

## artigo

Lehmkuhl, K., Cantos, C. A. R. de Luca, Paulleto, P., Hallal, A. L. C., Bastos, R. C., Cisneros, O., Massignan, C., Cantos, G. de Luca.  
Covid-19 and the challenges for higher education: a scoping review

DOI: <https://doi.org/10.36489/saudecoletiva.2021v11i69p7000>

# Covid-19 and the challenges for higher education: a scoping review

Covid-19 e os desafios para o ensino superior: uma revisão de escopo

Covid-19 y los desafíos para la educación superior: una revisión de alcance

### RESUMO

Objetivo: Identificar as estratégias e medidas adotadas pelas instituições de ensino superior (IES) a fim de manter as atividades de ensino e aprendizagem durante a pandemia de COVID-19. Método: Foi realizada uma revisão de escopo, onde 5 bases de dados foram consultadas. Foram incluídos estudos que apresentassem medidas preventivas e estratégias para manter as atividades educacionais em instituições de ensino superior durante a pandemia do COVID-19. Resultado: Foram incluídos 16 estudos. As medidas descritas pela maioria dos estudos foram relacionadas a mudanças no calendário acadêmico, uso de tecnologia, aulas online e plataformas de telemedicina. Conclusão: O ensino superior, foi profundamente afetado pelo cenário da COVID-19, mas também contou com alta tecnologia para manter as atividades educacionais e, ao mesmo tempo, equilibrar sua missão de proteger os estudantes e professores.

**DESCRIPTORIOS:** COVID-19; Educação superior; Educação à Distância

### ABSTRACT

Objective: The present scoping review aims at identifying the strategies and measures adopted by higher education institutions, to maintain teaching and learning activities during the COVID-19 pandemic. Method: A scope review was carried out, where 5 databases were consulted. Studies that presented preventive measures and strategies to maintain educational activities in higher education institutions during the COVID-19 pandemic were included. Result: 16 studies were included. The measures described by most studies were related to making changes in the academic calendar, use of technology, online classes, and telemedicine platforms. Conclusion: Higher education was deeply affected by the COVID-19 scenario, but it also relied on high technology to maintain educational activities and, at the same time, balance its mission to protect students and teachers.

**DESCRIPTORS:** COVID-19; Education, Higher; Education, Distance

### RESUMEN

Objetivo: Identificar las estrategias y medidas adoptadas por las instituciones de educación superior, para mantener las actividades de enseñanza y aprendizaje durante la pandemia de COVID-19. Método: Se realizó una revisión de alcance, donde se consultaron 5 bases de datos. Se incluyeron estudios que presentaron medidas preventivas y estrategias para mantener las actividades educativas en las instituciones de educación superior durante la pandemia de COVID-19. Resultado: se incluyeron 16 estudios. Las medidas descritas por la mayoría de los estudios estuvieron relacionadas con hacer cambios en el calendario académico, uso de tecnología, clases en línea y plataformas de telemedicina. Conclusión: La educación superior se vio profundamente afectada por el escenario COVID-19, pero también se apoyó en la alta tecnología para mantener las actividades educativas y, al mismo tiempo, equilibrar su misión de proteger a estudiantes y docentes.

**DESCRIPTORIOS:** COVID-19. Educación Superior; Educación a Distancia

RECEIVED: 31/08/2021 APPROVED: 01/11/2021

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**INTRODUCTION**

**C**OVID-19 forced the governments of different countries to take measures to restrict the concentration of people. Educational institutions at all levels have closed in 188 countries, affecting more than 91% of the global student population.<sup>1</sup>

With the suspension of classroom classes, the solution was to migrate teaching and its inherent activities to the virtual format. Protocols for transitioning from face-to-face to online classes have become a worldwide trend.<sup>2</sup> This scenario constitutes a great challenge for institutions, as well as for professors. These were faced with the need to change their teaching methodologies and establish new parameters to ensure the learning process.<sup>3</sup>

Many innovations were already happening in education, but gradually and without being mandatory. However, the context of the pandemic accelerated the adoption of pedagogical innovations. Thus, in a short period of time, it was imperative to adapt the methodologies for the migration to the virtual environment.<sup>4</sup> Even counting on technology as an ally, an education-

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nal system rooted in practices, sometimes outdated, was evident, basically based on a single way of making things happen.<sup>5</sup>

For health education, this reality was especially complicated.<sup>6</sup> After all, it is an area of knowledge in which curricula need to offer many hours of practical activities and in direct contact with patients. A major concern is how to offer these activities without exposing students, faculty, staff and patients to the new coronavirus. Medical education had to prepare for this scenario<sup>6</sup>, integrating information technology with problem-based methodologies to maintain clinical care and ensure safety.<sup>7</sup>

Thus, there are numerous questions about the transition from face-to-face learning to online learning in higher education. Which leads to the objective of this scope review, which intends to answer the following research question: What are the preventive measures and strategies in Higher Education Institutions to maintain teaching and learning activities during the COVID-19 pandemic in health education?

