

Is There a Change? Distance Education Studies in COVID-19 Pandemic

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ABSTRACT— *With the Coronavirus epidemic in China at the end of 2019 and in the rest of the World in the first quarter of 2020, all educational institutions started to give distance education partially or completely. Institutions were not ready for such a process, and they failed to the necessary preparations. That's why these applications are called emergency distance education. As a result, for the evaluation of distance education practices during the pandemic period, a number of studies have been published and continue to be conducted. Evaluation of these publications with content analysis will be very important in analyzing this period in the future. In this respect, the purpose of this study was to perform the content analysis of the articles related to distance education practices in the pandemic period. As a result of the search done using the Scopus database, a total of 180 articles were examined within the scope of the present study. The articles were examined in terms of country, number of times of citation, keywords, participants, data collection tools, variables / research interests, research designs and methods. Consequently, it was seen that the publications were mostly done in the USA; Opinion, Reflection and Review studies were conducted and cited most; that mostly the keywords of learning, online, education and covid-19 were used; that the participants were mostly undergraduate students; that the most frequent data collection tool was questionnaire; and that the most frequent dependent variables were engagement, readiness, perception and self-efficacy. The findings obtained were discussed in line with the related literature, and various suggestions were put forward.*

Keywords— covid-19, distance learning, research trends, systematic review, content analysis

1. INTRODUCTION

Although the history of distance education is very old, it would not be wrong to say that it is now in its most popular period in its history. It was impossible to predict that the virus, which emerged at the beginning of 2020, would affect our lives so much. With the spread of the virus, this change has undoubtedly begun to influence the field of education as well [1]–[3]. Countries limited their educational activities within the scope of the quarantine measures and then decided to make use of distance education. Some countries adapted themselves to this change more quickly and at once, while others first limited their traditional education and used distance education as a support and then completely switched to distance education.

Many studies have been carried out to reveal the effects of the pandemic process on education besides its effects on our lives. While the previous studies on distance education focused on certain areas, distance education studies started to be carried out in almost all fields of science especially during the pandemic period. Since the field of distance education is itself a versatile field, it could be associated with all scientific fields. It could be stated that the field of distance education, which has various dimensions such as learner, teacher, technology, support services, method and evaluation, is also quite extensive and comprehensive. The importance of distance education is increasing day by day [4], especially during this pandemic process, because all education and training activities are being given via distance education and because the possibility of using such applications in the future is increasing. Figure 1 presents the studies in the WOS database conducted in related literature in the last 10 years.

