgins, & Rothstein, 2009, p.78–79). The most important assumption inherent in the fixed effect model is "that for meta–analysis studies there exists only one true effect size". The random effect model, on the other hand, is based on the thinking that factors such as the "age of the participants, educational level or class sizes may differ from study to study" (Ustun ve Eryilmaz, 2014, p.10). As a result of the increased weighting of studies, the random effect model does not reach the same conclusion as that arrived at by the fixed effect model because it does not see the contribution to the effect as being uniform and because it attempts to predict the average distribution of the effect. In the random effect model, small–sample studies are weighted in accordance with their sample sizes and in such a way that they are not removed from the meta–analysis process just because of their limited size. By using this method, information is provided that allows the research to arrive at a prediction of the common effect of the other studies. In fact, the random effect model is suited not only for small-scale studies but rather is valid for all studies used for meta-analysis (Borenstein, Hedges, Higgins, & Rothstein, 2009, p.78–79).

Another important statistical criterion that is applied when deciding whether to use the fixed or the random effect model is the so–called Q analysis. In Q analysis, the hypothesis is tested on the basis of whether all studies share or do not share the general effect. If, after analysis, the significant value (p) is below the critical value, then all studies share the general effect. In such a situation, there exists heterogenity between studies (Borenstein, Hedges, Higgins, & Rothstein, 2009, p.112; Hedges & Olkin, 1985, p.124–128). The I^2 figure then provides information concerning the amount of heterogenity found.

All studies included in this research were analyzed for publication bias using a funnel plot. In situations where there is no publication bias symmetry should exist on

the graph plotted. Furthermore, the accumulation of studies on the internal and external parts of the graph show the contribution of the studies incorporated into the research and indicate that the effect size of the research is high. According to Cooper, Hodges, and Valentine (2009, p.437-440), if there is publication bias, the graph assumes an assymetrical appearance, and one corner of the graph appears emptier than the other one. In such an event, small–scale studies that contribute little to the common effect fall into the gaps at the bottom corners of the funnel. On the graph, the y axis indicates the standard error. It follows therefore that the accuracy of the meta–analysis provides information about the sensitivity of the data. Studies that accumulate at the top of the y axis are those in which accuracy and sensitivity are high.

Moderating analysis is an analytical method that tests the direction of differences between the subgroups and differences between the average effect sizes (moderating factors). The significance of the statistical difference between moderating factors is tested using the Q statistical method developed by Hedges and Olkin (1985, p.157-159). In this method, (Q_w) is divided into two areas, $Q_{between}$ (Q_b) and Q_w, and analysis is conducted on these two areas. While the homogenity of the internality of the moderating factor under analysis is tested, Q_b is used to test the homogenity between the groups. In this study, the significance of the differences between the moderating factors is observed using the values of Q_b. The common effect of the five moderating factors that are thought to play a role in influencing the average effect size were determined. These factors are the level of education received by the participant, the lesson under discussion, the geographical region, and the year and type of publication.

Findings

The information in the studies included in this research is summarized in Table 1. Fourty–three studies that met the criteria designated for meta–analysis were included in the research. These studies were predominantly conducted at the primary level and with a focus on science and technology lessons. Studies that concentrated on the effect of the constructivist approach on attitudes towards lessons were mainly found at the master's level and in academic articles. The greatest number of these studies was carried out in the Central Anatolian Region. Furthermore, the overwhelming majority of studies on the effect of the contructivist approach on attitudes towards lessons was carried out prior to 2010. The main reason for this fact may be the reform of primary school teaching programs in the 2004–2005 school year.

Table 1.

Information in the studies included in the research

The number of studies taken for meta-analysis	43	
The sample size reached after examination of studies taken for meta–analysis	$N_{(Experimental)}$	$N_{(Control)}$
	1.529	1.539
The level of education on which studies were conducted	***Primary School***	33
	Middle School	4
	University (Bachelor's Degree)	6
The distribution of lessons on which studies were conducted	***Science and Technology***	26
	Mathematics	8
	Other	9
The distribution of publications on which studies were conducted	***Doctoral thesis***	5
	Master's Thesis	23
	Article	15
Distribution of studies according to the geographical region in which they were conducted	***Eastern Anatolia***	5
	Central Anatolia	15
	Mediterranean	2
	Aegean	7
	South-Eastern Anatolia	5
	Black Sea	3
	Marmara	6
The year in which study was conducted	***Before 2010***	26
	2010 and after	10
	Not-specified	6

