

## A BIBLIOMETRIC ANALYSIS OF THE EFFECTS OF THE COVID-19 PANDEMIC ON STUDENTS

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### ABSTRACT

*The global impact of the Covid-19 pandemic has generated major changes in educational processes and universities' activities, affecting both the private life and academic activity of students. All these developments have prompted academic scholars to shift their focus to the study these unprecedented phenomena. This research provides a bibliometric examination of the personal and academic repercussions of the COVID 19 pandemic for students. To assess how these implications have been reflected in academic works published so far, a search of the Scopus database for the keywords "Covid\*" and "students\*" yielded 15,641 scholarly publications published between 2019 and 2022. This bibliometric research presents an analysis of the evolution of the works in time, the main geographical areas, their classification by fields and the most cited works, and finally, the analysis of keywords and the strength of the links between the terms.*

**KEYWORDS:** *bibliometric analysis, COVID-19, scientific documents, students.*

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### 1. INTRODUCTION

The coronavirus (COVID-19) has spread fast around the world, infecting more than 305 million people and killing approximately 5 million (Essadek et al., 2022). Governments have advocated for social distancing of population with the option of performing their activities online, remotely, to prevent the virus spreading. On 16 March 2020, Romania declared a state of emergency for the first time, lasting 60 days (Legislative Portal, 2020). Different aspects of education system were challenged, in forms of opportunities, but most of them as barriers (Cicea & Marinescu, 2021). All students have been told to stay home and participate in remote activities. As a result of COVID-19, they found themselves in an odd circumstance.

Since the pandemic broke out, scientists worldwide have done relevant research in a broad range of domains, including disease transmission and immunology (Wang & Tian, 2021), while other academics have expressed scientific worries about the pandemic's consequences on social life. Nevertheless, scientific interest in the academic sector existed before the Covid-19 pandemic, among the topics of interest are learning, motivation and development, both for students and researchers (Hashim et al., 2018).

The purpose of this research is to provide a bibliometric analysis of the personal and academic effects of the COVID 19 pandemic on students. The main goal is to examine whether scientific linkages exist and how they are established in academic works by examining the terms "covid" and "students." Finally, this study intends to investigate what additional notions interact with the terminology used and what the scientific link exists between them. The importance of this topic stems from the attention granted in national and international studies to the impact of the pandemic in various social situations.

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To investigate these topics, we offer a study of the specialist literature and theoretical advancements in the first part of the research, and methodological aspects and analysis findings in the second half of the paper. Thus, along with the main purpose of the research, we also want to answer the following research question:

*Q1. Does the COVID-19 virus have an impact on the academic environment in terms of research production?*

In the last part of the paper, we present and compare the results of this study with other scientific studies and provide future research directions.

## **2. THEORETICAL BACKGROUND**

The new coronavirus pandemic (COVID-19), which was discovered in Wuhan, China, in December 2019, has caused tight lockdown measures and adjustments in school activities and universities around the world. Furthermore, maintaining pedagogical continuity required the fast adoption of online education outside of the traditional classroom (Corbos et al., 2020). This unprecedented conditions had an impact on the university students (Aylie et al., 2020), being subjected to a variety of stressors, including academic overload, ongoing pressure to achieve, academic performance, and anxiety about the future (Tavolacci et al., 2021). According to Elmer et al. (2020), there are specific concerns about the personal and academic effects of the COVID 19 pandemic on students, such as social isolation, lack of interaction, lack of emotional support, and physical isolation. These problems have been linked to poor mental health outcomes among college students.

According to Baber (2020), there are several aspects that contribute to failure in the online learning process. Motivation and involvement of the students are the most crucial aspects. Lack of desire makes it difficult to complete online courses, resulting in higher dropout rates among students.

However, the implications of the pandemic have had also positive effects in the university environment; as a result, the agility and flexibility of information transmitted in the online environment represents a more contemporary approach to learning and teaching, which not only offers the benefits of real-time face-to-face teaching, but also equity in learning opportunities, the ability to overcome learning barriers for more introverted students, and the potential to create a more culturally safe learning environment (Currie et al., 2020).