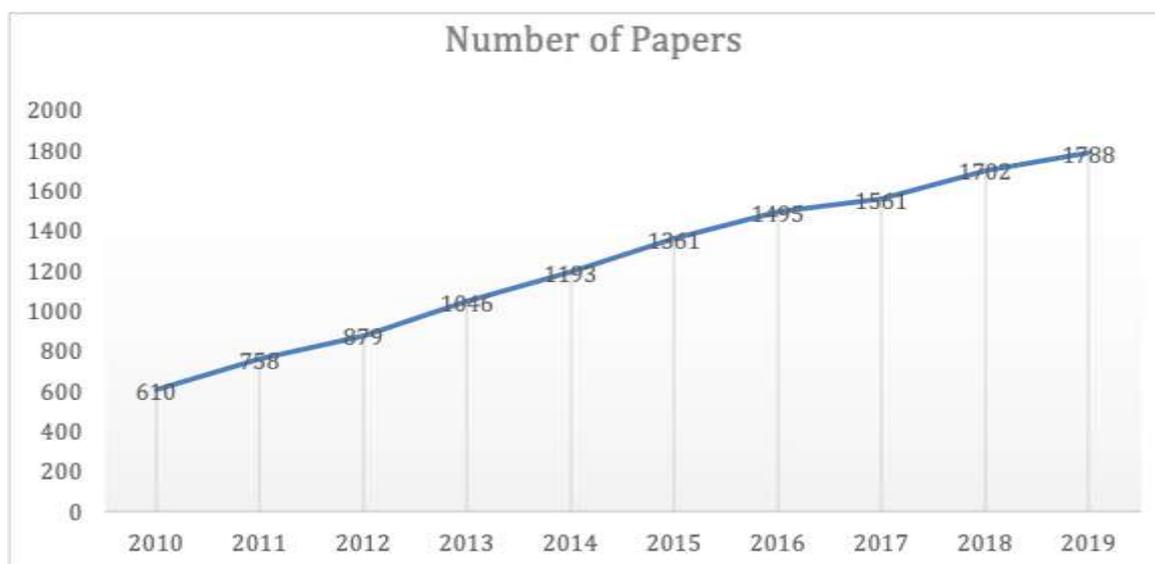


Figure 1. Number of Papers in Web of Science Database

As can be seen in Figure 1, it could be stated that distance education has become an increasingly important concept in related literature. It is known that many studies have been carried out in this field with the spread of the Internet especially after the 2000s. The year 2020 has been a year in which education and training processes are being carried out via distance education all over the world in the pandemic process. Researchers are studying on distance education systems, course designs and all sub-dimensions of distance education in this pandemic process. These studies can also be evaluated as a feedback mechanism by institutions and system designers.

The most important aspect of this study is to reveal the analyses of the studies conducted on distance education during the pandemic process and to draw related conclusions. Accordingly, in the study, conclusions will be drawn. In addition, it is important to make comparisons of the studies conducted in the pandemic period in various respects ranging from methodology to participants' preferences and from the research topics of the studies to the findings obtained in these studies. In this respect, the purpose of this study is to examine the studies in the field of distance education / online learning in the scopus database in terms of certain variables during the pandemic period.

In accordance with this aim the following topics were considered:

- Distribution of the articles by journals
- Major contributor countries
- Keywords,
- Most cited articles
- Research areas,
- Employed research designs/models,
- Data collection tools
- Dependent variables,
- Participants (with sample size),

2. RELATED LITERATURE

In literature, there are many analysis studies in the field of "distance education / learning". While some of these studies are directly related to the field of distance education, some of them are studies conducted on various dimensions of distance education. In this study, because the distance education studies conducted in the Covid-19 pandemic period were analyzed in general terms, the focus was on general analysis studies conducted in the field of distance education in related literature. Table 1 includes some of the analysis studies appropriate to this definition in the literature.

Table 1. Summary of the Literature Related to Distance Education

Author(s)	Highlights of Research Findings	Years	Number of papers
Koble & Brunker, 1997 [5]	Mostly preferred methods: quantitative methods	1989-1997	129 articles
Mishra, 1997 [6]	Mostly preferred methods: descriptive methods. Mostly preferred data collection tools: questionnaire and scales. Top countries: UK, USA, Australia	1991-1996	361 articles
Zawacki-Richter, Backer & Vogt, 2009 [7]	Mostly preferred research areas: interaction and communication. Least preferred research areas: costs and advantages. Top Countries: USA, Canada, UK	2000-2008	695 articles
Davies, Howell & Petrie, 2010 [8]	Mostly preferred methods: Survey and case study. Mostly preferred data collection tools: Questionnaire.	1998-2007	308 master thesis and dissertations
Horzum et al. 2013 [9]	Mostly preferred methods: quantitative methods. Mostly used dependent variables: achievement, satisfaction and attitude. Mostly preferred data collection tools: interview, document analysis and scale.	2005-2011	35 articles
Bozkurt et al., 2015a [10]	Mostly preferred research areas: instructional design. Mostly preferred methods: quantitative methods. Mostly preferred data collection tools: questionnaire, interview and scale. Mostly preferred participant type: undergraduate students.	1986-2014	61 dissertations
Bozkurt et al. 2015b [11]	Mostly preferred methods: mixed methods with exploratory sequential and explanatory sequential designs. Mostly preferred data collection tools: questionnaire, interview and document analysis. Mostly preferred participant type: undergraduate students.	2009-2013	861 articles
Durak et al., 2017 [12]	Mostly preferred research areas: educational technology. Mostly preferred methods: quantitative methods. Mostly preferred data collection tools: questionnaire, interview and scale. Mostly preferred participant type: undergraduate students. Mostly preferred dependent variables: academic performance, attitude.	1986-2015	285 Master's theses
Bozkurt et al., 2017 [13]	Mostly preferred research areas: theories and models. Mostly preferred methods: conceptual/descriptive, quantitative.	2008-2015	362 articles
MusaudAsdaque et al., 2018 [14]	Mostly preferred research areas: instructional design. Mostly preferred data collection tools: questionnaire and scale. Mostly preferred participant type: teachers. Mostly preferred dependent variables: effectiveness.	2001-2014	32 dissertations
Kılıç Çakmak et.al., 2016 [15]	Mostly preferred research areas: instructional design and educational technology. Mostly preferred methods: quantitative. Mostly preferred data collection tools: questionnaire, log data.	2000-2016	154 articles