The Effect of the Constructivist Approach on Student Attitudes towards Lessons

Before the effect of this approach was analyzed, the studies were examined for both the general effect and publication bias. In order to define whether the fixed or random effect test should be used, the degree of heterogenity was measured. At the end of the analysis conducted for his study, the 43 studies were defined as heterogenous ($Q_{(42)}$=564,690, p<.05). The significant nature of the Q statistical figure confirmed the assumption that the studies differed from one another. The degree of heterogenity of the studies was at a level of 93% (I^2 = %92,562). According to Cooper, Hedges, and Valentine (2009, p.263), when the I^2 level exceeds 75%, the studies are considered heteregenous. On account of the heterogenic nature of the studies, the meta-analysis conducted produces more accurate results when calculating the effect size by means of the random effect model. The effect size and the weighting of the meta-analysis are shown in Figure 1.

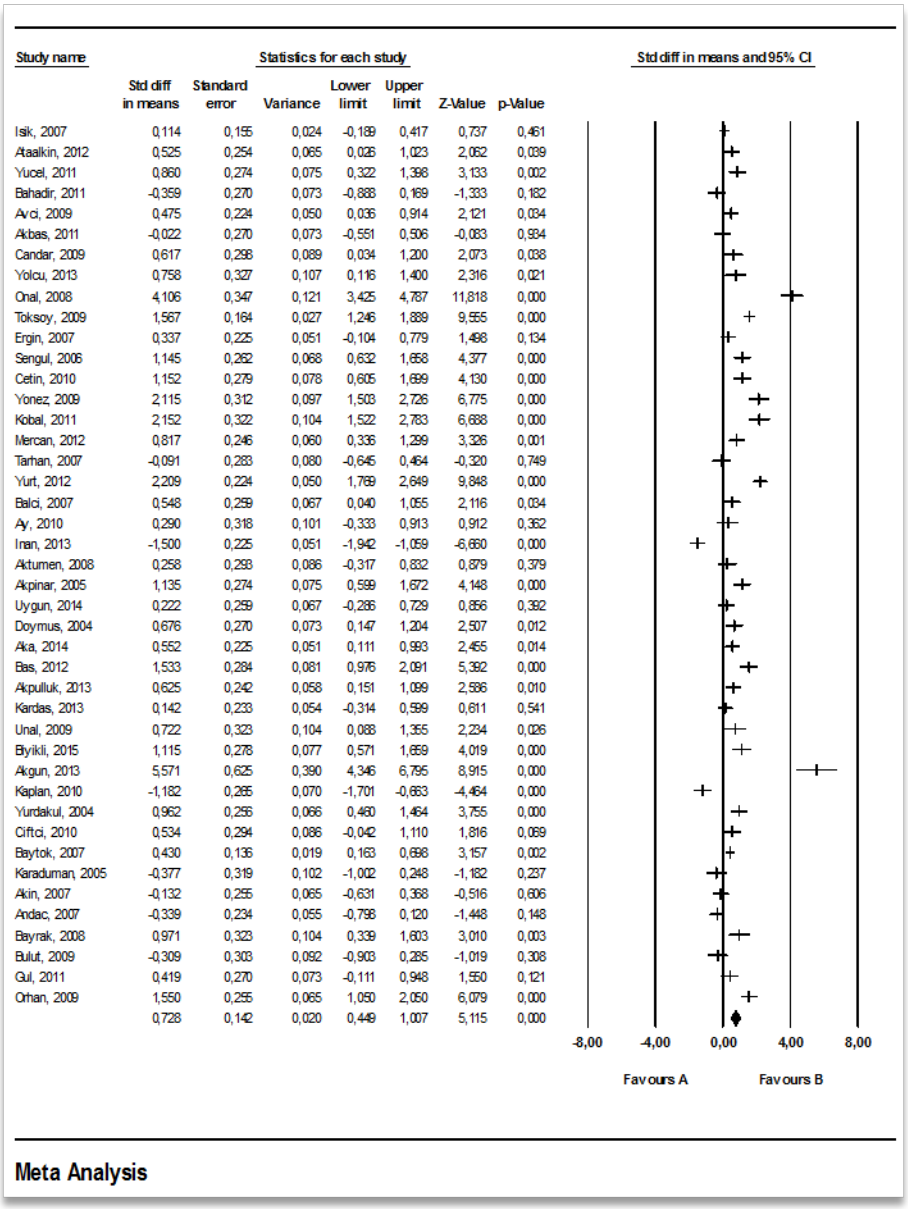


***Figure* 1.** *A Forest Plot showing attitudes towards lessons with use of the constructivist approach*

The weightings of the studies included within the research and the individual effect sizes can be seen in Figure 1. In Table 2, the results of the meta–analysis conducted in accordance with the random effect model are summarized.

