

## Methodological Trends of 500 Most Cited Educational Research Articles in the Last Decade

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**Abstract.** The purpose of this research is to reveal which paradigm/research method has dominated the 500 articles that have the highest citation in the last ten years in the field of education and examine whether the dominant paradigms impact the citations. The research was designed as a conversion mixed methods research, which does not highly used in the literature. During the research process, the articles were obtained from the Web of Science Core Collection, Social Science Citation Index-SSCI. To analyze the data obtained, independent researchers coded different articles on an Excel worksheet. Following the intercoder reliability process, two themes and eight sub-themes were identified. As a result of the research, it was found that the most preferred methodological paradigms were respectively quantitative, mixed methods and qualitative. One-way ANOVA test results showed that mixed-method and quantitative articles had higher usage statistics than qualitative articles. Moreover, the most preferred mixed methods design was found to be embedded design.

**Keywords:** Educational research, methodological trends, mixed method research, citation analysis, usage statistics.

### Introduction

The methodology that researchers seek to respond to the complex problems of real-world research in social sciences, healthcare, and educational sciences is developing day by day to get valid and reliable results. Data collection techniques, data characteristics, data collection process, number of subjects, experiment patterns, the purpose of the research, and the philosophy they are based on are used to define borders of all these methods (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2013). However, the classification used predominantly in educational sciences is quantitative, qualitative and mixed methods research based on the paradigms (worldviews) (Teddlie & Tashakkori, 2009).

The paradigm is defined as the whole of beliefs, values, and techniques shared by community members within a given time frame (Kuhn, 2016). Denzin and Lincoln (2008) defined the paradigm covering the terms ontology, epistemology, axiology, and methodology as the clusters of beliefs that direct actions. That is why there is more than one paradigm in scientific world. Lincoln and Guba (1985) classified

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paradigms as constructivist (naturalist) and positivist in the first paradigm classification. Teddlie and Tashakkori (2009) expanded this classification to the five paradigms as constructivism, transformative paradigm, pragmatism, post-positivism, and positivism. Similarly, Creswell and Plano Clark (2017) classified paradigms into four categories, post-positivism, constructivism, transformative, and, pragmatist paradigm. While the positivist and post-positivist paradigms are often associated with quantitative research methods, constructivist and transformative paradigms are associated with qualitative research methods. These two research methods are contradictory. However, the pragmatist paradigm is typically associated with mixed methods research, and it enables the researchers find a compromise. Although chronologically, paradigms emerged as positivist, post-positivist, constructivist, transformative and pragmatist, all these paradigms have shaped the world of science for a long time.

Each paradigm and the research method have its typical characteristics, and the primary purpose of them is to guide the research process. However, each research method has different claims about scientificity. The scientific value and scientific impact of each are different. Compared to other methods, the emergence of qualitative methods is based on the philosophical views of schools such as phenomenology or hermeneutics or the views against the quantification and statistical methods in social sciences in the first half of the 20th century (Allwood, 2012). Although the qualitative methods began to spread in the 1950s and 1960s, they did not fully participate in scientific research until the 1980s. In qualitative research, the researcher's presence affects the research process, and therefore, the role of the researcher is noted down in the report. In this way, the position of the researcher during the study is revealed. So, the researchers are not independent of their judgments and their values are reflected in the research process. In addition, the researcher is the primary data collection source in the research. For this reason, the researcher must collect the raw data in a qualified and transparent way. Thus, the results obtained by the analysis will be reliable and valid (McCusker & Gunaydin, 2015).

Moreover, after the data collection process in qualitative research, the researcher reflects on the whole process intending to deepen (Leppink, 2017). In this part of the research, the experiences of the researcher will contribute to the results. While reporting the results, passive use is not desired, but dense, rich, and deepened direct writing is preferred (Johnson & Onwuegbuzie, 2004). To sum, qualitative research methods are based on reality which focuses on the explaining and understanding the dynamics of social relationships, which cannot be quantified. That is why the post-positivist, constructivist or interpretive paradigm is in the foreground in qualitative studies.

According to Leppink (2017), qualitative research accepts multiple truths, while quantitative research advocates a single truth. That is due to the difference among positivism, post-positivism, and interpretive paradigms. Although the researchers are the people carrying out the process in quantitative research, they must be objective. To achieve that, they must be detached from their judgments and values during the whole research process. The steps of quantitative research are clear. For this reason, the process is planned before the data is collected. Since it is systematic and planned, it allows repetition at the same situation and conditions. It also enables to make comparisons (McCusker & Gunaydin, 2015). Even the language used in reports in quantitative research is passive, and the use of technical terms is intense. It is a way to show that the person is objective. Also, quantitative research methods deal with the quantifiable aspect of reality contrary to qualitative research methods (Queirós, Faria, & Almeida, 2017).