Table 1 shows whom the studies were conducted by, the prominent findings obtained in the studies (Highlights of Research Findings). in which years the studies were conducted, and what type of and how many studies were examined. The studies have been given in a chronological order. Apart from these studies, two more systematic review studies related to distance education were reached. In the first one, Durak and Çankaya [16] conducted a systematic content analysis on "Seamless Learning" in literature. It was the first systematic review study on this concept, which is quite new in literature, and it covered a total of 58 articles. As the research methods in these studies, conceptual/descriptive methods were prominent. Moreover, as the participants, K-12 students were preferred more, and interview and academic achievement tests were the most common data collection tools. In the studies examined, the most popular dependent variables included academic performance and perception.

In another study, Durak & Çankaya [17] carried out a systematic study on the concept of “Learning Space”. The researchers examined a total of 95 papers for the purpose of determining the research methods and models, concept list, most cited papers, top journal list, data collection tools, participants and dependent variables. The study is thought to be important because no content analysis was run on the concept of learning spaces. In these studies, the research methods mostly included conceptual/descriptive methods and qualitative methods; the participants were mostly undergraduate students; and interview and questionnaire were among the most common data collection tools. Finally, in these studies, the most popular dependent variables included perception and academic performance.

3. METHODOLOGY

In this study, a systematic content analysis was conducted on articles found in the database of Scopus regarding the concept of “distance education / online learning”. Content analysis is a technique which helps researchers to draw meaningful inferences by analyzing the written or visual written documents [18]. This type of research is thought to be effective in acting as a guide for future studies by summarizing the certain aspects of related studies in literature [19], [20], and in this respect, content analysis is preferred by researchers [21].

The following criteria were taken into account while reviewing the related literature for the articles: being written in English, being published in a peer-reviewed journal and being published in the year of 2020. In order to reach the related articles, Scopus database was searched. For peer-reviewed literature, Scopus is the largest database of peer-reviewed literature [22], and scientific journals, books and conference proceedings are listed in Scopus [23]. A systematic search in the SCOPUS database was done by using the following search keywords: “Covid-19” AND “distance education” OR “online learning” OR “distance learning” OR “online education”. In addition, the search year was limited to 2020 to reach only the articles published in the pandemic period.

As a consequence of this search, a total of 265 articles were reached. Among all these articles, 207 of them were full-text, and 58 articles were not included in this study because they were not reached as full-text articles, and 27 articles were excluded because they were not directly related to the topic. As a result, a total of 180 articles were examined in relation to the key words. The overall research flow is presented in Figure 2.