Table 2.

Findings pertaining to the effect size of the meta-analysis in accordance with the random effect model

Number of studies (N)	Effect size (ES)	Standard Error (SE)	Z	p	Effect Size at a Confidence Interval of 95%	
					Lower boundary	Top boundary
43	0,728	0,142	5,115	0,000	0,449	1,007

When the results of our study were analyzed according the random effect model, the effect size was found to be significant with a confidence interval of 95% (Z = 5,115, p<.05). The value of the average effect size was found to be 0,728 and positive. With such findings, the effect of the calculation could be said to be in favour of the experiment group. In this particular case, the attitudes of students who had undergone education in learning and teaching environments that were based upon a constructivist approach are more positive in attitude than those who had not been taught in accordance with such a philosophy. To determine if the results were subject to publication bias, we examined them by way of a funnel plot. The graph that shows the publication bias of this study can be found in Figure 2.

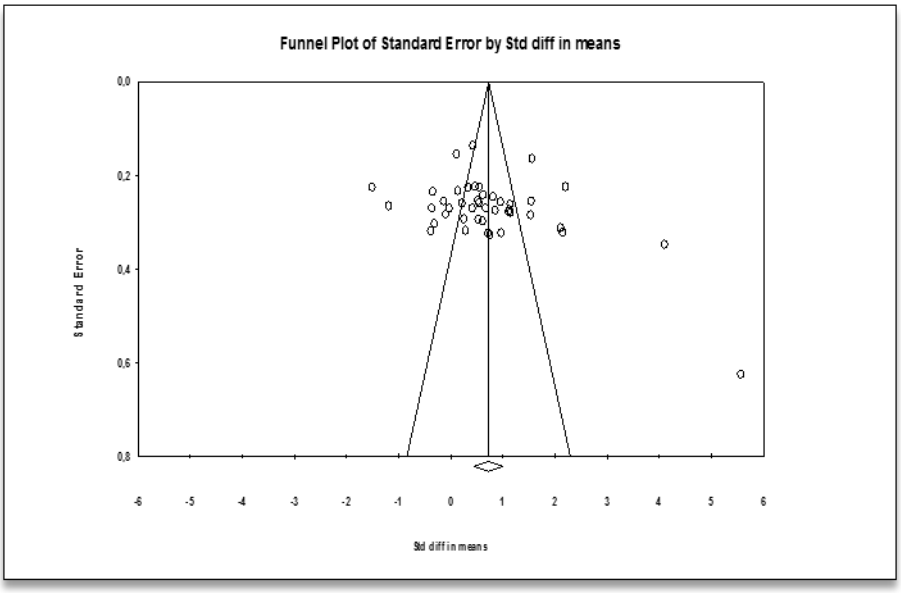


Figure 2. *Funnel Plot showing publication bias*

As can be seen in Figure 2, all studies included in the research accumulated on the most outward and internal parts of the graph. Furthermore, the shape of the graph is not symmetrical on both sides. The studies that fall outside the area of the graph are studies in which the effect size and partiality (bias) is small. Moreover, distortions or breaks in the symmetricality are an indication of publication bias. There was an attempt to ensure symmetry. Through an alteration in method that moved the graph from one side to the other, the value acquired for the effect size was 0,642.

The Effect of the Constructivist Approach on Attitudes towards Lessons With Regard To the Level of Education

Regarding the educational level the students found themselves in during the time of this research, there was an attempt made to observe whether differences could be ascertained among those who had undergone a process of teaching and learning in accordance with the constructivist approach. The results are summarized in Table 3.

Table 3.