Another claim is as follows: While qualitative research is exploratory, quantitative research is confirmatory. However, quantitative research also has exploratory sides, such as k-mean clustering and exploratory factor analysis. At the same time, quantitative data can be used to explore the studies using big data and eye-tracking. Similarly, forensic studies are both qualitative and confirmatory (Leppink, 2017). Also, big data has changed the situation. When the quantitative researchers encounter unexpected data in the data collection process, even they must consider how the process will proceed as the qualitative researchers do. That is why, it can be said that there is a natural tendency to mixed methods research.

Recently, it has been believed that the controversy between qualitative and quantitative research methods can be solved with a mixed research method. The mixed methods research will ensure that the strengths of both qualitative and quantitative methods are combined to reach qualified data (Leppink, 2017). In this case, repeatability will also increase. According to Johnson and Onwuegbuzie (2004), both quantitative and qualitative studies include empirical observations. Both research methods strive to make their processes reliable. According to them, people confuse epistemological rationale with methodology. A quantitative rationale logic will not prevent the use of qualitative data collection tools. Although some agreements about the use of quantitative and qualitative methods have been seen in recent years, the discussion among researchers that follow pure qualitative and quantitative methods will always continue. For this reason, mixed methods research based on a pragmatic paradigm has emerged in the 1960s. Despite its emergence in 1960s, the mixed methods research models have emerged in the 1990s. Pragmatists both accepted the external reality and believed that the values would be effective while interpreting the results (Onwuegbuzie, 2002).

While researchers who followed pure qualitative and quantitative research methods believed that paradigms and methods should not be blended, pragmatists believed more than one method could be used in one study. According to these researchers who followed pure qualitative and quantitative ways, each method has different ontological, epistemological, and axiological assumptions. However, according to pragmatists, this is a false dichotomy. Neither the quantitative method must be fully positivist nor the qualitative method must be fully postpositivist or interpretive (Onwuegbuzie & Leech, 2005). In mixed methods research, researchers can seek an answer for the research problem without limiting their choices (Johnson & Onwuegbuzie, 2004). With this aspect, it rejects dogmatic thoughts and practices. Also, approaching the research process with a pragmatic and pluralistic approach will enable knowledge development and increase quality (Maxcy, 2003).

When the literature was reviewed, many studies that investigated the methodological aspects were found. According to the analysis of Queiros et al. (2017), the number of qualitative studies conducted in 2006-2016, indexed in Web of Science, Scopus, and EBSCO databases, was approximately 23 million, while the number of quantitative studies was approximately 16 million. According to this finding, it can be said that the qualitative method was preferred between 2006 and 2016. Since the mixed methods research is not included in this study, a precise comparison cannot be made. In another study, Firat (2016) investigated the methodological paradigm preferences of 101 ICT-oriented young education researchers. The research paradigm preferences of participants were found to be 30% mixed, 33% qualitative, and 37% quantitative, respectively. Even though ICTs have an in-depth influence on scientific research, it could be stated that young educational researchers do not sufficiently adopt the new paradigm of mixed methods research. As an exciting result, the findings of path analysis demonstrated that “scientific contribution” motivation significantly predicted mixed paradigms preference of young educational researchers.

Rossmann and Wilson (1985) also identified the rationale of why the mixed methods should be used. According to them, both quantitative and qualitative methods support and approve each other with triangulation. Richer and more complete data can be accessed. In addition, the data obtained can be expanded, and new situations can be discovered. Mixed methods provide a holistic perspective with the long-term participation, observations, and triangulation. On the other hand, Creswell and Plano Clark (2017) stated that the researchers have different opinions about the dominant paradigm in mixed methods research. According to these views, it is argued that in mixed methods research, one or more paradigms can be dominant according to the type of the pattern. Another view argues that the expert communities have decided the dominant paradigm in the field, and this aspect can vary from one community to another. Therefore, it is crucial to understand these perspectives, considering that each researcher will demonstrate different worldviews in their actions (Özden & Saban, 2017).

Studies examining mixed methods research are also available in the literature (Creswell, 2014; Plano Clark, 2005). Creswell (2014) examined how mixed methods research was reported by focusing on their

writing processes in their research. Plano Clark (2005) focused on using mixed methods research in three disciplines (counseling psychology, primary care, and physics education research) and examined 60 empirical mixed methods research in detail. As a result of the study, he reached four mixed methods research designs (concurrent triangulation, concurrent nested/embedded, sequential exploratory, and sequential explanatory). As a result of interviews with 12 mixed method researchers, it was revealed that the researchers were affected by many attitudes and psychological factors while searching for answers to the research questions. These factors included researchers' methodological worldviews and attitudes in the relevant discipline. It was observed that the researchers divided the articles into two as empirical and methodological, as in the Journal of Mixed methods Research (Creswell, 2014; Plano Clark, 2005). In another aspect, while the parties put forward the scientific claims of each research method or paradigm, it is seen that the studies conducted with different research methods have different citation numbers. Citation enables the researchers to show another scientific study as a reference while doing a scientific study. The reference, which is very important in scientific studies, serves as proof for the justification of the study. The people doing the study can support their work by referring to other studies. The number of citations has started to be a factor that indicates the quality of scientific articles and is still a vital evaluation parameter today. Citation is given for reasons such as providing pre-reading, determining method, respecting pioneers, specifying original author, appreciating related work, criticizing/correcting related work, and refuting/verifying claims. The primary function of citing is to link a document with the cited document (Smith, 1981). In addition, scientific value, reliability, and originality come to the fore with reference. Scientific value is related to the usefulness of one study for other studies. It is also an indicator of the quality. For this reason, frequently cited studies are regarded as more qualified (Aksnes, 2005).