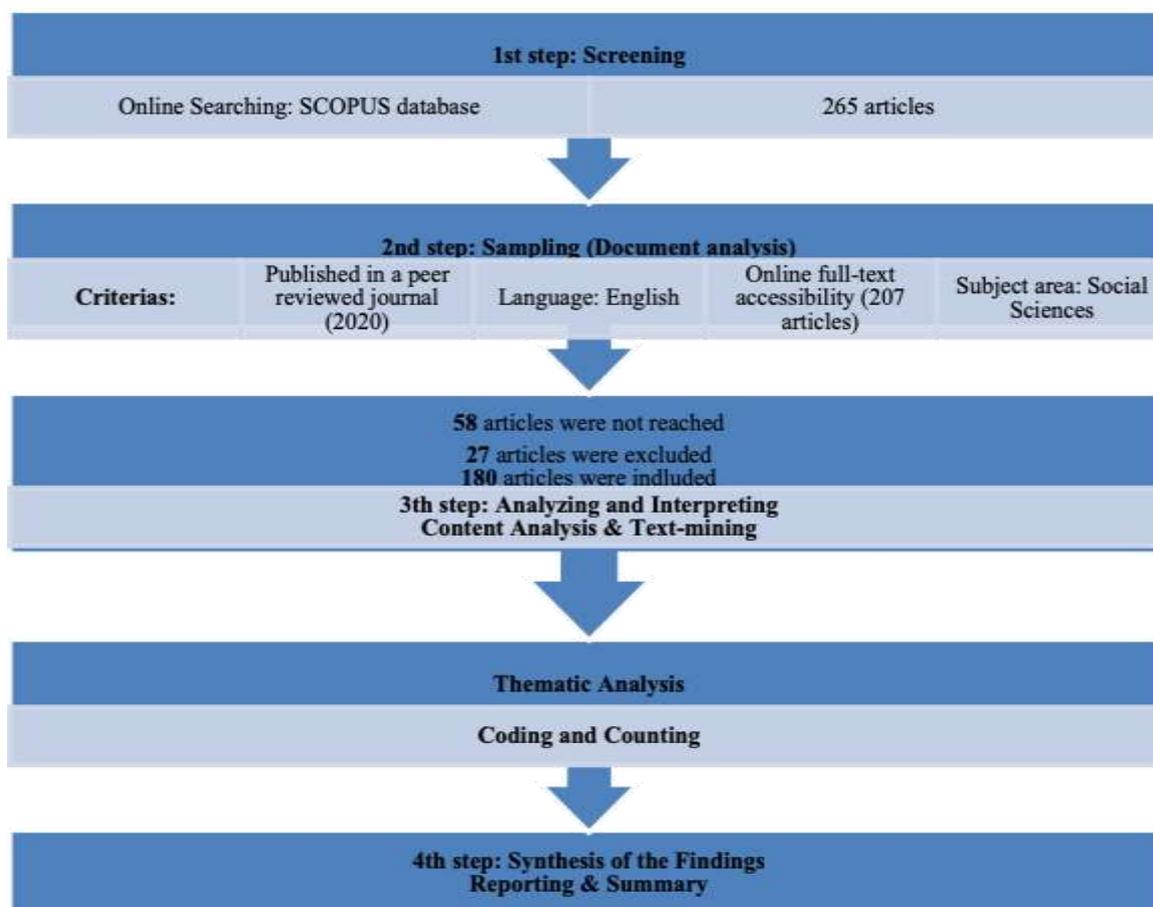


Figure 1. The Overall Reresearch Flow

In this study, in order to find answers to the research questions, content analysis was applied to a total of 180 full-text articles, and the related articles were examined considering certain variables. In the study, descriptive statistics were

performed with percentages and frequencies regarding the certain aspects of the articles. Following this, these statistics were interpreted and comparisons were made with the results of other systematic review studies in the same field.

3.1 Reliability

For the purpose of ensuring the reliability of the articles to be included in the review, a total of 30 articles were randomly selected from all the articles and examined by the two researchers in accordance with the inclusion/ exclusion criteria, and the disagreements were resolved by discussing them. Moreover, these 30 randomly selected articles were coded by two encoders considering the evaluation form to ensure intercoder reliability. For the intercoder reliability, Cohen's Kappa coefficient was used and calculated as 0.72 in the first step. Following this, the two encoders discussed and agreed on the differences, and in the second calculation, Cohen's Kappa was found to be 0.92. A value of 0.75 and higher indicates an excellent reliability between encoders [24].

4. FINDINGS AND DISCUSSIONS

This section presents the results of the analysis with descriptive statistics about the research participants, data collection tools, methods and model/designs, dependents variables, and key words in distance education/ online learning area. In Figure 3, the journals where the articles were published were examined.

