

# **EDUCATIONAL SCENARIOS OF PUBLIC HIGHER EDUCATION IN BRAZIL DESIGNED BY THE COVID-19 PANDEMIC: A SYSTEMATIC LITERATURE REVIEW**

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## **Abstract**

*Brazilian Federal universities were directly affected by the COVID-19 pandemic, requiring educational changes and new teaching policies. The role of universities in society go far beyond the classroom, and with the changes caused by the COVID-19 pandemic, this role has intensified with social policies and actions developed thinking about the welfare of the community in which it is inserted. The objective of this study was to carry out a survey using a systematic literature review to identify the educational scenarios of public higher education in Brazil designed by the COVID-19 pandemic. The Methodi Ordinatio was used which ranked the main studies. The search was conducted in four bibliographic databases: Science Direct, Web of Science, Scopus, and Emerald. With the application of the systematic literature review, it was possible to find out that Brazilian federal universities played a key role, with actions in the community to which they belong, namely: activities carried out to clarify the community about the SARS-CoV-2 virus, information about prophylactic care, community care services, food distribution, diagnostics, development of applications and portals, research activities carried out by teachers for the development of vaccines, production, and manufacture of materials and equipment such as alcohol gel, personal protective equipment, cleaning materials and maintenance of hospital equipment, reinforcing the important role played by universities.*

**Keywords:** Federal university; COVID; Public university; Higher education; Brazil.

## **1. Introduction**

The role of a federal university in a country is important. The development of a nation towards its autonomy is directly linked to the ability it has to use the systems of science, technology, and innovation to generate income and added value, both by the application of its productive systems and by obtaining gains with protected knowledge (ALVIM, 2007). Carvalho, Reis and Cavalcante (2011, p. 20) state that "Science, Technology and Innovation form the trinomial that strongly contributes to the competitiveness of a country". The university environment is rich in the development of new knowledge, but these do not always become innovative within these environments, especially when it comes to innovation in the teaching and learning process.

Considering the need to enable the offer of remote education, the Ministry of Education (MEC), through Ordinance 343 of March 17, 2020, and Ordinance 345 of March 19, authorized the offer of classroom education through digital resources for the duration of the pandemic. Thus, the Ministry of Education authorized on an exceptional basis the offering of teaching through Information and Communication Technology (ITC) (Bordin et al., 2020). With such acts, they brought the challenge of learning in a new model for educational institutions, teachers, and students. According to the Brazilian Association of Maintainers of Higher Education (ABMES, 2020, p.1), the Higher Education Institutions (IES) had to dedicate themselves to the search for alternatives to minimize the effects of social isolation due to the pandemic. "For the Higher Education area, the main measure that has been adopted is the use of technology for the continuity of face-to-face activities in virtual environments" (ABMES, 2020, p.1). To make a prosperous and safe future possible, public policies are needed that can guarantee the adequate promotion of education, make intelligent use of the available technological solutions, prioritize the most vulnerable, and protect educators and students (DIAS E PINTO, 2020).

The intended research question is: "What was the role of Brazilian federal universities in the face of the COVID-19 pandemic?".

## **2. Method**

The research was conducted through a survey of studies in the literature, following the Methodi Ordinatio systematic review methodology (PAGANI et al., 2015) for the selection of articles aligned to the central theme of the research, to build a base portfolio. The research corpus was built with the use of four bibliographic databases: Science Direct, Web of Science, Scopus, and Emerald, through institutional access to CAPES Journals, in April and May 2021, by using the following descriptors: 1. ("federal university" OR "federal universities") AND "covid" AND Brazil); 2. ("public university" OR "public universities") AND covid AND Brazil); 3. ("higher education" AND covid AND Brazil). English terms were adopted and combined with the logical operators OR and AND to give more breadth to the search.