Since citation is a criterion in determining the quality of studies in the scientific world, some studies use citation analysis as a data analysis technique. In a study conducted by Taskin and Dogan (2013), 197.687 studies reached on the Web of Science database and carried out in Turkey between 1928-2009 were analyzed. As a result of the study, it was found that the number of studies has increased since the 1980s. The most produced documents were articles in social sciences, art and humanities, engineering, and science. Moreover, fewer authors ( $n=10$ ) work together on a study in humanities and social sciences than in science and engineering ( $n=105$ ). It was also stated that journal selection criteria differed from one field to another, and the average citation age is the slowest in history and philosophy disciplines. In another study, Karadag et al. (2017) conducted a citation analysis of 7681 articles published in 32 peer-reviewed journals and 249.661 citations for these articles. This study aimed to put forward the scientific publishing map of educational sciences and teacher training in Turkey. The articles in this study covered the years 2005-2014. According to the study results, it was seen that 48% of the citations were journals, 24.8% were books, 8.5% were doctorate/master theses, 4.5% were papers, and 13% were other publications. While there was no difference in the number of citations per year, the three most cited works were Data Analysis Handbook for Social Sciences (by Şener Büyüköztürk), Scientific Research Methods (by Niyazi Karasar), and Qualitative Research Methods in Social Sciences (by Ali Yıldırım and Hasan Şimşek). Considering that, it can be said that mostly research method books were cited in the educational sciences and teacher training fields. However, in this study, the relationship between citations and research methods was not examined. Besides, a study conducted by Swygart-Hobaugh (2004) examined how the quantitative-qualitative discussion affected citations in sociology journals. The examined articles were published in 4 journals (American Journal of Sociology, American Sociological Review, Journal of Contemporary Ethnography, and Qualitative Sociology) between 1990-2000. A total of 274 articles were included in this study. As a result, it was revealed that the studies carried out with the quantitative methods were outnumbered, although the number of studies carried out with qualitative methods was increasing in the journals. While quantitative articles were cited by the researchers in other quantitative research-based journals, it is revealed that qualitative articles were cited by researchers in both quantitative and qualitative research-based journals. A pure quantitative attitude can be seen here. However, this study does not include any data on mixed methods research. In brief, the studies in the literature investigating the methodological aspects were mostly about quantitative and

qualitative research methods. While doing citation analysis in these studies, the mixed methods research was rarely included.

In this study, the articles of education researchers and the citations made in this field were examined based on the thought of Kuhn (2016) that more than one worldview (paradigm) could be dominant in a field of science within the same period. By accepting the single paradigm thesis (Creswell & Plano Clark, 2017), quantitative studies' paradigms were determined as positivist and post-positivist paradigms; qualitative studies covered constructivist (naturalist) and transformative paradigms. Furthermore, the paradigm surrounding mixed methods research was defined as pragmatism (Teddlie & Tashakkori, 2009). Discussions about which paradigm is dominant in research have continued. The paper enabled researchers to determine which paradigms they refer to when solving the research problems, and whether some research methods have a dominant role in solving these problems, as claimed. In this context, this study aims to reveal which paradigm/research method has dominated the 500 articles that have the highest citation in the last ten years in education and examine whether the dominant paradigms impact the citations. According to Creswell and Plano Clark (2017), the reason why the time interval is determined as the last decade is the idea of completing the defense and expansion process of mixed methods research and continuing its development with the reflective process for the last ten years. Also, the up-to-datedness of the articles is concerned. The research questions of this study identified as following:

1. Which research methods/paradigms predominate/are preferred in the most cited articles in education between 2010-2019?
2. Do the dominant paradigms/research methods have an impact on the citation?