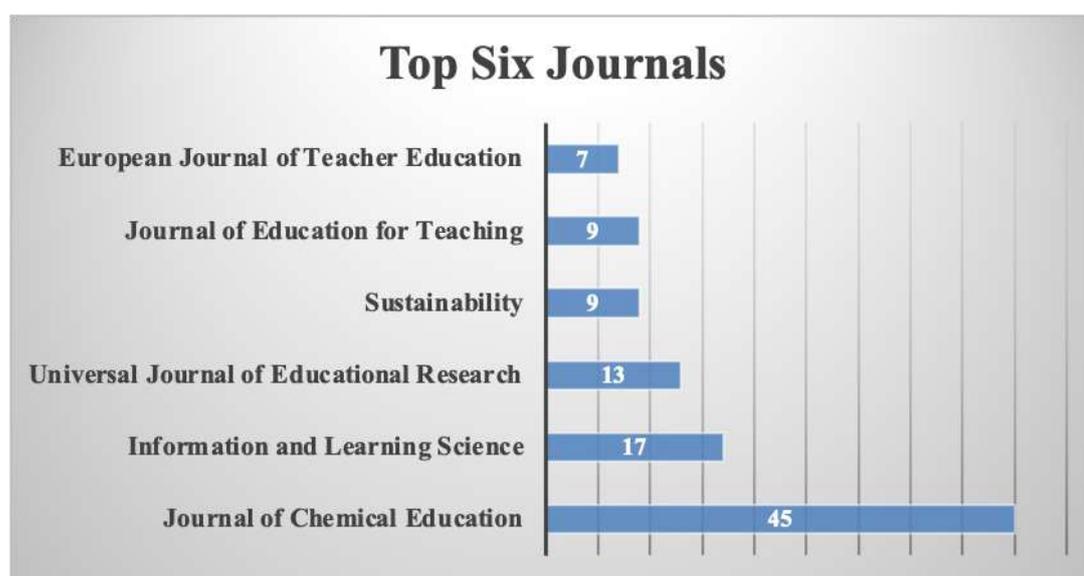


Figure 2. Journals the Articles were Published

Accordingly, the first three journals in the top-six list, where the most of the articles were published, are Journal of Chemical Education, Information and Learning Science and Universal Journal of Educational Research. It could be stated that especially the Journal of Chemical Education was not expected to have made so many publications in the field of distance education. When these publications were examined according to the methods, it was seen that the Journal of Chemical Education made more publications of reflection papers or opinion papers and fewer publications for research articles. It is relatively easier to produce articles in the type of reflection paper or opinion paper compared to research articles. Therefore, it could be stated that it is possible to have more numbers in the former type. It could be thought that a lack of a data collection process in reflection papers or opinion papers leads to the production of such publications in a shorter time. However, it is known that many journals in the field prefer publications of the research article type to such publications. Figure 4 shows the distribution of the countries where the studies were conducted.

Documents by country or territory

Compare the document counts for up to 15 countries/territories.

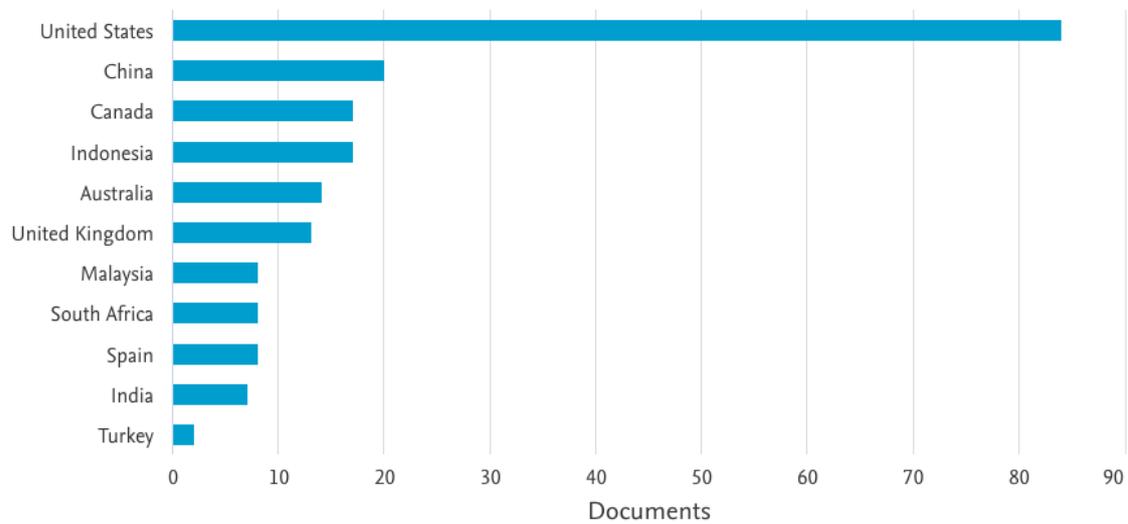


Figure 3. Countries Where the Articles were Written

When Figure 4 is examined, it is seen that USA is clearly ahead in the ranking of countries where the studies were conducted. USA is followed by China, and Canada and Indonesia are fairly close to these countries. It is seen that the first three countries in this list also appear as the leading countries in some of the review studies reported in literature [6], [7].

4.1 10 Most Cited Studies

The 10 most cited articles were listed within the scope of the study, and the data in Table 1 were obtained.