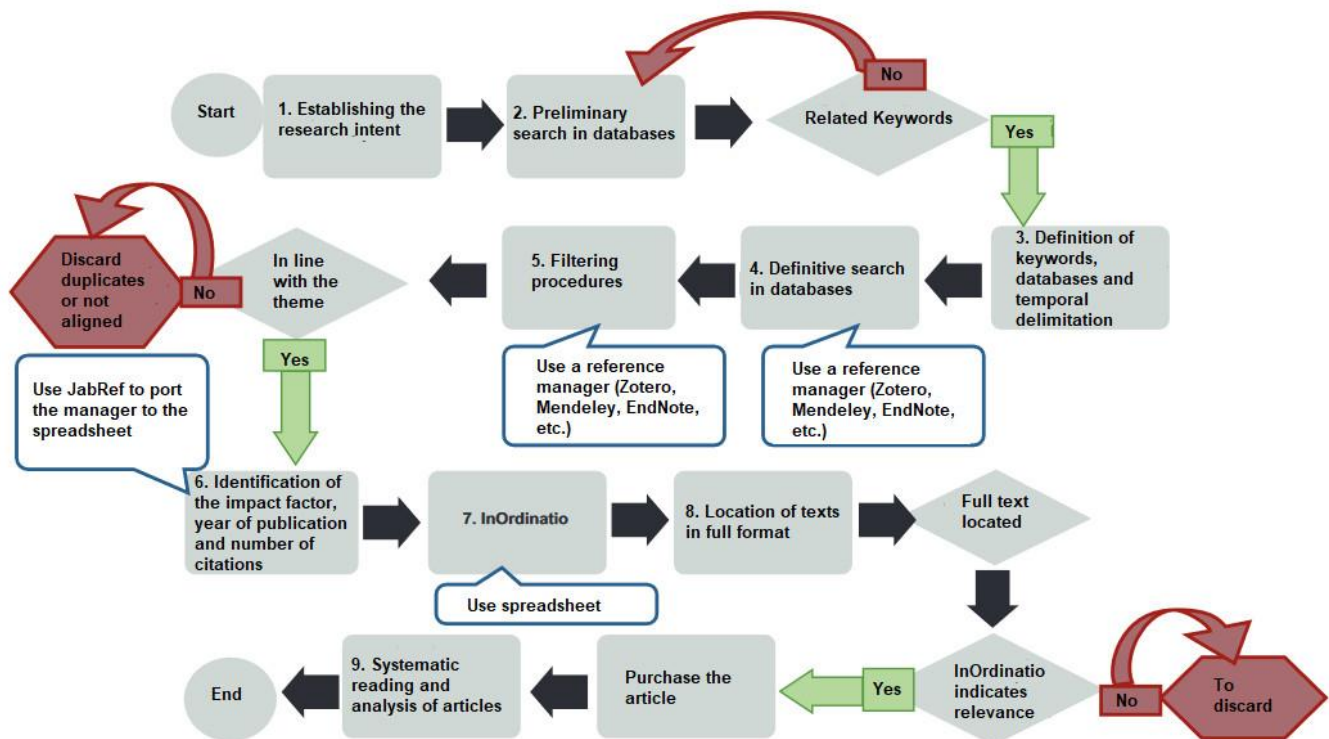


Figure 1. Stages of Methodi Ordinatio.

Figure 1 shows the process of applying the Methodi Ordinatio consisted of exporting the results obtained in the search to the reference management software Mendeley, where it was possible to exclude duplicate articles. Then, it was exported to a file compatible with the reference management software JabRef, so that it was possible to generate a file compatible with the Microsoft Excel spreadsheet, where the information of Author, Title, year of publication (YEAR), Journal, Impact Factor (FI) and Citations (CI). With this, it was possible to apply the InOrdinatio equation to list the most relevant articles concerning the research question. The next step consisted of searching the complete publications in the bibliographic databases for reading and identifying the alignment with the central theme, concluding the steps of applying the Methodi Ordinatio (PAGANI et al., 2015). Regarding the inclusion criteria of the research, the studies published between the years 2020 and 2021 were adopted, and as exclusion criteria, the following were added: title or abstract discordant with the central theme of the research, as well as the non-relevance of the article after the full reading and duplicate studies. Figure 1 indicates the steps that were applied in the method used, thus allowing a qualitative analysis of the relevant articles, to identify what was the role of Brazilian federal universities in the face of the COVID-19 pandemic.

### 3. Results and Discussion

The systematic literature review was carried out based on the defined research question, seeking to know what the role of Brazilian federal universities in the face of the COVID-19 pandemic was. The university plays an important role by carrying out actions in the community where it is located. Thus, the research topic focuses on the changes that have occurred in the transformation of the face-to-face classroom into a remote classroom model, as well as on the actions and research that the universities have carried out

since the beginning of the COVID-19 pandemic.