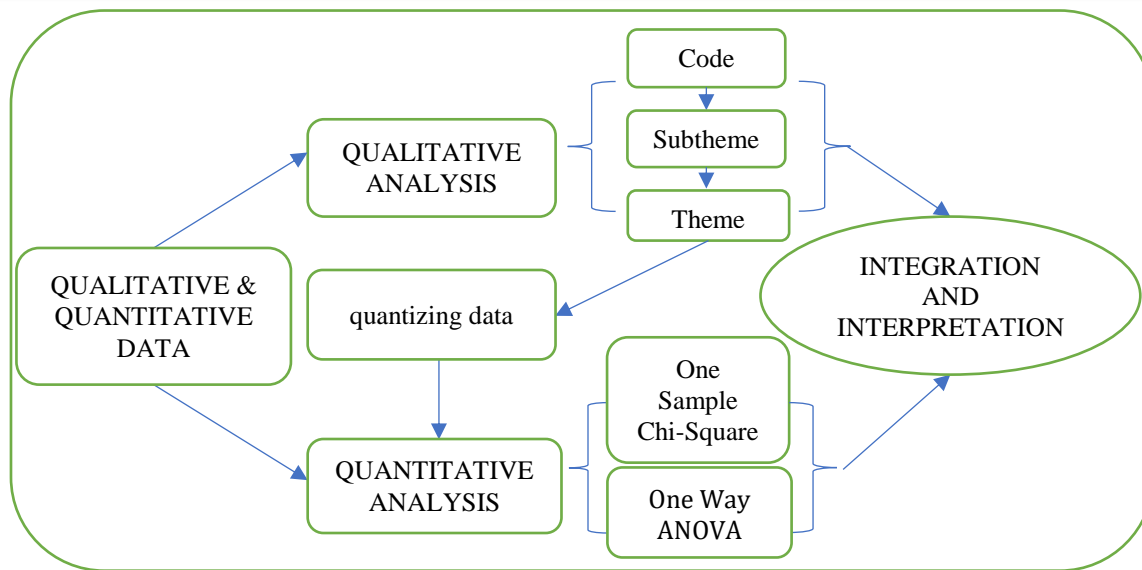
## **Method**

This part consists of the design, data collection and analysis process of the research.

### ***Research Design***

The study employed a mixed methods research approach. The conversion mixed methods design was used in the research. In a conversion mixed methods design, qualitative/quantitative codes, categories, and themes are first obtained by data collection and analysis, and then the data is subsequently quantized or qualified (Teddlie & Tashakkori, 2009). A conversion process is applied in the data analysis process. In this study, qualitative data was collected first. After finding the codes, themes, and sub-themes, the data was digitized. With the digitized data, statistical analyses were conducted. The data was collected and analyzed with a holistic perspective. The research process summarized in Figure 1 below.





**Figure 1.** Conversion mixed design diagram

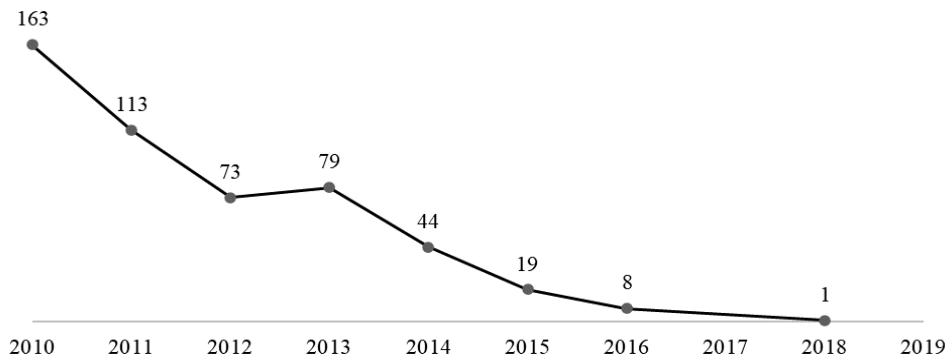
According to Greene, Caracelli, and Graham (1989), mixed methods studies have five common purposes. The first one of these purposes is triangulation, which involves looking for convergence and confirmation regarding the findings from various methods that examine the same phenomenon. The second purpose is complementarity that involves looking for amplification, exemplification, improvement, and explanation of the findings from a single method with the results of another method. The third purpose is development which includes employing the findings of one method to assist in notifying another method. The fourth purpose is the initiation that involves exploring paradoxes and inconsistencies which cause the research question to be re-framed. The last one is the expansion that includes extending the scope of inquiry by utilizing various methods for various research elements. In this study, the purpose of using one of the mixed methods designs is to provide complementarity.

### **Data collection**

This research was based on a sample of 500 most cited SSCI indexed educational research articles. Web of Science Core Collection selected as database. Web of Science Core Collection includes more than 21000 peer-reviewed, high-quality academic journals from more than 250 disciplines in science, social sciences, arts & humanities. The search was limited to Social Science Citation Indexed articles. To choose articles, the “Education” keyword was searched in topics. Timespan was selected between 2010-2019. “Article” was selected as a document type, and “educational research” was selected as an area. The search code is provided below.