**METHOD**

A scope review was carried out following the PRISMA-ScR reporting guide. 8 A research protocol was developed and is available in the Open Science Framework (OSF) under DOI 10.17605/OSF.IO/KBDSF, link <https://osf.io/37a6q/>. Appendices 1, 2 and 3 can also be viewed on OSF at <https://osf.io/avbhp/>.

The research question to be answered is: What are the preventive measures and strategies in HEIs to maintain teaching and learning activities during the COVID-19 pandemic in health education? Regarding the selection criteria, studies that presented any type of preventive measures and strategies to maintain educational activities in HEIs, in any country, were included, while face-to-face activities were restricted or prevented from taking place due to the COVID-19 pandemic. Studies on day care centers, schools and preschools were excluded. Comments, letters, editorials, conference abstracts, case reports, systematic reviews, and other review articles and personal information were not considered. Likewise, unavailable studies in full text or articles in languages other than English, Spanish or Portuguese were not considered. Among the studies on COVID-19 in universities and colleges, those not related to teaching were also excluded.

The search strategy was developed and performed by a librarian and adapted to search the following databases: Embase, LILACS, MEDLINE/PubMed, Scopus and Web of Science. The searches were conducted on May 14th, 2020. The results were not filtered by date, retrieving all data available in these databases since the start of the COVID-19 pandemic. Search strategies are available in appendix 1 at <https://osf.io/avbhp/>.

The selection of studies was performed in two stages by two reviewers (KL and CR). In phase one, both reviewers independently read titles and abstracts and applied the eligibility criteria. In phase two, the same two reviewers (KL and CR) read the full text again, applying the election criteria. In both phases, all retrieved information was crossed by the third reviewer (PP). The final selection was based on the

full text.

As for data collection and mapping, once again two reviewers (KL and CR) worked independently by gathering the data in a spreadsheet. The next step was to cross-reference the information retrieved with the third reviewer (PP), who also resolved any disagreements. Subsequently, a table with the collected data was generated, which includes the characteristics of the studies (author, year and country), the type of study, the characteristics of the environment/context (university, residence or postgraduate studies), the main preventive measures and conclusions. The synthesis of the results was carried out in a narrative way. Regarding preventive measures, it was understood as all actions or attitudes adopted to prevent the spread of the disease and its consequences, for example, wearing a mask or social distancing. As for preventive strategies, techniques or procedures that were adopted to prevent the spread of the disease and its consequences, such as online classes, were considered. The synthesis of the results was carried out in a narrative format and the studies were grouped according to the area of the IES, with a group from the medical area and a group from the other areas.

## RESULTS

The search in the databases returned 1.822 references. After removing duplicates, using reference management software, 1.502 articles remained. After reading the abstracts, 70 were selected for phase 2, of which 54 did not meet the eligibility criteria (reasons in Appendix 2). At the end of the selection process, 16 articles met the inclusion criteria. A summary of its descriptive characteristics is available in table 1.

The selection process is summarized in the diagram in Appendix 3. Among the selected studies, 15 were opinion articles and 01 was an observational study. Studies related to health education 9,10,14,15,17,18,20,21 shared concerns about how to maintain academic activities during the pandemic, not only in relation to classes, but mainly in how to provide

students with practical activities inherent to medical education. The measures described by most studies were related to changes in the academic calendar; establishing new ways of teaching with technological tools such as teleconferencing, online classes, virtual study activities; and the use of telemedicine platforms for clinical care or teaching. When face-to-face activity was impossible to replace, such as for residency training programs, activities were restructured to create the safest environment for residents and staff. Soled et al.<sup>21</sup> described an initiative created by medical students to involve them in the workforce and efforts during the pandemic. The only article on dental education<sup>13</sup>, like the others, it provided guidance to teachers and administrators to ensure educational activities during the pandemic.