As a result, several research studies have been carried out to determine which teaching technique is superior, online, or conventional (Gopaln et al., 2021; Göksu et al., 2021). According to Laksana (2021), online learning requires considerable patience and requires students to search the Internet on their own, resulting in a self-learning process.

From the teachers' perspective, the pandemic period represented also a difficulty, since adjusting to the online school required more effort to create virtual resources such as interactive presentations, films, etc. (Gopaln et al., 2021). Meyer (2012) was able to conduct a study on the impact of online instruction on productivity before the advent of the COVID-19 virus. It was found that the more they engaged in various online activities, the more productive most of the teachers at a university in the United States of America felt. However, more recent research conducted during the pandemic by Selvaraj et al. (2021) indicates that direct student-teacher engagement is vital for online learning and, without genuine interaction, instructors tend to feel useless.

COVID-19, as an infectious disease, has piqued the interest of researchers in a variety of fields. As a result, scientists have investigated the disease from a variety of clinical perspectives, including virology, microbiology, and other domains where the virus has left its impact. Many researchers have published their findings in prestigious peer-reviewed publications around the world.

The current study uses the bibliometric analysis approach to statistically examine scientific articles (Fan et al., 2020) regarding the scientific association between the terms "Covid" and "students." Furthermore, bibliometrics is used to investigate the field's significance in academic research, the evolution over time, the link between key phrases, and so on.

### 3. DATA COLLECTION AND METHODOLOGICAL FRAMEWORK

According to the specialist literature (Gauthier, 1998), scientometrics is a mean of tracking scientific research activities. Furthermore, bibliometrics is a subfield of scientometrics that involves the quantitative analysis of scientific resources for statistical reasons.

The extraordinary and fast rise in scientific production related of COVID-19 poses various problems for researchers in maintaining an increasing level of research understanding (Porter et al., 2020). As a result, the objective of this research is to investigate and develop links between the examined concepts and the way they appear in scientific publications. Finally, this study intends to investigate what additional concepts interact with those of main interest and highlight their relationships.

Table 1 shows the methodological framework adopted for this study.

**Table 1. Methodological Framework**

Scopus Searching	
Keywords	'Covid *' AND 'students *'
Search filters	Title, abstract, key terms of the document.
Type of research	Articles and conference papers
Years	2019 - 2022 (March)
N	15,641
Type of Analysis	Evolution over time, most cited articles, areas of interest, number of scientific publications per country, keywords, etc.
Software	VosViewer 1.6.18 (Van Eck & Waltman, 2022)

*Note:* N - the final number of analyzed documents.

*Source:* authors

To gather data and information for the analysis, the Scopus database was searched using the keywords "Covid\*" and "students\*". Based on the search parameters mentioned in Table 1, 17,946 scientific documents were found and after applying a selection filter, the final database allows for the examination of 15,641 articles and conferences-type documents. The database was later downloaded in .csv format and processed in the VosViewer program, version 1.6.18. (Van Eck & Waltman, 2022). Thus, according to the specialized literature (Broadus, 1987; Ștefan & Breazu, 2022), we aimed to achieve a series of bibliometric objectives, such as: the evolution over time of the works, the geographical affiliation, the field of interest in research, the analysis and connection of key terms, as well as other aspects.

To achieve the first two objectives, analysis methods provided by the Scopus platform were used, and thus information about the years in which the scientific materials were published, the names of the authors who contributed significantly to the field researched, the field covered, the type of document, the geographical space, etc. was centralized with its assistance.