*TOPIC: (education) Refined by: DOCUMENT TYPES: (ARTICLE) AND RESEARCH AREAS: (EDUCATION EDUCATIONAL RESEARCH) Timespan: 2010-2019. Indexes: SSCI.*

Thus, with these search protocols, 67625 records were accessed. Listed articles were sorted by times cited. Then, the top 500 articles were selected for exporting. The entire record option was selected for recording content and CSV for the file format. The number of selected 500 most cited educational research articles by years, provided in Figure 2.



**Figure 2.** Number of the most cited articles by years

As seen in figure 2, there are fewer articles in the last years. This is because it takes time for an article to be highly cited.

### Data analysis

This paper investigated the methodologies of the selected most cited papers in terms of research method and research paradigm. Additionally, the research included citation and usage analysis of the selected papers. Concurrent mixed analysis (Onwuegbuzie & Leech, 2004) was mainly used for complementarity in the study. This process helped enhance and clarification the findings from qualitative with results from the quantitative. In this direction, qualitative and quantitative data were analyzed together for the selected most cited 500 articles. An iterative process of reviewing was conducted with the articles. The authors prepared a list of articles with author information, title, and abstract for the first step. The list was shared with independent researchers to identify, control, and review the methodologies of the articles. Each step is summarized in Table 1.

**Table 1.**

#### Methodological review process

Time	Action	Number of Independent Researchers
October 2019-May 2020	Methodology Identification	6
May 2020- June 2020	Methodology Control	4
June 2020- July 2020	Methodology Review	4

The methodological review process required detailed reading and analysis of the articles. To determine the design of studies, each researcher read the abstracts at first. When there was not enough information about the research design in that part, the whole article was read. However, all articles did not include information about the research design directly. That is why, while reading them closely, each researcher determined their designs based on their experiences. At the end of end of the first stage, the determined designs were assigned as codes (n=31). Codes featuring similar designs were grouped, yielding themes “Methodological/Theoretical Discussion” and “Empirical Research/Article.” Afterward, sub-themes were determined based on the research methods and paradigms for the studies in the theme of ‘empirical research/article.’ The determined sub-themes were “qualitative,” “quantitative,” and “mixed methods research.” Since the study aimed to reveal which paradigm/research method has dominated the articles, the 237 articles categorized as Methodological/Theoretical Discussion were excluded from the main analysis because empirical research should be conducted to reveal the method and paradigm. Throughout the data analysis, a three-stage control process was carried out to ensure validity and reliability. In addition, the data were kept accessible to all authors, and in-depth analysis was carried out in determining the designs for the studies. The methodological review process and the characteristics of independent researchers involved in the process are given below in Table 2.

**Table 2.**

*Demographics of the independent researchers and methodological review process*

Demographic Features				Methodological review process		
Codes	Gender	Education Level	Expertise	Identification (October 2019-May 2020)	Control (May 2020-June 2020)	Review (June 2020-July 2020)
1	Male	M.Sc.	Special Education	X	X	X
2	Female	M.Sc.	Special Education	X	X	X
3	Female	M.Sc.	Social Studies Education Curriculum and Instruction	X		
4	Female	M.Sc.	Sport Sciences	X	X	X
5	Male	M.Sc.	Social Studies Education	X		
6	Female	M.Sc.				
Consistency Between Coders (Empirical Research/Article Theme)					(193/(193+70)=.73	1.00
Consistency Between Coders (Methodological/Theoretical Discussion Theme)					(189/(189+48)=.80	1.00
Consistency Between Coders (All Themes)					(382/(382+118)=.76	1.00

The consistency rate of expert opinions in the control process was calculated as 0.73 (Table 2). Considering that, the consensus rate of the experts was above the 70% consistency rate stated by Miles and Huberman (1994). The articles in which the inconsistency was detected in the control process were reviewed again with the experts. The rate of consistency reached 100% (Table 2). With this percentage reached, another recommended limit for the coder consistency (85-90%) has been exceeded (Milles, Huberman, & Saldana, 2014).

Quantitative data analysis was conducted with the data obtained by qualitative analysis of 263 selected articles. Before conducting analysis, variables were examined to meet assumptions of the parametric tests. One-way ANOVA was separately conducted to understand differences among the “Empirical Research/Article” themes. In addition, a One-Sample Chi-Square test was conducted for finding statistical proof of preferred methodological paradigms in empirical research/article theme. IBM SPSS 25.0 (Chicago, IL) was used to conduct analyses. The significance level was determined to be 0.05.

## Findings

In this study, the researchers gathered raw data of 500 articles from a database. The qualitative results obtained were quantified, and the research methods were classified. It was then analyzed along with collected quantitative data of articles. Qualitative thematic analysis revealed two themes, including “Empirical Research/Article” and “Methodological/Theoretical Discussion.” Methodological/theoretical discussion theme had 237 (47.4%) and empirical research/article theme had 263 (52.6%) articles. While the methodological/theoretical discussion theme had five subthemes: reviews, informative studies, meta-analysis, meta-ethnography, and position papers; the empirical research theme had three subthemes: quantitative, qualitative, and mixed methods research. There were 11 codes in the quantitative, nine in the mixed methods research, and eight in the qualitative sub-theme (Figure 3).