Studies related to higher education in general<sup>4,11,12,16,19,20,23</sup> they also proposed emergency measures to ensure educational activities. Furthermore, the consequences of distance learning for the future of higher education and how pedagogical innovations will continue after the pandemic were discussed.<sup>4</sup> Most studies agree that training is necessary for teachers and all stakeholders involved in online education and present good practices for tackling the current and future crisis.<sup>12,15,16,22</sup> Daniel<sup>11</sup> understands that it is imperative that students have equal conditions and access to materials and technology. Academic managers and government officials must not take advantage of this state of emergency to make major changes in the educational landscape without proper debate.<sup>19</sup>

## DISCUSSION

This scope review aimed to identify preventive measures adopted by HEIs to maintain educational activities during the crisis caused by the new corona virus pandemic. Most of the retrieved studies were related to health education, but studies on higher education in general were included. Another important observation is that, as the corpus of the study is mostly composed of opinion articles, the information collected

Table 1 – Characteristics of the included studies: authorship, location, type of study, context, measures and conclusions.

AUTHOR, YEAR, PLACE AND TYPE OF STUDY	CONTEXT	MEASURES AND CONCLUSIONS
Ashokka et al. <sup>9</sup> , 2020 Singapore Opinion article	Preparation of academic medical centers during the pandemic for undergraduate and graduate courses, residency and research activities.	Establish a response team; postponement of evaluations; reformulation of the academic calendar; establish a coordinated communication process; establish safety and prevention measures; encouraging the reporting of symptoms, facilitating early detection, isolation and management.
Chick et al. <sup>10</sup> , 2020 United States Opinion article	Maintenance of education in surgical residency in the pandemic.	Recommendations for keeping students, educators and patients safe; Proposition of innovative solutions: implementation of a virtual classroom; online practice questions; academic conferences via teleconferences; resident-involved telehealth clinics; easy use of surgical videos.
Moreno-Correa <sup>4</sup> , 2020 Colombia Opinion article	Awareness of the importance of educational and pedagogical innovation in view of the situation imposed by the pandemic and the expected changes in education in the future.	Teacher training in new educational tools, teaching and learning methodologies; teacher as a tutor who accompanies and guides the student, maintaining the motivation of the teaching and learning process; move to inverted classroom; development of learning guides with explanatory videos; adaptation of experience, reflection and practical activities for the virtual environment; use of information and communication technologies for monitoring and pedagogical assessment in order to fulfill educational objectives; presence of an academic monitor to monitor students.
Daniel <sup>11</sup> , 2020 Canada Opinion article	Guidance for instructors, institutional managers and governments to manage the educational consequences of this pandemic crisis.	Ensure that students bring the materials they need to study; finalize tests and reports; preparation and training of personnel; asynchronous learning with video classes, use of open educational resources.
Fernandez e Shaw <sup>12</sup> , 2020 United States Opinion article	Best leadership practices for academic managers in facing the crisis created by the pandemic.	Connecting with people and establishing mutual trust; distribution of leadership throughout the organization; communicate clearly and frequently with all stakeholders.

Iyer, Aziz e Ojcius <sup>13</sup> , 2020 United States Opinion article	Recommendations for educators and managers to ensure continuity of dental education during the COVID-19 outbreak.	Recommend telecommuting; establish clear policies and protocols; special considerations for female faculty and staff with young children; hold online meetings to prioritize goals, reorganize course materials, and obtain training in remote learning; reassure the faculty about their ability to adapt to this emergency; offer psychological counseling to students to deal with the situation; open communication and accurate information available to students, faculty, staff and patients.
Kohan et al. <sup>14</sup> , 2020 United States Opinion article	Clinical care workflow, clinical supervision, job satisfaction, and mentoring for fellows during the pandemic.	Better evidence on the use of remote and virtual platforms in clinical care; adaptation to changes in clinical management; provide guidance on the impact on graduate school.
Longhurst et al. <sup>15</sup> , 2020 United Kingdom Observational study	Strengths, weaknesses, opportunities, threats, in adapting anatomical teaching to the online context.	Strong: new online classes, improved technologies and resources. Weak: time constraints, lack of practice sessions, assessment problems. Opportunities: academic collaboration, teleworking, embedding hybrid learning in the curriculum. Threats: decreased teacher/student ratio and reduced student involvement.
Majowicz <sup>16</sup> , 2020 Canada Opinion article	Planning for professors and universities in relation to the COVID-19 context.	Macroenvironmental factors with potential to influence the functioning of the academy within the scope of COVID-19; analysis of future scenarios to test decisions or decision making.
Menon et al. <sup>17</sup> , 2020 United States Opinion article	Institutional responsibility for medical education, student exposure and teaching guarantees.	Ensure student safety by promoting remote learning; provide adequate protection for students who are in essential and non-educational roles; keep graduate medical students "on hold" to serve as needed.
Mukhopadhyay et al. <sup>18</sup> , 2020 United States Opinion article	Teaching of pathology and technology for remote education and learning.	Curated online resources that can be used for virtual learning in pathology; virtual meetings.