### 4. DATA ANALYSIS

#### 4.1 Evolution over time and top 10 countries involved in research

According to the WHO (2022) study, the first documented SARS-CoV-2 diseases were detected in December 2019 in Wuhan, China. As a result, a small group of scholars conducted studies in the same year on the influence of the new virus on online education and its implications for academia. It is not surprising that most Asian scholars have expressed interest. Table 2 also contains information on the first scientific items indexed in the Scopus database in 2019. As a result, the first scientific materials

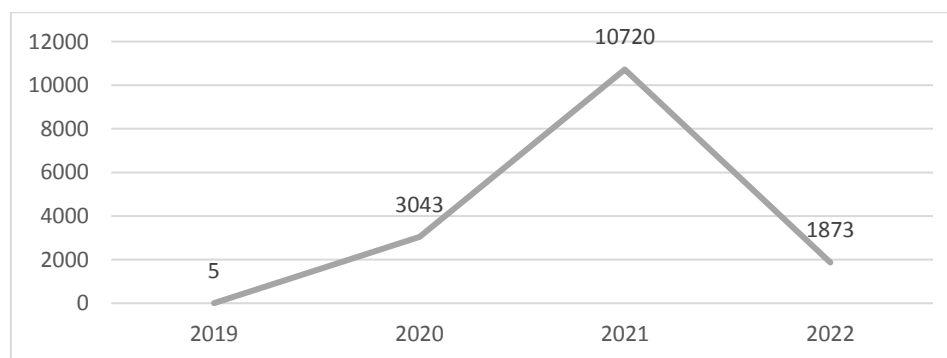
analyzing the virus' impact on online education were published in a variety of publications from diverse sectors.

**Table 2. First scientific materials indexed by the Scopus database on COVID-student analysis**

No.	Authors	Research Name	Journal	Authors' affiliation
1	Ng et al. 2019)	Business (Teaching) as Usual Amid the Covid-19 Pandemic: A Case Study of Online Teaching Practice in Hong Kong	Journal of Information Technology Education: Research	Rutgers University, The University of Hong Kong
2	Torres-Campos, A. (2019)	Basics of Astrophysics in primary school: Marvel, play and learn	Proceedings of the International Astronomical Union	Fundación Colegio Le Bret
3	Agata, H. (2019)	With Covid-19: Attempt of learning to observe the moon using a telescope at home	Proceedings of the International Astronomical Union	National Institutes of Natural Sciences – N. Astronomical Observatory of Japan

Source: Data processing by authors with the Scopus database (2022)

Figure 1 shows the evolution of scientific publications, articles-type or conference-type materials, during the previous four years. Thus, from the beginning of the pandemic to today, we can see a rising tendency, with the number of scholarly articles relevant to the examined issue increasing to 3,043 documents in 2020. In terms of the year 2021, we can see that there is the greatest increase from a scientific point of view, which is 68.53% more compared to the year 2020, and this is also because the researchers required a period to analyze the effects, implications, and other phenomena that contributed to the change in the social and academic environment. The analysis for the year 2022 presents the situation of scientific materials up to the moment of querying the Scopus database, more precisely, March 2022; as a result, we can see that up to that moment a number of 1,873 scientific materials have been published. Even if the axis is decreasing for the year 2022, we can anticipate the fact that 11,238 materials will be published this year if the interest of researchers would be maintained as in the first two months of this year.



**Figure 1. Research published by year for 2019-2022**

Source: Data processing by authors with the Scopus database (2022)

Table 3 shows the main countries, or the top ten countries, that participated in the scientific process. Therefore, the United States ranks first in terms of research on COVID and its impact on students and