Findings on the effect size at different levels of the educational system

Educational level	Number of studies (N)	Effect size (ES)	Standard error (SE)	Z	p	Effect Size at a Confidence Interval of 95%	
						Lower boundary	Top boundary
Primary	33	0,727	0,139	5,22	0,000	0,454	1,001
Middle School	4	0,203	0,727	0,28	0,780	-1,222	1,627
Undergraduate/ bachelor's degree level	6	1,550	0,255	6,08	0,000	1,050	2,050
$Q_{between}$ (Q_b) = 0,840 df = 2 p = 0,657							

We can see in Table 3 that the research was conducted at three different levels of the educational system. On examination of Table 3, we are able to ascertain that heterogenity does not exist between attitudinal studies when the moderating factor of educational level ($Q_{(b)\,(2)}$ = 0,840, p>.05) is taken into consideration. Differences in levels of education do not represent an important factor in the meta–analysis process.

The Effect of the Constructivist Approch on Attitudes towards Lessons With Regard To the Subject Taught

We also attempted to observe whether individuals who had undergone a teaching and learning process employing the constructivist approach differed when subjects were taken into consideration. The results are summarized in Table 4.

Table 4.

Findings on the effect size in different subjects

Leson	Number of studies (N)	Effect size (ES)	Standard error (SE)	Z	p	Effect Size at a Confidence Interval of 95%	
						Lower boundary	Upper boundary
Science and Technology	26	0,897	0,153	5,857	0,000	0,597	1,197
Mathematics	8	-0,285	0,269	-1,058	0,290	-0,812	0,243
Other	9	1,095	0,344	3,179	0,001	0,420	1,770
$Q_{between}$ (Q_b) = 16,298 df = 2 p = 0,000							

In Table 4, we can see the research on the effect of the constuctivist approach on attitudes towards lessons with reference to science and technology, mathematics, and other subjects (a merging of the other subjects into a single group). On examining Table 4, we find that attitudinal studies demonstrate heterogenity in accordance with the subject moderating factor ($Q_{(b)\ (2)}$ = 16,298, $p<.05$). In light of the meta–analysis conducted in connection with the effect of the constructivist approach on mathematics lessons, we can conclude that the effect size is not significant. In contrast, the effect size with regard to science and technology and other lessons is significant.

The Effect of the Constructivist Approach on Attitudes towards Lessons With Respect To Types of Publication

In our study, we researched whether the attitudes of those individuals who had undergone a process of learning and teaching based on the constructivist approach differed by taking publications that focused on attitudes towards lessons as the

moderating factor. Our aim was to see if there were differences in the effect sizes. The results are summarized in Table 5.

Table 5.

Findings on the effect size in different types of publications

Type of publication	Number of studies (N)	Effect Size (ES)	Standard error (SE)	Z	p	Effect Size at a Confidence Interval of 95%	
						Lower boundary	Upper boundary
Doctoral thesis	5	1,742	0,670	2,599	0,009	0,428	3,056
Master's Degree Thesis	23	0,620	0,157	3,946	0,000	0,312	0,928
Academic article	15	0,651	0,270	2,414	0,016	0,123	1,180
$Q_{between}$ (Q_b) = 2,664 df = 2 p = 0,264							

Clearly, the effect of the constructivist approach upon attitudes towards lessons was taken as a topic of focus in all three types of publications: doctoral theses, master's degree theses, and in academic articles. Table 5 shows the different types of publications as the moderating factor and the finding that there was no heterogenity observed between attitudinal studies ($Q_{(b)\ (2)}$ = 2,664, p>.05). In this meta–analysis, differences in types of publications are not considered a significant factor in the differentiation.

The Effect of the Constructivist Approach on Attitudes towards Lessons With Regard To the Geographical Region in Which the Study Was Conducted

The researchers also examined whether there were differences between individuals who had undergone a teaching and learning process based on the constructivist approach in various geographical regions where research was conducted. The results are summarized in Table 6.

Table 6.

Findings on the size effect with regard to differing geographical regions

Geographical region	Number of studies (N)	Effect size (ES)	Standard error (SE)	Z	p	Effect Size at a Confidence Interval of 95%	
						Lower boundary	Upper boundary
Eastern Anatolia	5	0,124	0,401	0,309	0,757	-0,663	0,911
Central Anatolia	15	1,008	0,229	4,410	0,000	0,560	1,456
Mediterranean	2	1,503	0,725	2,073	0,038	0,082	2,924
Aegean	7	0,870	0,273	3,188	0,001	0,335	1,405
South-Eastern Anatolia	5	0,531	0,685	0,775	0,438	-0,812	1,874
Black Sea	3	0,671	0,518	1,295	0,195	-0,345	1,687
Marmara	6	0,413	0,090	4,597	0,000	0,237	0,589
$Q_{between}$ (Q_b) = 10,524 df = 6 p = 0,104							

We can see that the studies were carried out in the seven principal geographical regions of Turkey. Table 6 shows that no heteregenity among the studies exists ($Q_{(b)(6)}$ = 10,524, p>.05). In meta-analysis, geographical region is not considered a significant factor in the differentiation of studies.