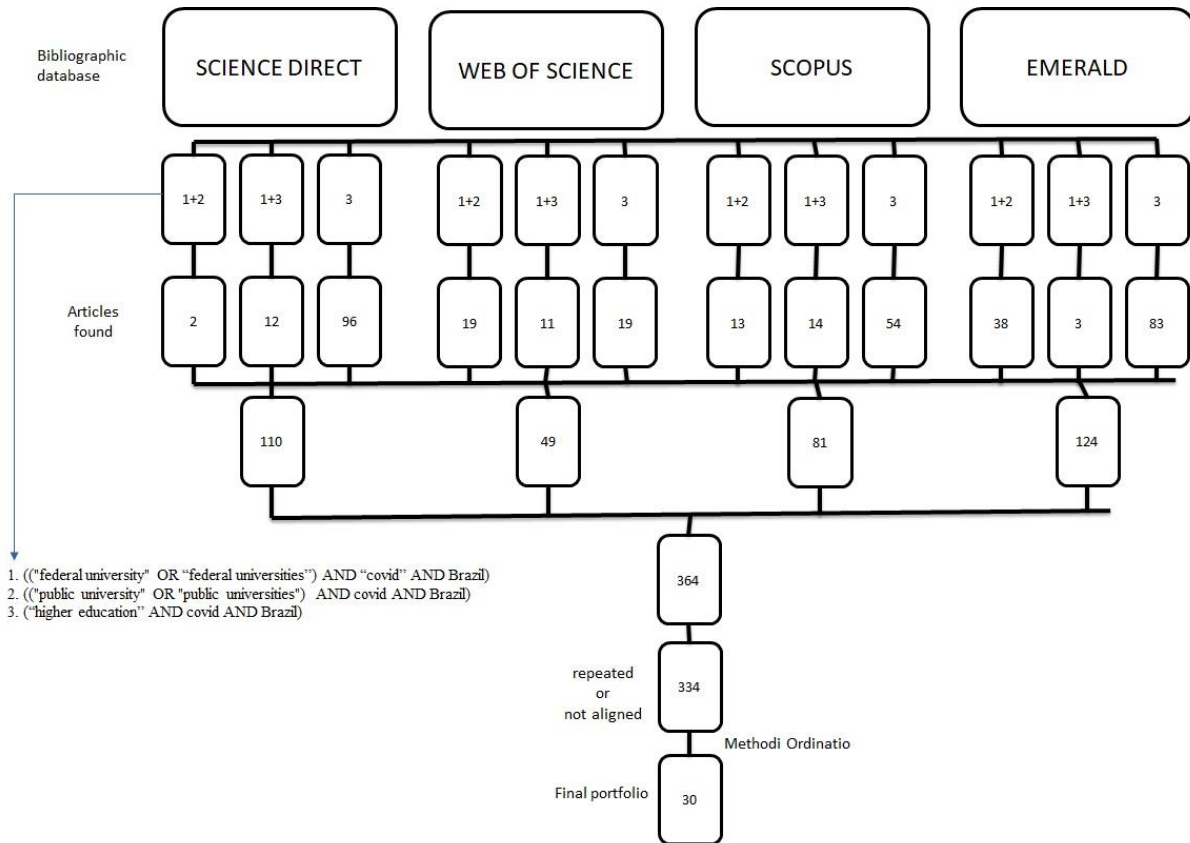


Figure 2. Application of Methodi Ordinatio

Figure 2 shows the application of the Methodi Ordinatio with the result of searches carried out in bibliographic databases in the applications of descriptors and the filters carried out to obtain the results. As a result of applying the Methodi Ordinatio, a portfolio was built with 30 articles aligned to the research question, based on four themes that are presented in Table 1, with their respective publications.

Table 1. Themes and references

Themes	References
1. What changes in education policies have occurred in Brazilian public universities in face of the COVID-19 pandemic	Peloso et al. (2020), Alves et al. (2021), Plummer et al. (2021), Leite et al. (2020), Leite & Soares (2020), Gomes et al. (2020), Santo & Lima (2020).
2. What alternative tools for remote teaching have been produced to meet the demands imposed by the COVID-19 pandemic.	De la Fuente et al. (2021), Cultri et al. (2020).
3. What studies have been developed in universities related to the social relationships of the individuals who make up the academic community that suffered the impact of the COVID-19 pandemic.	Carvalho & Souza (2021), Ivenicki (2021), Castonia et al. (2021), Guimarães et al. (2020), Inomata et al. (2020).
4. What actions have been taken by public universities	Arrais, C.A et al. (2021), Anholon et al.

<p>to meet the demands imposed by the COVID-19 pandemic.</p>	<p>(2021), Panizzon et al. (2020), Santos et al. (2020a), Paula et al. (2020), Meneses et al. (2020), Almeida &amp; Queiroz (2020), Almeida et al. (2020), Costa et al. (2020), Silva et al. (2020a), Prueter &amp; Porto Alegre (2020), Santos et al. (2020b), Silva et al. (2020b), Da Cruz Bezerra et al. (2020), Van Kaick &amp; Porto Alegre (2020), Severo et al. (2020).</p>
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Table with themes and references used in the systematic review.

The construction of the portfolio enabled the discussion of the central theme of the research, making it possible to analyze what was the role of Brazilian federal universities in the face of the COVID-19 pandemic.