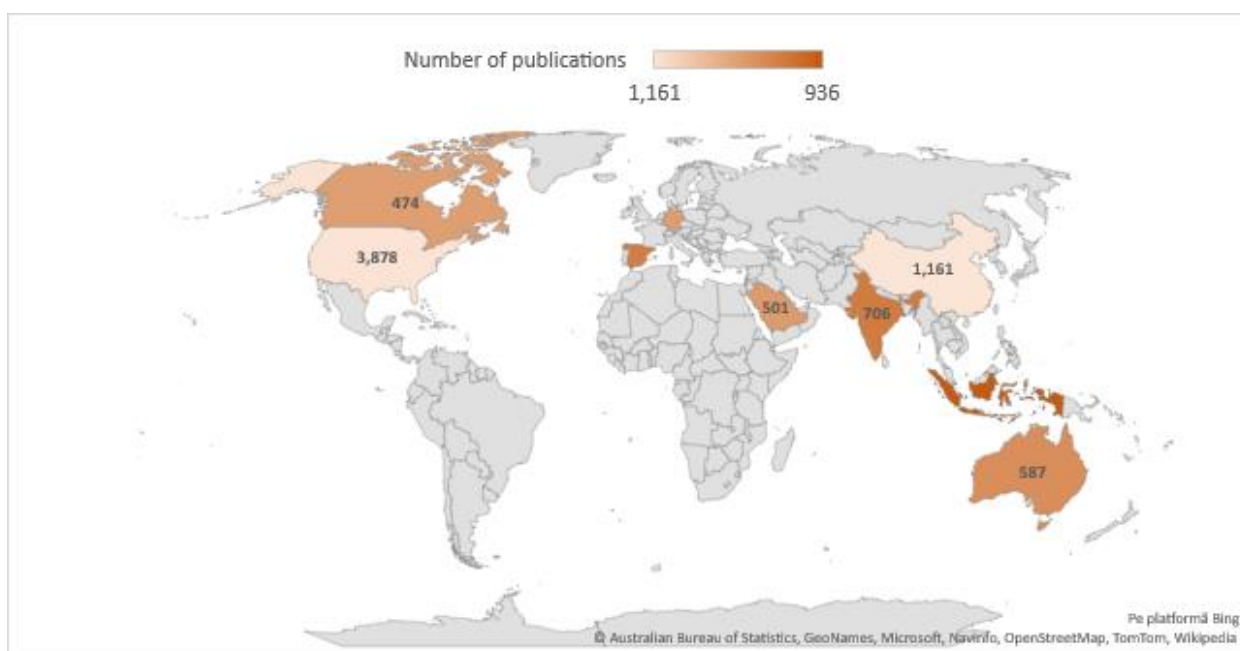
the higher education environment, with 3,858 publications in fields such as social sciences, medicine, cybernetics, psychology, engineering, healthcare, and others, including 3,303 articles and only 575 conference papers. China, which is second, also makes a significant contribution in the field, even if the number of scientific materials is reduced by half. Asian researchers have focused their attention more on the field of medicine, with 422 materials in the field, and in total they have 929 articles and 232 conference studies that were indexed in the Scopus database. Other nations are active in the scientific approach, such as Romania, which, although not in the top 10, managed to produce 99 articles and 33 conference studies between 2020 and 2022.

**Table 3. Number of scientific publications per country**

Rank	Country	Number of publications
1	United States	3,878
2	China	1,161
3	Indonesia	936
4	Great Britain	842
5	India	706
6	Spain	693
7	Australia	587
8	Saudi Arabia	501
9	Germany	482
10	Canada	474

*Source:* Data processing by authors with the Scopus database (2022)

With the information from Table 3, Figure 2 was built for a better geographical representation. Thus, the number of publications distributed geographically is depicted on the map using the colors orange and pink. Thus, the pink color denotes a high number of publications (United States, China), while the orange color suggests a lower number of publications (Germany, Spain, Canada, etc.).



**Figure 2. Geographical dispersion of countries according to the number of publications**

*Source:* Data Processing by the Authors



#### 4.2 Classification by fields of interest and the top five most cited papers

Since many of the academic papers that examined the impact of the COVID-19 virus were framed in different disciplines of study, Table 4 provides information on the key areas in which researchers addressed the impact of this virus on the university environment and students. With a total of 7,015 scholarly publications, the discipline of social sciences was found to be the most addressed. This may be explained since the impact of the pandemic has caused changes in all social situations. Medicine ranks second in terms of published materials; therefore, we may emphasize the fact that 4,467 items have been published and indexed in the Scopus database since the beginning of 2020 up to now. The following positions are held by cybernetics and engineering, demonstrating that scientists were interested in digitalization related topics during the pandemic. Scientific approaches have also been used in other fields such as environmental science, nursing, management, energy, etc.