The Effect of the Constructivist Approach In Terms of the Year in Which Studies Were Carried Out

The researchers also studied whether there was a difference in attitudes betwen those who had undergone a constructivist process of learning–teaching based on the year the studies were carried out. The results are summarized in Table 7.

Table 7.

Findings on size effect of the different years in which the research studies were conducted

Year	Number of studies (N)	Effect size (ES)	Standard error (SE)	Z	p	Effect Size at a Confidence Interval of 95%	
						Lower boundary	Upper boundary
Before 2010	26	0,689	0,167	4,122	0,000	0,361	1,016
2010 and afterwards	10	1,122	0,319	3,511	0,000	0,496	1,748
Unspecified	6	0,280	0,470	0,596	0,551	-0,641	1,201
$Q_{between}$ (Q_b) = 2,484 df = 2 p = 0,289							

We observed that there was a greater number of research studies conducted on the effect of the constructivist approach upon attitudes towards lessons prior to 2010 than during that year and afterwards. After 2010, there has been a decline in the studies carried out on the topic. On examination of Table 7, we observe that no heterogenity exists between attitudinal studies when the moderating factor of the study's year is taken into account ($Q_{(b)\ (2)}$ = 2,484, p>.05). In meta-analysis, the year in which the research is conducted is not considered to be a significant factor in creating differentiation.

Discussion and Conclusion

Before beginning the meta-analysis for this research study, the criteria by which studies would be included in the research were specified. The research was conducted using 43 studies that satisfied the criteria. These studies predominately focused on primary school science and technology lessons and were overwhelmingly featured in master's degree theses and acadmemic articles. They were conducted most frequently in the Central Anatolian Region and were mainly carried out prior to 2010. The distribution of the studies poses the question as to why the constructivist approach is applied less frequently to lessons outside the fields of science and technology. According to Yilmaz and Cavas (2006), the effect of the constructivist approach on science education is more pronounced. Because the nature of science lessons lends itself to more practical application, researchers have tended to prefer examining the effect of the constructivist approach on science lessons. However, this tendency may originate from the fact that there was an increase in the number of studies conducted on costructivism as a result of changes to the educational program

implemented in 2005. In particular, the widely accepted notion that the constructivist approach is the fundamental approach of education has been abandoned as a result of changes to programs carried out by the National Ministry of Education during the past five years. Educators and researchers no longer claim that programs are developed in accordance with the constructivist approach, and there is no emphasis observed on the effective use of the constructivist approach within the learning-teaching process.

Before testing whether there were different effect sizes in accordance with the moderating factors, tests were conducted to discover which group the average effect size favoured. Following analysis of test results occurring from the use of the random effect model, we found that the average effect size was significant, with 95% degree of reliability ($Z = 5{,}115$, $p<.05$). The value of the effect size was found to be 0.728 and positive. We established that the effect of the constructivist approach on the attitudes to lessons of the experimental group was positive. A similar result was reached in a research study conducted by Semerci and Batdi (2015, p.175). According to this study, students who have undergone their education in a learning environment in which the constructivist approach is employed can be said to hold higher scores in attitudes to lessons than those students who have been educated in a setting where traditional teaching methods have been employed. At the conclusion of the meta-analysis, we found more positive results in the attitudes towards lessons from the experimental group in which the constructivist approach was employed than in the other group. The studies that were included within the scope of this research were scientific research studies. They were conducted in controlled environments in which the moderating factors were closely monitored and were, therefore, reliable. From 2005, the National Ministry of Education was thought to have developed and applied programs in accordance with the constructivist approach. Nevertheless, in examinations that (educational institutions from) Turkey participated in, such as PISA or TIMSS, no noticeable changes (in performance) took place. Moreover, at the schools themselves, teachers mentioned no noticeable changes in their students' motivation towards lessons. The discrepancy between the results in scientific studies and applications in the schools should be of interest to researchers. Further studies on this topic will play an important role in explaining this difference.