Main results and conclusions of the qualitative studies of the research corpus related to theme “What changes in education policies have occurred in Brazilian public universities in face of the COVID-19 pandemic”:

Peloso et al. (2020): The authors address the concerns of higher education health students in Brazil about moving to the remote model due to the COVID-19 pandemic. Personal information, feelings about the pandemic, the change to remote learning, and the impact of this modality on the performance in the higher education course were surveyed. As a result, it was possible to ascertain the rate of students having difficulty following remote classes and the main difficulties reported by them. The authors indicated that a high level of self-discipline is necessary for the student to follow the remote classes. Another point raised is that it is not possible to suddenly replace traditional teaching strategies with remote classes and expect everything to continue in the same way. There are many variables involved in the process (teachers/infrastructure) and abrupt changes can lead to negative results. The study is important as it has contributed to higher education institutions being able to learn from each other's experiences during the COVID-19 pandemic and transform future learning activities.

Alves et al. (2021): The authors make an approach by relating the content of the human physiology course at the Federal University of Pampa to the COVID-19 pandemic. One of the ways to keep students engaged with the university was to implement a teaching-learning model relating physiology content in online educational platforms. A one-month online course was proposed, with synchronous meetings and asynchronous activities, using scientific articles, case studies, and interactive online tools. It was concluded that the use of online platforms with a contextualization of physiology content helped students in learning and improved application skills in students' routines. The results obtained by designing a new teaching policy demonstrated the importance of contextualizing the teaching-learning process of human physiology with COVID-19, providing students with a meaningful way of learning. The authors concluded from their research that such contextualization can have a significant impact on learning, and this approach can be adopted in Web teaching, online platforms, or other contexts. It can also impact students' daily lives by influencing their decisions and practices.

Plummer et al. (2021): The authors take an approach to online teaching during the COVID-19

pandemic by indicating phenomenological study of a physical therapy course faculty. The qualitative method of inquiry focused on making sense of participants' experiences with a phenomenon, which in the case of the article was the transition to remote teaching. The study explored the perceptions of therapist educators in three countries that have made such a transition: Brazil, Cyprus, and the United States. The authors point out that the physical therapy faculty indicated that the change in methodology was one of the most challenging experiences of their careers. There was innovation and development of meaningful learning for their students, creating social, cognitive, and teaching presence. The virtual medium created challenges for engagement and assessment of content understanding. Collaboration with faculty colleagues who shared the experience was perceived as the greatest facilitator of success. As higher education institutions are able to return with their face-to-face learning activities, faculty will be able to use the methodology created as a support for their traditional classes.

Leite et al. (2020): The authors approach the gains and losses in experiential education with a focus on the pharmacy course at the Federal University of Santa Catarina (UFSC). The abrupt interruption of activities forced a rapid change in the routine of the services, with internships now dedicated to management tasks. Virtual communication was established, allowing students to be tasked with maintaining contact with special group patients, tracking health outcomes, COVID-19 symptoms, and other particular needs. Three domains were affected: organizational and management skills, professional/personal skills, and pharmaceutical assistance. Student involvement (pharmacy practice trainees) was essential to the pharmacy's ability to serve all patients. The authors indicated important results, noting that medication distribution was maintained for all patients and that no staff or students were infected with the SARS-Cov2 virus. The students developed management skills and learned to manage patient care remotely. The result is that the managers and staff of the University Pharmacy at UFSC are investing in the development of a platform for remote interaction with patients, with a focus on pharmaceutical care and administrative solutions.

Leite & Soares (2020): The authors address the social challenges for pharmaceutical education in Brazil during the COVID-19 pandemic. Many institutions are using hands-on remote activities with video demonstration, making the students play a passive role in the learning process. It must be taken into consideration that this alternative does not fully supply the learning. The authors argue that the Brazilian Guidelines for Pharmaceutical Education define that a minimum of 20% of the hours during undergraduate programs should be for internship activities. Allowing internships to be conducted remotely is an insufficient adaptation. The authors indicated that information and communication technologies and remote teaching strategies are valuable resources for the evolution of pharmaceutical education in Brazil, but the educational system needs to find strategies to prevail over current social conditions. The lessons to be learned are that universities, professionals, and Brazilian society need to reflect on investments in pharmaceutical education, intending to connect instruction and the profession to the scientific and technological advances that are so present today.

Gomes et al. (2020): The authors address teaching experiences during the COVID-19 pandemic in the Brazilian scenario of higher education in Dentistry at the State University of Campinas (UNICAMP). This university developed several initiatives, such as a special support page for digital teaching and lent computer equipment to undergraduate and graduate students according to socioeconomic criteria. A

commission was implemented to discuss important measures for the return of undergraduate and graduate students, establishing rules for biosecurity and welfare. Protocols for disinfection of surfaces and dental instruments in conjunction with the use of personal protective equipment were discussed. For the authors, education during the pandemic, with all its complications, should focus on the students, not only in their professional training but also to form them as responsible citizens, so that they can interact with the community.