**Table 4. Areas of interest in research on the analyzed topic**

Rank	Research field	Number of publications
1.	Social Sciences	7015
2.	Medicine	4467
3.	Cybernetics	2956
4.	Engineering	1886
5.	Psychology	1515
6.	Environmental Sciences	1080
7.	Healthcare	836
8.	Art and Humanities	720
9.	Business, Management and Accounting	689
10.	Medical Professional	629

*Source:* Data processing by authors with the Scopus database (2022)

The Scopus platform's online tool "See the summary of citations" was used in this study to analyze the most cited documents, ranked on the basis of the "most citations" criterion. Therefore, Table 5 displays the most referenced scientific publications, whether they are articles or conference materials, at the time of the analysis (8.03.2022). Therefore, the research with the highest number of citations is by Wang et al. (2020), which gathered 3,741 citations at the time of the analysis. The material provides information on quick psychological responses and related variables in the general population of China during the initial stage of the 2019 coronavirus disease pandemic (COVID-19). Furthermore, the objective of this study was to poll the Chinese population in order to better understand the psychological effect, anxiety, sadness, and stress levels during the early stages of the COVID-19 pandemic. Cao et al. (2020) come in second position with 1,739 citations for their article-type work. This study focuses on the psychological impact of the COVID-19 outbreak on Chinese students. Rajkumar, R.P. (2020), in third place, performed a literature analysis to examine the psychological impact of the COVID-19 virus on the mental health of people in different impacted nations. Therefore, the study also offered information on the impact of the pandemic on students, concluding that anxiety and depression symptoms, as well as self-reported stress, may be prevalent psychological reactions to the COVID-19 pandemic and may be associated with sleep disturbances.

**Table 5. Top 5 most cited documents**

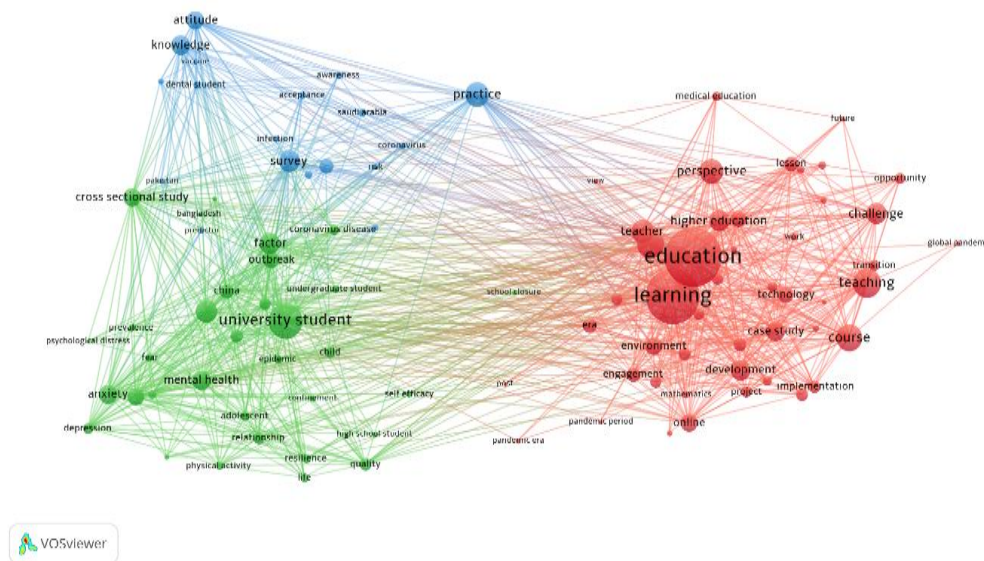
Rank	Authors	Journal Name	Research name	Number of citations
1.	Wang et al. (2020)	International Journal of Environmental Research and Public Health. 17(5), 1729	Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) pandemic among the general population in China	3741
2.	Cao et al. (2020)	Psychiatry Research. 287, 112934	The psychological impact of the COVID-19 pandemic on college students in China	1739
3.	Rajkumar, R.P. (2020)	Asian journal of psychiatry. 52, 102066.	COVID-19 and mental health: A review of the existing literature	1348
4.	Meng et al. (2020)	Journal of Dental Research. 99(5), 481-487.	Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine	763
5.	Li et al. (2020)	Infectious Diseases of Poverty.9(1), 45	Expression of the SARS-CoV-2 cell receptor gene ACE2 in a wide variety of human tissues	634