The studies found to have the greatest positive effect on the experimental group when considered on an individual basis were the following: Akgun (2013), Onal (2008), Yonez (2009), Kobal (2011), Yurt (2012), Sengul (2006), Cetin (2010), Akpinar (2005), Bas (2012), Biyikli (2015), Toksoy (2009) ve Orhan (2009). The effect sizes of these studies were significant. Within the context of the results of the meta–analysis, those studies that had exerted the greatest positive effect on the control group were also specified. These were the studies by Inan (2013) and Kaplan (2010). The studies that were carried out on the new programs that were first applied in 2004–2005 either did not have a significant effect or were seen to favour the experimental group, whereas the study conducted in 2010 and two further studies favoured the control group. This situation introduces the possibility that over time the constructivist approach has in fact been internalized, and, therefore, the control group that has

been compared to the experiment group for the purpose of the study may have experienced a process of teaching and learning that incorporated qualities of the constructivist approach while being simplistically labelled 'traditional'. All studies included in this research accumulated on the outer and internal parts of the graph. The studies that were found to make little contribution to the common effect of the research and that showed publication bias were highlighted. In meta-analysis studies, one of the most important factors to endanger the reliability is publication bias. In such a situation, studies that are abandoned and not published on account of the results not being meaningful or that are not published after being presented at a conference may be the reason why studies never reach their ultimate goal. As a result, all studies are not exposed to meta-analysis. Studies that examine the effect of the constructivist approach on attitudes towards lessons but that are not converted into a form suitable for publication may be subject to a repeated process of meta-analysis so as to reduce the likelihood of publication bias and to raise the validitiy of results.

In this study, the moderating factors were taken to be the level of education the study concentrated on, the lesson subject on which the study focused, the geographical region, the type of publication, and the year of publication. It was established that with regard to the data collected, only the lesson subject was significant in creating differentiation, while the other factors were found to be insignificant. Regarding the lesson subjects, positive attitudes towards science lessons were more widespread than towards lessons in math and other subjects in which the constructivist approach was employed. This result could be correlated with the fact that the nature of science and technology lessons makes them more appropriate for the use of the constructivist approach. Ozdemir, in one of his studies (2004), determined that the attitudes of students in the experimental group improved when science lessons were taught in which skills-based laboratory methods were applied. Researchers have established that science lessons that are conducted through the incorporation of experiments increase students' success and foster positive attitudes towards science, which leads to a wider enjoyment of the lesson (Aydogdu, 2000; Ergin, Akgun, Kucukozer & Yakal, 2000; Hall & Quinn, 2014).

This research study was limited only to academic studies conducted in Turkey. If studies on "the effect of the constructivist approach on student attitudes towards lessons" conducted in different countries were subjected to meta-analysis, the results of the research conducted would be strengthened. We suggest that the research be repeated and extended in such a way as to include literature that incorporates foreign publications.

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Yapılandırmacı Yaklaşımın Derse Yönelik Tutuma Etkisi: Bir Meta-Analiz Çalışması

Özet

Atıf:

Toraman, C. & Demir, E. (2016). The effect of constructivism on attitudes towards lessons: A meta–analysis study. *Eurasian Journal of Educational Research*, 62, 133-160, http://dx.doi.org/10.14689/ejer.2016.62.8

Problem Durumu: Günümüzde belirli bir konuda birbirinden bağımsız olarak yürütülmüş ve farklı sonuçlara ulaşmış çok sayıda çalışmaya rastlanmaktadır. 10 yılı aşkın süredir uygulamada olan yapılandırmacı öğrenme yaklaşımının, derse yönelik tutuma etkisini araştıran birçok çalışma mevcuttur. Böylesi durumlarda tüm çalışmalara, çalışmalar üstü bir bakış açısıyla bakma ve bilimsel bir sonuca ulaşma ihtiyacı hissedilmektedir. Bu nedenle yapılan çalışmaların sonuçlarını yorumlamak, karşılaştırmak ve yeni araştırmacılara yol açmak için daha geniş ve detaylı bir araştırma yaklaşımına ihtiyaç duyulmaktadır. Bu ihtiyaca meta–analiz karşılık vermektedir. Türkiye'de yapılandırmacı yaklaşımın derse yönelik tutuma etkisi üzerine çok sayıda akademik çalışma bulunmaktadır. Tez ve makale niteliğindeki bu çalışmalar fen ve matematik öğretimi ağırlıklıdır. Farklı sonuçlar elde edilen bu

araştırmalardan ortak bir sonuç çıkarılması, benzer veri ve bilimsel/istatistiksel yöntemlerin kullanıldığı çalışmaları anlamlandırmak açısından önemlidir.