Santo & Lima (2020): The authors present an approach to continuing education for the use of digital technologies in times of pandemics. The research is qualitative and uses the case study method, with a description of the satisfaction evaluation questionnaire filled out by 413 students. The educational design of the course contemplated a learning trail with two sequentially organized modules, with a total workload of 34 hours. Module 1 discussed the key aspects of online pedagogical practice and teachers' digital competencies that underpin digital teaching in virtual learning scenarios. In module 2 the students studied the concepts of online didactic design. At the end of the course, the teacher trainees participated in the online questionnaire. The evaluation of the course for teachers revealed a high level of satisfaction from the participants with the reflective activities promoted. We perceived the urgent need to expand the offer of continuing education programs in digital technologies so that teachers at all levels of education are better prepared to face the challenges of online teaching in these pandemic times.

Main results and conclusions of the qualitative studies of the research corpus related to theme "What alternative tools for remote teaching have been produced to meet the demands imposed by the COVID-19 pandemic":

De la Fuente et al. (2021): The authors approach a strategy to engage students during the pandemic with the development of a health sciences programming course dedicated to teaching introductory programming concepts. The course lasted 12 weeks and was attended by 27 undergraduate and graduate students from two federal universities. It was observed that the extension course activities improved the programming skills and confidence of most of the students. One of the main focuses was the opportunity to keep the students active in the sciences. A friendly environment was made available during synchronous classes, promoting interaction and learning. Formal evaluation of the course did not use formal quantitative methods, because of the high stress the students were experiencing in the pandemic. This article has indicated that universities can offer extension activities to their community to minimize the effects of social distance by allowing students to develop activities and obtain learning that may be important for their academic life.

Cultri et al. (2020): The authors approach the services that university libraries are offering in face of the pandemic, citing the libraries of Federal Fluminense University (UFF), as well as the Fluminense Memory Center and the Rare and Special Works Center of UFF, in qualitative and exploratory research. The research aimed to survey the new changes, adaptations, or innovations that have emerged to serve the users. The authors justify the work by the importance that universities have in the field of Science, Technology, and Society and detailed the services provided by university libraries in figures and tables, concluding that UFF, especially librarians and professionals from information units, have adapted and innovated in face of this new scenario. Part of this new routine was the use of collaborative tools and the growth in the production of instructional materials for dissemination in social media. All this is to continue

supporting the development of science, research, art, culture, information, and leisure innovatively.

Main results and conclusions of the qualitative studies of the research corpus related to theme "What studies have been developed in universities related to the social relationships of the individuals who make up the academic community that suffered the impact of the COVID-19 pandemic":

Carvalho & Souza (2021): The authors approach the regional, socioeconomic, racial, and gender inequalities that the pandemic of COVID-19 caused, especially in the university communities of the northeast region of Brazil. The results achieved by the authors indicate that the adaptability needs for the adverse situations presented by the pandemic encounter unequal conditions for adherence. The importance of the article was to make a survey to verify which were the impacts on the daily life of university communities in northeastern Brazil. The reflections presented can be apprehended as a thermometer that enables institutions to better see the structural conditions under which their communities are submerged in the pandemic context. The authors concluded the research by highlighting the importance of support networks and assistance to the most vulnerable social groups in their communities, in order to guarantee the institutional permanence of each one of these individuals.

Ivenicki (2021): The author takes an approach to digital learning in higher education indicating multicultural strengths and pandemic challenges. The article aimed to discuss digital learning throughout university life in Brazil. It states that two lessons can be learned from the pandemic and social disconnect regarding digital learning throughout the academic life in higher education: the first is that digital learning is primarily about learning itself, and it is critical to clarify what is meaningful in learning. The second refers to the educational equity and social justice policies that need to be considered within the local contexts where digital lifelong learning is developed. In terms of digital learning, the article postulated a dual perspective: on the one hand, to design educational policies aimed at widening access to digital artifacts, and on the other hand, there is a need to prepare higher education teachers so that they can adequately articulate digital competence to the curriculum and pedagogy.

Castionia et al. (2021): The authors approach federal universities in the COVID-19 pandemic with a focus on student access to the Public Internet. Data from the Pnad- Contínua, from IBGE, were used for the research to dimension the problem of access to the Public Internet among students in higher education. The issues concerning the creation of solutions for the development of remote education depend on the students' access to the Public Internet. Having better knowledge about the socio-economic conditions of the subjects is essential to establish parameters to help plan the implementation of remote teaching. The didactic-methodological issues involved in the changes also assume an important weight. The issues that will drive educational policies for Higher Education tend to incorporate learning from all that has been created in confronting the COVID-19 pandemic.