*Source:* Data processing by authors with the Scopus database (2022)

### 4.3 Keyword analysis

The final goal of the research is to examine the keywords and connection strength within the word graph created in the Vosviewer software version 1.6.18. (Van Eck and Waltman, 2002) To create the keyword connection map, the type of analysis "cooccurrence" and the unit of analysis "keywords" were selected using the option "Create a map using text data" (Bunea, 2021).

Following analysis, 29,766 keywords relevant to the topics "Covid19" and "students" were found. Given the enormous number of keywords discovered, only those occurring in at least 50 articles were chosen. As a result, 163 keywords were selected and the keyword map is shown in Figure 3. We didn't make any categories inside the database since we didn't want to exclude any terms.



**Figure 3. Keyword map**

*Source:* authors with Vosviewer (Van Eck & Waltman, 2022)

According to the keyword clustering selection criterion for terms that occur in more than 50 publications, 98 nodes may be detected. A keyword represents a node and its size is proportional to the number of occurrences (Popa & Gora, 2020). In terms of categorizing the 98 keywords, three clusters were discovered and highlighted in distinct colors. According to the information in Figure 3, the largest cluster is marked in red, with 47 nodes, the green cluster has 33 nodes and the blue cluster has 18 nodes.

Regarding the analysis of the first cluster, the word "education" is noted as the most used keyword with links to keywords such as adaptation, challenge, distance learning, opportunity, era, pandemic, and other words, which leads us to believe that, for the first grouping, home education has caused a challenge and provided a unique experience to students and the university environment.

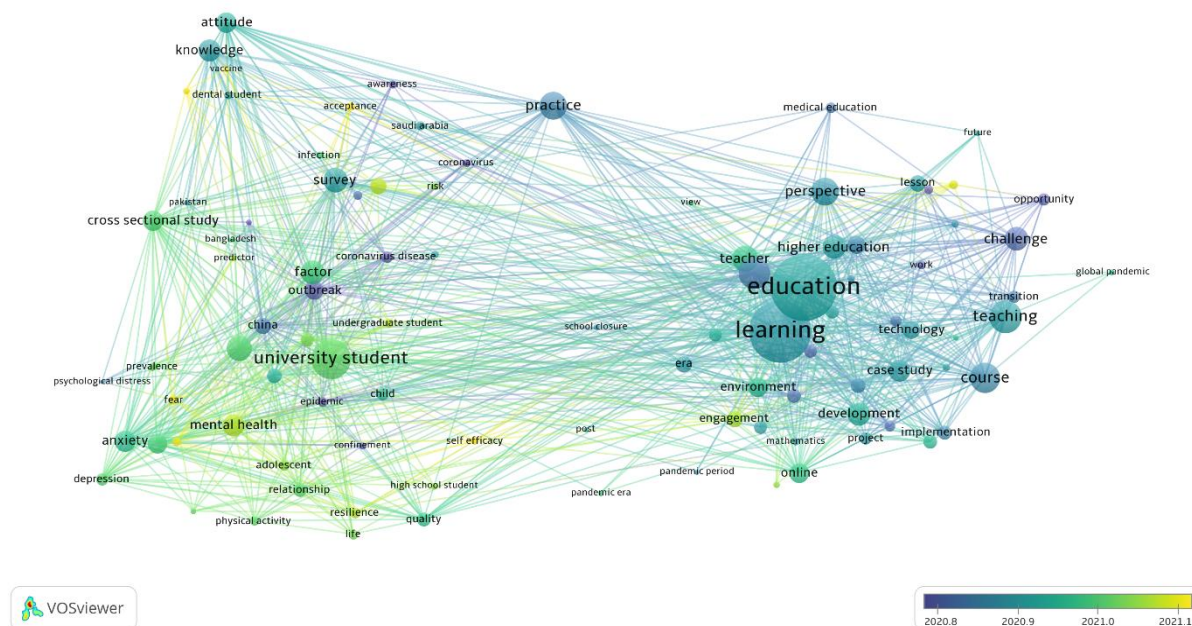
For the second cluster, we find "university student" as the most commonly used term, with correlations to keywords such as anxiety, sadness, fear, and mental health. As a result, we might evaluate the fact that social isolation and change have prompted the academic environment to examine students' health status.