Araştırmanın Amacı: Bu araştırmada on yılı aşkın süredir uygulamada olan yapılandırmacı öğrenme yaklaşımının derse yönelik tutuma etkisini araştıran çalışmalar meta–analiz yöntemi ile bir araya getirilerek sentezlenmeye çalışılmıştır. Bu doğrultuda araştırmanın amacı; yapılandırmacı yaklaşımın geleneksel yönteme göre derse yönelik tutuma etkisini belirlemektir. Ayrıca öğretim kademeleri, farklı dersler, çalışmanın yayınlandığı yayın türleri, çalışmanın yapıldığı coğrafi bölgeler, çalışmanın yapıldığı yıl moderatör değişken olarak kullanılmıştır.

Araştırmanın Yöntemi: Bu araştırma, meta–analiz türünde bir araştırmadır. Belirli bir konu ya da alan hakkında yapılmış benzer görgül çalışmaların belirli ölçütler altında gruplandırılması ve bu çalışmalara ait nicel bulguların birleştirilerek analiz edilmesine meta–analiz denilmektedir. Çalışmaların meta–analize dâhil edilmesi için kullanılan ölçütler şunlardır: Çalışmada (*i*) deney grubunda yer alan tüm katılımcıların yapılandırmacı yaklaşıma dayalı öğrenme–öğretme ortamından geçmiş olmasına, (*ii*) kontrol grubunda yer alan katılımcıların geleneksel olarak ifade edilen öğrenme–öğretme ortamından geçmiş olmasına, (*iii*) katılımcıların derse yönelik tutumlarının belirlenmiş olmasına, (*iv*) deney ve kontrol grubundan son test ölçümlerinin alınmış olmasına, (*v*) deney ve kontrol grubuna ait aritmetik ortalamaların, standart sapmaların, katılımcı sayısının belli olmasına, (*vi*) bilimsel araştırmalar sonucu üretilen makale ya da tez olmasına, (*vii*) çalışmanın Türkiye'de yapılmış olmasına, (*viii*) çalışmalarda katılımcı grubun yer aldığı eğitim kademesinin, sınıfın, tutumun ölçümünün yapıldığı dersin, yayın türünün, araştırmanın yapıldığı coğrafi bölgenin ve yıl bilgisinin olmasına dikkat edilmiştir. Araştırmaya dâhil edilen çalışmalar için, "ProQuest Citations, EBSCO, Google Akademik, Yüksek Öğretim Kurumu (YÖK) Ulusal Tez Arama Sistemi" bilimsel veri tabanlarından alınmıştır. Belirlenen ölçütleri karşılayan çalışmalardan elde edilen bilgiler "Comprehensive Meta Analysis (CMA)" programına aktarılmış ve analizler bu program aracılığıyla yapılmıştır. Meta–analiz temel birim olarak etki büyüklüğünü kullanır. Her bir çalışmanın etki büyüklükleri belirlenerek buradan ortak etki büyüklüğüne gidilmeye çalışılır. Burada en önemli soru; "Bu etki büyüklüğü hangi yöntemle hesaplanacaktır?". Alanyazında iki etki modeli kullanılmaktadır. Bunlar; sabit etkiler modeli ve rastgele etkiler modelidir. Sabit etkiler modeli meta–analize dâhil edilen tüm çalışmalar için gerçek etki büyüklüğünün aynı olduğunu ve gerçek etki büyüklüğünü paylaştıklarını varsaymaktadır. Rastgele etkiler modelinde küçük örneklemli çalışmalar örneklem büyüklükleri doğrultusunda ağırlıklandırılır ve bu yolla meta–analizden çıkarılmaz. Araştırmaya dâhil edilen çalışmalardaki yayın yanlılığı huni grafiği (funnel plot) aracılığıyla incelenmiştir. Huni grafiğinde yayın yanlılığının olmadığı durumlarda bir simetri olması gerekmektedir. Ayrıca çalışmaların grafiğin iç ve uç kısımlarına toplanması da araştırmaya alınan çalışmaların etki büyüklüğüne katkısının yüksek olduğunu göstermektedir.