Guimarães et al. (2020): The authors address the impacts of the COVID-19 pandemic on higher education in tourism, focusing on the state of Rio de Janeiro (Brazil). The authors indicate several strategies used by educational institutions as support for the academic community. Many of the problems reported are the same ones that affect society as a whole. The listening channel mechanism was important for human reasons. It also contributed to the formation of a collection about the memory of these actors in the pandemic. An important point in the article was the concern that there was an immediate lack of interest among students in the academic area of Tourism, given the severe crisis in tourism and the forecasts of long



difficulty in the sector's recovery. Most students expressed a desire to continue the undergraduate course, despite all the difficulties faced. The article has a focus starting from the social point, with the concern of the impact of the COVID-19 pandemic on the academic community.

Inomata et al. (2020): The authors approach knowledge sharing and collaborative learning in a time of Pandemic, discussing the results of the learning evaluation process from the Special Extracurricular Activity (SEA) and the Information Reference Service (IRS), in the undergraduate course in Librarianship, at the Federal University of Amazonas (UFAM). The methodology used an exploratory and descriptive study, with data collected through an online questionnaire with 65 participants. As result, the authors found that both SEA and IRS were positively evaluated by the students. The authors expose graphs and figures of the research indicating the results and conclude that the established objective was achieved when evidencing the result and evaluation of learning in a time of pandemic from the realization of SEA and IRS in the undergraduate course in Librarianship at the UFAM.

Main results and conclusions of the qualitative studies of the research corpus related to theme "What actions have been taken by public universities to meet the demands imposed by the COVID-19 pandemic":

Arrais et al. (2021): The authors take an approach to assess the impacts of the COVID-19 pandemic in Brazil and how this was handled by the government and civil society. The Unified Health System (SUS) in conjunction with science-based initiatives were surveyed. The study was based on consultation of institutional material published by universities summarizing their research and outreach initiatives. The results revealed that university initiatives included alerts to society about the risks of the pandemic, with an emphasis on establishing observatories that assisted local governments and civil society in understanding the evolution and prevention of the disease. It also included direct assistance to local communities. The study quantified the actions developed according to three central indicators: solidarity actions, support for epidemiological crisis management, and research support. Thus, the authors indicated the important role that universities played in mitigating the effects of the pandemic.

Anholon et al. (2021): The authors approach the role of the leadership of Brazilian public universities facing the pandemic of COVID-19, working with initiatives carried out by three public universities of São Paulo, being these: State University of Campinas (Unicamp), University of São Paulo (USP), and University of the state of São Paulo (Unesp). Considering specifically the three universities analyzed by the research, besides the scientific contributions provided by their research centers, their leaders were quick and firm in making decisions, managing the crisis from the beginning. The article shows the importance of public universities not only as educational institutions but also as community support institutions with a leadership role in facing difficult situations.

Panizzon et al. (2020): The authors approach the analysis of the relationship between public resources invested in federal universities and their capacity to implement responses to the pandemic. Data were analyzed, signaling a tendency towards a positive relationship between the level of executed expenditures and the capacity to implement responses. Amid budget cuts suffered by the Federal System of Higher Education in recent years, Brazil was impacted by COVID-19, which demanded that federal universities implement practices to combat the disease. The research conducted raised a list of the final categories of classification of the universities' actions related to the pandemic of COVID-19. In this way, the results point out that the Federal System of Higher Education is being important for the construction of solutions in

many different fields, mitigating the effects of the crisis imposed by the pandemic. Moreover, these practices can leave a future legacy regarding the institutionalization of preventive actions to solve new complex problems.

Santos et al. (2020a): The authors approach about university hospitals and how they are facing the pandemic, through a documentary study, from information available on the official websites of 44 university hospitals of the federal teaching network in Brazil. The authors highlighted the suspension of consultations not related to COVID-19, elective surgeries, as well as changes in routines with reinforcement of biosecurity issues. At the management level, new professionals were hired, and the health teams were trained. The results found show the heterogeneity of the distribution of university hospitals, general beds, and Intensive Care Unit beds in Brazil. The scenario is worse in the North and Northeast of the country. An important aspect of the research was the indication of the adoption of emotional support measures to the professionals. The authors indicate the role of the university as an agent of actions directed to the community in which it is inserted, not only in the role of education, which is the main axis of the university but providing support to citizens in general.