Keywords such as vaccination, risk, and knowledge are used in group 3, which leads us to infer that there is a pandemic developing in which pupils face the unknown and take risks.

Figure 4 shows the progression over time of the important keywords selected throughout the analytic process using the VosViewer function "Overlay visualization." Therefore, in the first decade of the 2020, themes such as pandemic, challenge, education, and practice predominate. Furthermore, this accurately depicts the social environment in which academic life was located. Finally, we can witness the evolution of terms through time; as a consequence, in the second semester of 2020 we will see terms like: practice, online school, learning, teaching, knowledge, perspective, lesson, teachers, course, opportunity, and so on.

Furthermore, concepts like anxiety, sadness, university students, relationships, online school, and anxiety are discussed in the first half of 2021. This phenomenon is most likely due to the fact that researchers in 2021 investigated the personal and intellectual consequences of the COVID 19 pandemic on students more thoroughly. Furthermore, in the last quarter of 2021, research will focus on topics of mental health, dedication, vaccination, and challenge.





**Figure 4. Overlay Visualization**  
 Source: authors with Vosviewer (Van Eck & Waltman, 2022)

## 5. CONCLUSIONS

The outbreak of the COVID-19 virus has altered all social and economic activity around the world. The efforts to mitigate its spread also had an influence on the academic environment, and academics around the world have begun to investigate the psychological impact of the virus on the university setting. This research provides a bibliometric perspective on the personal and academic implications of the COVID 19 pandemic for students. As a result, we examine the history, geographical association, field of study interest, and the relationship of important phrases.

Based on the study data and returning to our research inquiry, we found that most of the publications were published in 2021. Furthermore, Dehghanbanadaki et al. (2020) conducted a bibliometric analysis in which they analyzed the volume of papers published during the pandemic's onset, and they discovered that the United States and China rank first in terms of researching COVID and its impact on the academic environment. According to the current analysis, the United States offers 3,878 scientific articles and China provides 1,161 scientific materials.

The study fields most addressed were social and medical studies, and the most referenced work was by the authors Wang et al. (2020), which had 3,741 citations at the time of the analysis. Therefore, there were studies that supported the findings of our study, such as Nasir et al. (2020) discovered that the Mortality and Morbidity Weekly Report (MMWR) ranks first in the publication of the coronavirus literature in the field of social sciences.

Furthermore, examining the link made between the important concepts, we saw that home education posed a challenge while also providing a unique experience to students and the university environment. However, social isolation and change in the societal context have prompted the academic environment to examine the health state of students.

This study is unique in the literature, as no other bibliometric work has been found that allows a quantitative examination of studies that represent the links between the words COVID and students. As for the future agenda, more specialized components might be included in future studies (Romanian students and Covid19). Future research might also look at topics like student effectiveness. A

bibliometric study may be performed at the university level to discover many characteristics (the most productive author, the most productive department, the most cited journal, or the most cited research). The boundaries of bibliometric study are reflected by the boundaries of quantitative research. Thus, a statistical analysis of the quality of the evaluated articles may also be performed (Pătărlăgeanu et al., 2019).

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