**Table 3.**

Preferred methodological paradigms in empirical research/article theme

\*\*\*p<.001 \*\*p<.01 \*p<.05 p>.05

9

**Table 4.**

*Comparison of research designs*

Research Designs	Variables	n	Mean	sd	df	$\eta^2$	F	Multiple Comparisons (Scheffe)
Quantitative	WOS Cite	139	146.51	75.67	2		.65	
Qualitative		51	133.30	54.21	2			
Mixed Methods Research		73	142.97	70.18	2			
Quantitative	All Cite	139	148.61	76.87	2		.70	
Qualitative		51	134.67	54.61	2			
Mixed Methods Research		73	144.96	71.20	2			
Quantitative	Usage in last 180 days	139	7.16	7.98	2	.02 <sup>#</sup>	3.05*	Mixed Methods Research>Qualitative*
Qualitative		51	5.59	5.64	2			
Mixed Methods Research		73	9.37	11.27	2			
Quantitative	Usage since 2013	139	117.27	98.98	2	.05 <sup>#</sup>	6.92**	Quantitative>Qualitative** Mixed Methods Research>Qualitative **
Qualitative		51	64.88	45.22	2			
Mixed Methods Research		73	128.42	123.46	2			
Quantitative	Numbers of Authors	139	3.37	1.92	2		2.25	
Qualitative		51	2.90	1.59	2			
Mixed Methods Research		73	3.60	1.79	2			

\*\*\*p<.001 \*\*p<.01 \*p<.05 p>.05

<sup>#</sup> $\eta^2=0.01$  Small Effect <sup>##</sup> $\eta^2=0.06$  Medium Effect <sup>###</sup> $\eta^2=0.14$  Large Effect <sup>####</sup> $\eta^2=0.20$  Very Large Effect

Multiple comparison results showed that methodological paradigms had statistically significant differences in terms of usage statistics. A significant difference was not identified between paradigms in terms of citations and the number of authors. To the findings of the OneWay ANOVA test, mixed methods research articles had a significantly higher “usage since 2013” and “usage in last 180 days” than qualitative articles ( $F(2, 261) = 3.05, p<.05, MS = 3.87$ ,  $F(2, 261) = 6.92, p<.01, MS = 63.54$ ). Quantitative articles had a significantly higher “usage since 2013” than qualitative articles ( $F(2, 261) = 6.92, p<.01, MS = 52.39$ ).

The 263 articles analyzed were empirical research. The rest of 237 articles were evaluated as Methodological/Theoretical Discussion. These were reviews (narrative literature review, literature review, systematic literature review, critical literature review, consensus literature review, book reviews, theoretical investigations, scoping reviews, meta-synthesis), informative papers, position papers, and guides. Reviews outnumbered the other type of studies. Although most of these studies were reviews, the language used was quite different. In some studies, the researcher directly specified that the tone was critical. Moreover, the purpose and scope varied from one review to another.

The 263 articles were analyzed to determine which research designs are preferred in the high cited educational studies. Quantitative research outweighed the qualitative and mixed methods research. While the number of studies using quantitative methods was 140, studies using qualitative methods were 50. The most preferred research design was found to be “Descriptive (Correlational, comparative, casual) Studies.” The second most preferred research design was “Experimental Design.” The third one was the “Embedded design” of mixed methods research articles. In terms of the qualitative studies, the case studies outnumbered the rest. Considering these results, it can be said that the aim of revealing the current situation is more common in social sciences research. The distribution of research designs in mixed methods research articles is given in Table 5.

**Table 5.**

*Mixed Methods Research Designs*

<b>Mixed Methods Research Designs</b>	<b>Frequency (f)</b>	<b>Percent (%)</b>
Embedded Design	22	30.1
Multiphase Design	16	21.9
Convergent Parallel Design	11	15.1
Exploratory Sequential Design	7	9.6
Explanatory Sequential Design	6	8.2
Mixed Case Study	4	5.5
Conversion Mixed Design	3	4.1
Design Based Research	3	4.1
Transformative Design	1	1.4
Total	73	100.0

The analyses showed that the most preferred mixed methods research designs were respectively embedded design with 30.1%, multiphase design with 21%, and convergent design with 15.1% by the most cited educational research articles. There was a controversy for the studies defined as mixed methods. While 73 studies used mixed methods, only 17 of the studies called its method mixed methods. The mixed methods design was used to study university students' use of digital technologies by Margaryan, Littlejohn, and Vojt (2011). They explained it in that way:

The study employed a mixed methods research approach, with a quantitative phase followed by a qualitative phase, both of which were ascribed equal status (Johnson & Onwuegbuzie, 2004). Mixed methods research aims to maximise the strengths of both quantitative and qualitative approaches. An initial questionnaire survey explored the types of technology tools students adopted and the frequency with which they used these tools for formal and informal learning and socialising (extent of technology use).