Paula et al. (2020): The authors make an approach about innovation in university libraries in a time of pandemics in the northern region of Brazil. The authors used a qualitative research method of basic nature using the exploratory and descriptive method, with a bibliographic review regarding the theme of innovation in university libraries. They indicate that professors and students had to continue using the university libraries with their support materials (books, dissertations, thesis). The article cites innovative actions in university libraries focusing on the northern region of Brazil, mainly indicating digital library services, where the academic community can access the collection remotely. The authors conclude by indicating that it is necessary that university libraries can use technology as an ally to innovations, being one of the primary factors to keep university libraries active, considering the current pandemic scenario of COVID-19.

Meneses et al. (2020): The authors make an approach in the interdisciplinary production of graphic materials for nursing professionals in the confrontation of COVID-19 with experience at the Federal University of Bahia (UFBA). The authors indicate that the UFBA, through partnerships, developed graphic materials for digital communication, for guidance to nursing professionals in the prevention and confrontation of the disease. For the authors, the collaborative construction of the graphic materials presented demonstrated both the viability of interdisciplinary work and the solidarity in contributing to the collective. The public university shows that, even under adverse conditions and with fragilities of remote virtual structure, it can build and contribute with its diversity and expertise in preventing and fighting the pandemic of COVID-19. In the face of the global crisis, it is necessary to find new models and reinvent processes.

Almeida & Queiroz (2020): The authors approach the performance of students and faculty in the health area at the Clinics Hospital Complex of the Federal University of Paraná (CHC/UFPR) to face the pandemic of COVID-19 in 2020, in collaboration with the Unified Health System (SUS). One of the actions taken was to call for the registration of health students from the university itself to do volunteer work on the institution's premises. Residents of the Psychology course provided digital support to the families of patients with COVID-19, and also provided psychological support to the employees of the CHC and the

residents of the other programs. The nursing residents played an important role in organizing and carrying out the flu vaccination for the hospital's employees. The medical residents continued to perform triage of all patients who needed access to the internal area of the hospital. The authors emphasize that SUS and public universities continued to play a leading role in the actions to face the pandemic, showing that the government investment in education, science, and technology is returned to society through research and contributions of the most diverse possible.

Almeida et al. (2020): The authors approach Brazilian public universities in the context of the pandemic, with initiatives and partnerships in facing COVID-19. The authors' research had as a starting point the Federal University of Rio Grande do Norte (UFRN). The authors surveyed to verify the categories of actions and the number of institutions that performed them, indicating the following actions performed by universities during the pandemic period: production of alcohol gel, glycerin and/or 70% alcohol; manufacturing of PPE with 3D printers; counseling service/psychological support; production of educational materials; advice to health departments; distribution of food; training of professionals; teleservice for guidance and clarification to the population; production of masks and other products for individual protection; carrying out tests to diagnose the SARS-CoV-2 virus; loan of equipment; cession of space; production of cleaning materials, hygiene, and sanitizing solutions; manufacture of hospital equipment; cession of vehicles; manufacture of spare parts for hospital equipment and development of future vaccines against COVID-19. The authors conclude the research indicating that the context of the pandemic has shown that both Higher Education Institutions (IES) and governments have the public interest as a common purpose in their actions. It is possible, therefore, to recognize that the autonomy conferred to universities does not represent their dissociation from the social context, but rather their main tool for insertion into it, through the most diverse actions carried out with and for society, in each context.

Costa et al. (2020): The authors approach federal universities and their coping actions in the fight against the pandemic of COVID-19. The research analysis used quantitative and statistical methods addressing the different activities carried out, their characteristics, and types, comparing them in their coping contexts. The activities were classified into four categories: social actions, research solutions, production and manufacturing of materials/equipment, and infrastructure support. The research surveyed 607 actions carried out by Brazilian federal universities divided by regions of Brazil. The data were collected between March and April of 2020. The authors conclude that the performance of universities is not only related to the issues of teaching and research but also the issues of the local community, indicating that the actions that were undertaken by federal universities rescue the importance of universities.

Silva et al. (2020a): The authors address the contributions of Biomedical Engineering at the Federal University of ABC (UFABC) in fighting the pandemic of COVID-19. The article reports the actions that were initiated by groups of students mobilized together with professors. The group was divided to develop actions in five action fronts: (i) hospital Personal Protective Equipment (PPE's) and masks, (ii) sterilization of masks by UV light, (iii) patient triage application, and (iv) lung ventilator. Some of the initiatives have already shown results in the first months of the project. Other initiatives, which involve the development of new equipment, are still under development. It is important to highlight that the working group's initiatives have opened an interaction channel between the university, companies, public agents, and other educational institutions.

Prueter & Porto Alegre, (2020): The authors discuss the development of a collaborative website by the Culture Committees of the Federal University of Technology – Paraná (UTFPR) whose objective was to mitigate the impacts and anguish caused by social isolation during the COVID-19 pandemic. The collaborative site was developed with the Google Sites tool. The authors highlighted in their conclusions the role of educational institutions in the production of scientific knowledge, in extension activities, in providing services, and in the dissemination of culture to the Brazilian population. The support of the collaborative site allowed users to use the isolation period differently, expanding repertoires, horizons, and customs. Social isolation has driven society to seek ways to solve problems, especially when it comes to the proactivity of educational institutions.