Table 2. List of Articles with the Highest Number of Citations

Publication Name	Authors	Journal	Cited by	Research Methods	Main Focus of The Study
Impact of COVID-19 on dental education in the United States	Iyer et al.	Journal of Dental Education	35	Theoretical/ Descriptive	This article discusses the challenges that we face currently and offers some simple strategies to bridge the gaps in dental education to overcome this emergency.
Adaptations to a face-to-face initial teacher education course ‘forced’ online due to the COVID-19 pandemic	Moorhouse	Journal of Education for Teaching	23	Theoretical/ Descriptive	This report details the adaptations and challenges one tutor made to the course in primary English language education.
Blended learning via distance in pre-registration nursing education: A scoping review	Jowsey et al.	Nurse Education in Practice	12	Theoretical/ Descriptive	This article reports the findings of a systematic literature review and identifies comprehensive evidence of the efficacy of blended learning for pre-registration nursing students who learn across distances and/or via satellite campuses.
COVID-19 and digital disruption in UK universities: afflictions and affordances of emergency online migration	Watermeyer et al.	Higher Education	9	Mixed/ Triangulation	This article reports the findings from a survey of academics working in universities in the United Kingdom and representing all the major disciplines and career hierarchy.
Impact of COVID-19 pandemic on information management research and practice: Transforming education, work and life	Dwivewdi et al.	International Journal of Information Management	8	Quantitative	This study offers a collective insight to many of the key issues and underlying complexities affecting organizations and society from COVID-19, through an information systems and technological perspective.
U.S. faculty and administrators’ experiences and approaches in the early weeks of the COVID-19 pandemic	Johnson et al.	Online Learning Journal	8	Qualitative	This study reports the findings of a survey investigating the rapid transition to emergency remote teaching in the early weeks of the pandemic at public and private post-secondary institutions in the United States.
Anxiety and coping strategies among nursing students during the covid-19 pandemic	Savitsky et al.	Nurse Education in Practice	7	Quantitative	This study assesses levels of anxiety and ways of coping among nursing students in the Ashkelon Academic College, Southern District, Israel.
Academia in the Time of COVID-19: Towards an Ethics of Care	Corbera et al.	Planning Theory and Practice	6	Theoretical/ Descriptive	This article discusses how the COVID-19 crisis is affecting our profession and how it may change it in the future.
Secondary school mathematics teachers' views on e-learning implementation barriers during the COVID-19 pandemic: The case of Indonesia	Mailizar et al.	Eurasia Journal of Mathematics, Science and Technology Education	6	Quantitative	This article investigates e-learning barriers experienced by Indonesian secondary mathematics teachers amid the COVID-19 pandemic.
The perceptions of primary school teachers of online learning during the covid-19 pandemic period: A case study in Indonesia	Rasmitadila et al.	Journal of Ethnic and Cultural Studies	4	Mixed/ Triangulation	This study explores the perceptions of primary school teachers of online learning in a program developed in Indonesia called School from Home during the COVID-19 Pandemic.

When Table 2 is examined, it is seen that nearly half of the most cited articles were conducted with the Theoretical/Descriptive methods. It was seen that the most frequently cited article was opinion paper, which was followed by reflection paper and then by systematic review. Especially in this pandemic process, many new applications were encountered in the field of education. Many people gave up their habits and tried new things. Due to this situation, people needed to reflect and interpret this experience. Therefore, an increase in the number of such articles will be an expected result during this period. Likewise, citation of such articles increases accordingly.

It was seen that the article cited in the third place was a systematic literature review study. Depending on this, the researchers could be said to make more use of the review studies which summarized the studies in related literature. Researchers willing to conduct studies on the related research topic will be able to save time by getting informed more about the related literature with the help of such review studies [16].

4.2 Keyword Analysis

Figure 6 presents the major keywords covered in the reviewed articles.



Figure 4. Major Keywords Covered

Figure 6 presents the keywords regarding the number uses in the studies. As a result, it was seen that concepts such as “learning”, “online”, “education” and “Covid-19” were prominent. It could be stated that the concepts in the graph with large fonts have been used extensively in related studies. It is known that the concepts of "learning", "online" and "education" are among the keywords frequently used in studies conducted in distance education. The concept of Covid-19 was used in all the studies because it was among the criteria of the studies examined.

4.3 Participants

Table 2 presents the frequencies and percentages of the participants which were preferred in the reviewed articles.

Table 3. Participants

Participants	Frequency	Percentage	Sample Size
Undergraduate students	47	49	9-7205
K-12 Teachers	17	18	1-1174
Academicians	11	11	4-1148
K-12 Students	9	9	15-354
Graduate Student	4	4	4-35
Experts	2	2	4-12
Adult	2	2	123-186
Administrator	2	2	3-7
Parent	2	2	3275

*One study may use more than one participant type

When the data presented in Table 3 are examined, it is seen that Undergraduate students (%49) constituted approximately half of all the participants. Similarly some systematic review studies found that undergraduate students were also favored more as participants [10]–[12]. The sample sizes in the reviewed articles range from 1 to 7205. It can be said that while the most of the sample sizes were small, there were also large scale studies performed in this period.