As it is seen, the researchers did not mention which research design was used. They only explained the phases. When there was a case like that, the researchers of this study decided on the research design by their knowledge and experience. However, the informed design of some studies was not accepted by the researchers for the 56 studies. For instance, the research method was stated as "a pretest and posttest quasi-experimental design" in a study conducted by Yang and Wu (2012). However, the study was a mixed methods study. In the study, they indicated that data from interviews with students and teachers enable triangulating the quantitative findings with the participants' perspectives.

The mixed methods research design was also specified in some of the 17 studies that informed the research method. The research design was indicated directly in a study by Ibanez, Di-Serio, and Delgado-Kloos (2014):

"This study adopted a mixed research method approach known as the sequential explanatory design method. The mixed research method is considered a legitimate, stand-alone research design in engineering education that combines the strengths of both qualitative and quantitative research. The sequential explanatory design method comprises a quantitative phase followed by a qualitative phase. For the quantitative phase, data about the activity of students using the platform was collected, and then the data was analysed statistically using parametric and non-parametric techniques. For the qualitative phase, open-ended surveys were administered and then analysed to shed light on the numerical results."

Even in one study by Ng (2012), the researcher indicated the research paradigm that s/he followed:

"The research paradigm employed for this research is a pragmatic paradigm (Johnson & Onwuegbuzie, 2004) that embraces the mixed method (quantitative and qualitative) approach to seeking answers to the research questions."

Although there were 17 articles using mixed methods, the researchers indicated the design directly in only three of them. They only specified the order of qualitative and quantitative phases. They did not

use any categorization for the research design. The number of mixed methods research articles indicating and not indicating the research design is given in Table 6.

**Table 6.**

*Articles written as mixed methods research in the method part*

Years	Yes	No	Total
2010	9	20	29
2011	1	10	11
2012	2	6	8
2013	3	9	12
2014	2	6	8
2015	0	3	3
2016	0	2	2
Total	17	56	73

As seen in Table 6, the articles not specifying the research design as mixed methods outnumbered the specified ones. In addition, while analyzing the articles straightforwardly, it was seen that one qualitative and one quantitative article were expressed as a stage of a mixed methods research. These articles were not presented among these 73 articles, which had both quantitative and qualitative stages.

## Discussion

The integrated mixed methods research strategy with a main-exploratory phase has been effective in forming the basis of the study. The complementary mixed methods research strategy in the second phase has been supportive in addressing the multifaceted and complex effects of the research. The research problem was answered from qualitative and quantitative perspectives by converting the codes and themes obtained in the first stage into numerical data and combining them with the previously obtained numerical data in the second stage. The number of studies that have answered research questions with the conversion mixed design is relatively low in the literature. Therefore, the design used in the research is seldom one of the mixed methods research designs. As a result of the study, there were only three articles using conversion mixed design among the most cited 500 articles. Although it is a seldom-used design, it offers concurrent mixed analysis (Onwuegbuzie & Leech, 2004). The concurrent mixed analysis includes transforming qualitative data into quantitative data (Teddlie & Tashakkori, 2009). Quantizing data helps to enhance meanings further by calculating the effect sizes of qualitative data (Onwuegbuzie, 2003).

Several striking findings were obtained in this study. Its main finding showed that the articles adopted which research methods and paradigms. 52.6% of the 500 most cited educational articles were found to be “Empirical Research/Article” and 47.4% “Methodological/Theoretical Discussion.” That was an expected finding because “methodological/theoretical discussion” papers provide an overview by synthesizing current knowledge in the field while identifying gaps and future research directions. Therefore, researchers refer to these studies more than others when writing their research reports. In terms of research paradigms, 52.9% of articles were quantitative, 19.4% of articles were qualitative, and 27.8% of articles were mixed methods research. These differences were significant. This finding supports the assumption that the interest in mixed methods research is increasing rapidly in educational research (McKim, 2017).

Another finding supporting these main results was that the methods used by the articles were associated with WOS cites, all cites, usage in the last 180 days, usage since 2013, and numbers of authors. One-way ANOVA test results showed that mixed methods research and quantitative educational articles had higher usage statistics since 2013 than qualitative educational articles. This usage difference continued

for mixed methods research articles, but no significant differences were found between quantitative and qualitative articles in the last 180 days. This finding is in line with the finding of O'Cathain, Murphy, and Nicholl (2007) that mixed methods research articles are more used by researchers and have higher reading rates.