Araştırmanın Bulguları: Meta–analize belirlenen ölçütleri karşılayan toplam 43 çalışma dâhil edilmiştir. Bu çalışmalar ağırlıklı olarak ilköğretimde ve fen ve teknoloji

dersinde yapılmıştır. Yapılandırmacı yaklaşımın derse yönelik tutuma etkisi çalışmaları ağırlıklı olarak yüksek lisans tezleri ile makalelerde konu edinilmiştir. Çalışmalar en çok İç Anadolu bölgesinde gerçekleştirilmiştir. Yapılandırmacı yaklaşımın derse yönelik tutuma etkisi konusundaki çalışmalar büyük çoğunlukta 2010 öncesinde gerçekleştirilmiştir. Yapılan analiz sonucunda 43 çalışmada ortalama etki büyüklüğünün hangi grup (deney–kontrol) lehine olduğu test edilmiştir. Rastgele etkiler modeline göre yapılan analiz sonucunda ortalama etki büyüklüğü değeri %95 güven aralığında anlamlı bulunmuştur ($Z = 5{,}115$, $p<.05$). Ortalama etki büyüklüğü değeri 0,728 ve pozitif bulunmuştur. Yapılandırmacı yaklaşımın derse yönelik tutuma etkisi bu yaklaşımla öğrenme–öğretme sürecinden geçen deney grubu lehine olduğu tespit edilmiştir. Analiz sonucuna göre yapılandırmacı öğrenme yaklaşımının kullanıldığı deney grubu öğrencileri geleneksel öğrenme yönteminin kullanıldığı kontrol grubu öğrencilerinden derse yönelik daha olumlu tutuma sahiptir. Huni grafiği aracılığıyla yapılan incelemede yayınlarda yanlılık olduğu saptanmıştır. Araştırmada etkisi incelenen moderatör değişkenlerden yalnızca ders değişkeni anlamlı bulunmuştur. Fen ve teknoloji dersinde yapılan tutum çalışmaları matematik ve diğer derslere göre derse yönelik tutumda daha olumlu sonuçlara ulaşmıştır.

Araştırmanın Sonuç ve Önerileri: Analiz sonucuna göre yapılandırmacı öğrenme yaklaşımının kullanıldığı deney grubu öğrencileri geleneksel öğrenme yönteminin kullanıldığı kontrol grubu öğrencilerinden derse yönelik daha olumlu tutuma sahiptir. Etki büyüklüğü tek tek çalışmalar bazında incelendiğinde deney grubu lehine en büyük etkiye sahip çalışmalar; Akgün (2013), Önal (2008), Yönez (2009), Kobal (2011), Yurt (2012), Şengül (2006), Çetin (2010), Akpınar (2005), Baş (2012), Bıyıklı (2015), Toksoy (2009) ve Orhan'ın (2009) çalışmalarıdır. Bu çalışmaların etki büyüklükleri anlamlıdır. Yapılan meta–analiz sonucunda çalışmalar içinde kontrol grubu lehine anlamlı etki büyüklüğüne sahip çalışmalar olduğu da belirlenmiştir. Bunlar: İnan (2013) ve Kaplan'ın (2010) çalışmalarıdır. 2004–2005 Eğitim–Öğretim yılı itibariyle uygulamaya konulan yeni öğretim programına yakın yıllarda yapılan çalışmaların ya anlamlı bir etkiye sahip olmadığı ya da deney grubu lehine etkiye sahip oldukları görülmektedir. Oysa 2010 ve sonrasında yapılan iki çalışmada kontrol grubu lehine fark bulunmuştur. Bu durum zamanla yapılandırmacı yaklaşımın içselleştirildiğini, bu durumda deney grubuna kıyaslanan kontrol grubundaki geleneksel şeklinde isimlendirilen öğrenme ortamında da yapılandırmacı yaklaşımla benzer niteliklere sahip bir öğrenme–öğretme süreci yaşanmış olabileceğini düşündürtmektedir. Araştırmanın yurtdışı literatürdeki çalışmaları da kapsayacak biçimde genişletilerek tekrarlanması önerilir.

Anahtar Kelimeler: Yapılandırmacılık, Öğrenme, Tutum, Meta–Analiz, Moderatör Analiz