Santos et al. (2020b): The authors address public communication and scientific dissemination in times of pandemic COVID-19 in actions developed at the Federal University of Uberlândia (UFU). The theme has been addressed in materials for scientific dissemination and science journalism produced and published by the UFU, in the institutional website, profiles in major social networks, podcasts, and columns. For the authors, it is possible to realize that the theoretical contribution of public communication is broad and the range of discussions around the concept is vast. Nevertheless, most of the authors indicate that the guiding principle of public communication is the search for transparency and the construction of citizenship. This study evidenced the importance of public communication of science in actions of scientific dissemination, especially in times like the pandemic of COVID-19, in which the public interest must be based on scientific criteria.

Silva et al. (2020b): The authors address the production of epidemiological bulletins as a strategy for Health Surveillance in the context of the pandemic, reporting on an extensionist action of weekly production in a federal university. Eleven bulletins were produced and disseminated on a support website and social networks. The production gained visibility in the municipality, becoming an important mechanism for the dissemination of technical and scientific information. The authors concluded that the development of bulletins proved to be an effective way to carry out communication for Health Surveillance, having a great impact on the confrontation of COVID-19, being essential to be conveyed and stimulated in times of pandemic in the country.

Da Cruz Bezerra et al. (2020): The authors discuss the extension activities of public universities, with a focus on waste pickers, in the context of the COVID-19 pandemic. It covers occupational health research, surveys of the needs of the families of waste pickers, the definition of the strategy of the 'Pickers in Quarantine' campaign, and the evaluation of the action. The article describes that the actions did not end in welfare character but demanded a social and civic responsibility in valuing the work of the waste pickers, during and after the pandemic. The extension activity in action reaffirms the commitment to social engagement and the relationship between the external and academic communities, based on the premise that this action confirms the importance of university extension as a positively transformative and empowering agent of people and society.

Van Kaick & Porto Alegre (2020): The authors approach the trends and potentialities of extension at the Federal University of Technology – Paraná (UTFPR) and the attendance of agenda 2030 in times of pandemic. A survey of data related to actions and projects was carried out. The actions and projects benefited 43 municipalities, which demonstrates the capillarity of the UTFPR's extension actions to face

the COVID-19 in the state of Paraná. The UTFPR's response capacity was evidenced by the extension proposals aimed at meeting the needs and problems of society.

Severo et al. (2020): The authors approach the efforts of the Federal University of Technology – Paraná (UTFPR) to produce and donate alcohol gel 70° INPM to the community during the pandemic. The institution developed new formulations of the ones already known to serve the most vulnerable community. The team was composed of nine undergraduate and graduate students in Chemistry and the university produced and donated more than eleven thousand liters of alcohol gel to reduce the possible contamination of the population and to aim for a better perspective for the current scenario which is faced.

#### **4. Conclusions**

Raising the intended research question: “What was the role of Brazilian federal universities in the face of the COVID-19 pandemic?”, the research managed to answer this question through the analysis of actions carried out in Brazilian federal public universities, the application of the review systematic literature through the Methodi Ordinatio, and with this it was possible to assemble a portfolio of important publications related to the central theme of the research that indicate the importance of public universities. It can be seen that Brazilian federal universities played a key role, with actions in the community to which they belong, namely: activities carried out to clarify the community about the SARS-CoV-2 virus, information about prophylactic care, community care services, food distribution, diagnostics, development of applications and portals, research activities carried out by teachers for the development of vaccines, production, and manufacture of materials and equipment such as alcohol gel, personal protective equipment (PPE), cleaning materials and maintenance of hospital equipment. The university hospitals played a prominent role, with support in infrastructure and availability of beds for COVID-19 patients. Moreover, the federal universities modified their teaching policies to adapt to the new reality, and continued with their academic activities, using remote teaching. Although the lack of investments has affected Brazilian Federal universities in recent years, they continue to be an essential pillar for society.

It is verified that the article by Arrais et al. (2021) entitled "The Role Played by Public Universities in Mitigating the Coronavirus Catastrophe in Brazil: Solidarity, Research and Support to Local Governments Facing the Health Crisis", published in *Frontiers in SASociology* was the article that had the greatest alignment with the central theme of the research in the central portfolio.

The answer found to the research question is beneficial to the global community, as it indicates the importance of public universities in the contexts in which they are inserted, and therefore they must be supported and financed by their governments so that they can play their role in society.

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