The most preferred research design was found to be descriptive, experimental, and embedded design. The descriptive study design is used for basically describing the desired characteristics of the studied sample (Omair, 2015). Therefore, it can be said that most of the studies just present the current situation to the audience. That may be because the human factor is at the forefront in educational sciences as a field of social sciences. The second most preferred research design was the experimental design which has intervention and is the most common design in positive sciences. The third one was the embedded design of mixed methods research. In studies that preferred this design, both quantitative and qualitative data were used. Moreover, most of these studies obtained quantitative data from experimental studies. In terms of the qualitative studies, the case studies outnumbered the rest. It also shows that presenting the current situation is more common in the social sciences.

The most preferred mixed methods research designs were embedded, multiphase, and convergent design. Based on the theoretical framework of Creswell (2014), it was found that all types of mixed methods design appeared within the published literature in the field of education. Interestingly, only 17 of 73 mixed methods research articles evaluated its method as mixed methods. It can show that researchers still do not have enough information and experience about mixed methods research. This finding supports Firat's (2016) result that the educational researchers do not sufficiently adopt the new paradigm of mixed methods research. The informed design of 56 articles was not accepted by the researchers of the current study. For instance, in a study conducted by Yang and Wu (2012), the research method was stated as "a pretest and posttest quasi-experimental design." However, the study was a mixed methods study. All in all, the results showed that the view that mixed methods research completes the "defense and expansion process" and experiences the "reflective process" (Creswell & Plano Clark, 2017) is an optimistic interpretation for the field of education.

## Conclusion

The main purpose of this research was to reveal which paradigm/research method has dominated in the 500 articles that cited most in the last ten years in education and examine whether the dominant paradigms impact the citations. With this purpose, two main categories of articles were identified as "Methodological / Theoretical Discussion" and "Empirical Research / Article." The coders analyzed the 500 articles regarding their methods, 237 included in the "Methodological / Theoretical Discussion" theme and 263 in the "Empirical Research / Article" mixed methods theme. From 263 articles in the theme of "Empirical Research/Article," the number of studies using the quantitative method was higher than the sum of the studies using the qualitative and the mixed methods.

The distribution of the methods of 263 articles was found to be statistically significant. It was observed that the cited articles mainly were articles using quantitative methods, followed by mixed and qualitative methods, respectively. Despite this numerical superiority, there was no significant difference between the methods used in the studies in terms of WOS cite, and all cite. A significant difference was found in terms of usage in the last 180 days and usage since 2013. The comparison test results conducted in terms of citations indicated that the research conducted with mixed methods in education had been accepted and used as much as the studies carried out by quantitative or qualitative methods. In addition, according to the multiple comparison results in terms of "usage in last 180 days", significant differences were found in favor of mixed methods research between qualitative and mixed methods. Moreover, according to the multiple comparison results in terms of "usage since 2013", significant differences were found in favor of quantitative and mixed methods research among quantitative, mixed methods and qualitative.



While the number of articles directly indicating their method as mixed methods research was 17, the number of articles decided to be mixed methods research was 56. It has been concluded that the patterns of mixed methods research articles in education form embedded design, multiphase design, and convergent design.

One of the difficulties encountered in conducting mixed methods research is that the researchers must know both quantitative and qualitative research. The suggestion for researchers to overcome this difficulty is to include researchers who have experience of qualitative and quantitative methods in their team. Therefore, it was tested whether the number of authors in mixed methods research was higher than the other methods. The results obtained showed that the number of authors in mixed methods studies was similar to those using the other methods. The reason for this may be that the researchers usually prefer multiple author partnerships in education.

### ***Contributions to Mixed Methods Literature***

This research offered a new approach by using both a citation analysis and mixed methods design to the ongoing debates about which paradigm is dominant in research in education. Such a citation analysis in terms of research methods and paradigms has importance for comparisons of their use among the papers. The results of the study can contribute to the field of mixed methods research. The value of mixed methods research is still ambiguous. This study can be an example to see the position and value of mixed methods research in education. Also, this study can show that mixed methods research literature should agree on the concepts and models related to mixed methods. As seen in this study, many researchers do not know which research design they use. Even they know, they do not know how to call these designs and related concepts. Namely, they do not know the technical terms and how to use language. Besides, this study can show that the pragmatic paradigm may not be dominant in education. Therefore, more research using mixed methods and adopting pragmatic approach must be done. Existing mixed methods literature shows that mixed methods research is developing day by day. However, this thought may be too general to cover all research fields. These results are not obtained by using one strand of data alone. Therefore, this study can also be an example for researchers in the field of education. This study shows how conversion and triangulation can be achieved at the methods level from a methodological aspect. In addition, it shows how interpretation and reporting of both qualitative and quantitative data can be made in a conversion mixed methods study. Since concurrent mixed analysis is used in this study, it also enables other researchers to see an example. Based on the findings of this research some further research suggestions developed. These suggestions listed below.

- Methodological trends of highly cited articles from different fields can be investigated.
- The reasons why methodology is not written in mixed methods research articles can be explored by getting the authors' views.
- Interviews can be conducted with education field experts on the findings of this research.

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