4.4 Data Collection Tools

Table 4 presents frequencies and percentages of the data collection tools used in the reviewed articles.

Table 4. Data Collection Tools

Data Collection Tools	Frequency	Percentage
Questionnaire	64	45
Scale	26	18
Interview	18	13
Document analysis	16	11
Academic achievement tests	4	3
Focus group	4	3
Observation	3	2
Log	3	2
Field notes	2	1
GPA	2	1
Discussion post	1	1

*One study may employ more than one data collection tools

According to Table 4, as the most popular data collection tools, questionnaire (45%), scale (18%), interview (13%) and document analysis (11%) were the most frequent ones used in these studies. The fact that questionnaire, scale and interview, were the most common data collection tools is also supported by other research results in related literature [6], [8]–[12], [14], [15].

4.5 Variables/Research Interests

The articles were examined according to the dependent variables. While there could be more than one dependent variable in a study, it was observed that no dependent variable was used in some studies. No dependent variables are used especially in opinion paper, reflection paper and review studies.

Table 5. Variables / Research Interests

Dependent Variables	f	%
Engagement	7	11,3
Readiness	6	9,7
Perception	6	9,7
Self-efficacy	6	9,7
Anxiety/Stress	5	8,1
Academic-performance	4	6,5
Experience	4	6,5
Attitude	4	6,5
Skills	3	4,8
Effectiveness	3	4,8
Usefulness	3	4,8
Satisfaction	2	3,2
Interaction	2	3,2
Confidence	2	3,2
Others	5	8,1

According to Table 5, the most frequent dependent variable was “engagement” (11,3 %) used in 7 studies. This variable was followed by readiness (9,7 %) in 68 studies, “perception” (9,7 %) in 6 studies and “self-efficacy” (9,7 %) in 6 studies. It was seen that the most frequent dependent variables used in the articles were engagement, readiness, perception and self-efficacy and they constituted almost half of all the variables. However, it is seen in literature that the studies mostly focused on more general variables such as academic achievement, effectiveness, attitude and satisfaction [9], [12], [14]. The reason for this difference in this study could be said to be the distance education applications in the pandemic period and the elements investigated in these applications. In this respect, it is not surprising that such elements as "Engagement", "Readiness", "Perception" and "Self-efficacy" were preferred in the studies in the pandemic period.

4.6 Research Design and Method

The articles were examined according to their Research Design and Methods. The results of the analysis were given in Table 5.

Table 6. Frequencies of Methods and Models/Designs

Method	f	%	Model/Design	f	%CUM	%TOTAL
Quantative	45	26	Survey	30	68	16
			Experimental	3	7	2
			Causal Comparative	4	9	2
			Correlational	7	16	4
Qualitative	23	13	Case Study	17	74	9
			Content Analysis	3	13	2
			Descriptive	1	4	1
			Narrative	1	4	1
			Phenomenology	1	4	1
Mixed	19	11	Explanatory sequential	2	11	1
			Embedded	2	11	1
			Convergent Parallel	16	77	9
			Exploratory Sequential	1	6	1
Conceptual / Descriptive / Other	88	49	Literature Review	2	2	1
			Report	1	1	1
			Reflection Paper	44	49	24
			Opinion paper	38	42	21
			Systematic Review	5	6	3
Practice Based	3	2	Action Research	3	100	2
Data Mining and Analysis	1	1	Learning Analytics	1	100	1

The analysis reveals that researchers mostly preferred Conceptual/Descriptive methods (49%), while reflection paper (n=44) and opinion paper (n=38), were the most frequent ones used in Conceptual/Descriptive methods. Quantitative methods (%26) were the second most preferred research paradigm, and among these studies, survey model (n=30) was the most common in these researches. Qualitative method studies scored the next highest (13%), within which case studies (n=17) and content analysis (n=3) were the most frequent ones used in Qualitative methods. Mixed methods (11%) and was the fourth most preferred research paradigm. Convergent parallel (n=16) was the leading research model in mixed methods. In the sampled publications, only three studies preferred Practice Based method and only one study preferred Data Mining and Analysis method. The most popular research methods and models were different in different review studies. In this study, the most common ones were Conceptual/Descriptive methods. On the other hand, in some other studies, quantitative methods were more common [5], [8]–[10], [12], [15]. Similar to the related finding obtained in the present study, in four review studies carried out by Mishra [6], Bozkurt et al. [13], Durak & Çankaya [17] and Durak & Çankaya [16] Conceptual/Descriptive methods were used more. Therefore, in recent studies, Conceptual/Descriptive methods could be said to have become more popular.

5. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

In this content analysis study, 180 publications were examined to identify trends and patterns in distance education/online learning area. Although there are many review articles on distance education in literature, lack of a study conducted in the pandemic period has increased the importance of this study. Accordingly, the articles published in 2020 were determined on Scopus, which is the world's largest academic database, to examine only the articles published in the pandemic period.

According to the research methods and models used in reviewed articles, it was seen that Conceptual/Descriptive methods was prominent. The Quantitative methods constituted 26% and the Qualitative methods constituted 13% of all

the methods. In literature, while mixed method and quantitative methods are frequently used in the review studies conducted in areas such as technology and distance education, the conceptual / descriptive methods were the most frequently used ones in this study. This situation could be explained as the preference of different research topics in distance education applications in the pandemic period. In this pandemic period, the world is not experiencing an ordinary situation in any respects, and different problems and different orientations in the field of education could be said to be an expected result.

Experimental methods were not much favored in articles carried out on distance education/online learning concept. This result was not surprising, because experimental studies are those requiring more time and effort. It might be quite normal that such studies have not yet appeared in this short period of time. When an evaluation was made in terms of the journals, it was seen that the journal of Chemical Education unexpectedly published the most articles in the field of distance education in the pandemic period. It was also revealed that most of the 45 articles published in this journal were of Opinion / Reflection Paper type. None of the top 6 journals in the list of journals with the highest number of publications focused on distance education. Normally, articles on distance education are expected to be published in specific journals in this field. However, in the pandemic process we are in, distance education has intensely affected many scientific fields. Therefore, it is seen that studies on distance education are carried out in almost all fields.

The studies related to the concept of distance education/online learning were examined with respect to the number of citations made to them. Ten most cited articles were listed. When these articles were examined, it was seen that the most cited 3 studies were performed with opinion/reflection/review research models found under the category of Theoretical/Descriptive methods. Thus, it could be said that the researchers cite these types of articles most because they reflect the experiences and summarized the studies in related literature in a systematic way. The present study, which was also designed as systematic literature review with content analysis, is thought to be a guide for researchers who want to perform a research about distance education area. Besides, this study is important to see the changes in distance education before and after the pandemic.

As a result of the analysis of the keywords, learning, online, education and covid-19 are the mostly included keywords. These keywords are frequently used keywords in distance education, and it is not surprising that covid -19 is among these key words with the pandemic process. In the articles undergraduate students were preferred mostly as a participant type. However, studies on k-12 teachers and k-12 students are not sufficient, and the groups most affected by this process are thought to be k-12 teachers and k-12 students. As data collection tools used in the articles, questionnaire, scale and interview were dominant. When evaluated in terms of research interest, it was seen that variables such as engagement, readiness and perception, which have not been frequently used in literature, are preferred. This situation could be said to be related to different research orientations in the current pandemic period.

As demonstrated by the review of the related literature, there isn't any systematic content analysis conducted to distance education/online learning concept in covid-19 pandemic. Therefore, the present study is expected to be the first one. Based on the findings of this research, the following suggestions were made for researchers who wants to perform studies in this concept.

It is seen in the studies that experimental research methods were almost never preferred. Experimental studies are very important in terms of giving first-hand data regarding the success of the education given. Researchers can include more experimental studies on emergency distance education practices.

When the methods of the studies were examined, it was seen that the Mixed Method was ranked 4th in terms of popularity. Researchers could use the mixed method more in their studies to provide data diversity.

Researchers could conduct new studies by using less popular dependent variables such as academic achievement, motivation and social presence.

Researchers could carry out studies comparing the practices in different countries.

Researchers could design new content analysis studies by using different databases and by focusing on certain aspects of distance education.

In this period, researchers have written many reflection papers to reveal the experiences of their own institutions or their countries. A detailed content analysis especially on reflection papers will be useful in terms of seeing the whole picture.

The Data Mining and Analysis method was preferred in only one of the 180 studies. With the help of studies to be carried out with Data Mining and Analysis methods, valuable findings and results could be obtained from the traces left by students on distance education systems. Researchers could be encouraged to do more studies using this method.

The studies were mostly carried out with undergraduate students. Undergraduate students are among those with the best self-learning skills. Therefore, these students could be said to be one of the groups who will benefit most from distance education. However, this is not the case for K-12 students. It could be stated that especially young primary and

kindergarten students are among the groups most affected by this process. In this respect, more studies could be conducted on this subject with K-12 students.

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