Murphy <sup>19</sup> , 2020 Canada Opinion article	Analysis of emergency eLearning protocols adopted by universities during the COVID-19 outbreak.	Use of the Copenhagen School securitization theory for protocol analysis; normalizing emergency e-Learning would mean normalizing a form of education that perpetuates structural inequalities.
Nassar et al. <sup>20</sup> , 2020 United States Opinion article	Emergency restructuring of a general surgery residency program during the COVID-19 pandemic.	Promoting the well-being of the workforce, limiting the number of residents with direct patient contact and creating teams that work in isolation from one another.
Soled et al. <sup>21</sup> , 2020 United States Opinion article	Creation of the response team formed by medical students in the fight against COVID-19.	Development of a peer organizational structure would optimize the capacity to efficiently mobilize interested peers in the COVID-19 response; serve as a link between administration and hospital managers.
Wendelboe et al. <sup>22</sup> , 2020 United States Opinion article	University preparation to deal with the COVID-19 crisis.	Creation of an exercise to help universities prepare for the pandemic.
Varalakshmi e Arunachalam <sup>23</sup> , 2020 India Opinion article	Initiatives to keep students active and connected to activities during social distancing and quarantines.	Massive open online courses, recorded videos, video streaming, quiz assessments, collaborative assignments, online resource sharing.

Source: Prepared by the authors.

education institutions must invest in technological resources, but mainly in their human resources. Online tools for education will certainly be increasingly present, so it is essential that all professionals involved in education know how to use them, when they would be more appropriate and when they would not be. In short, talking about the impact of the new coronavirus on the education sector goes beyond a structural (re)organization of courses. It implies a change in attitude for managers, teachers and students so that they (re)formulate teaching practices. It is necessary that practices

are innovative, providing the student with criticality, reflection, interaction, dialogue and bonding. These are essential elements for transformation, not just the transmission of knowledge.

As for the limitations perceived in this study, the first one is the small number of publications that answered the research question. Furthermore, most of them were opinion articles, which, given the urgency of the topic, was something to be expected. Another point is that no studies were found reporting whether the measures taken actually worked.

## CONCLUSION

The challenges faced by higher education institutions during the COVID-19 pandemic were mainly related to finding ways to provide good quality teaching and learning experiences while dealing with social distancing. Higher education, especially health education, was profoundly affected by this scenario, but it also relied on high technology to maintain educational activities and, at the same time, balance its mission to protect students and teachers.

## REFERENCES

1. UNESCO. Education: from disruption to recovery [Internet]. 2020 [cited 2020 Aug 18]. Available from: <https://en.unesco.org/covid19/educationresponse>
2. Bezerra IMP. State of the art of nursing education and the challenges to use remote technologies in the time of Corona Virus Pandemic. *J Hum Growth Dev* [Internet]. 2020 Apr 14;30(1):141–7. Available from: <http://revistas.marilia.unesp.br/index.php/jhgd/article/view/10087>
3. Kenski VM. *Tecnologias e ensino presencial e a distância*. 6th ed. São Paulo: Papirus; 2008.
4. Moreno-Correa SM. La innovación educativa en los tiempos del Coronavirus. *Salut Sci Spiritus* [Internet]. 2020;6(1):14–26. Available from: <https://revistas.javerianacali.edu.co/index.php/salutemscientiaspiritus/article/view/2290/2863>
5. Santos AT dos, Almeida JMC de, Rolim ILTP, Passos HM, Coutinho NPS,

## REFERENCES

- Sardinha AH de L. Educação a distância através do ensino remoto durante a COVID-19 em um mestrado acadêmico em enfermagem: relato de experiência. *Rev Saúde Coletiva* [Internet]. 2021;11(COVID):6973–7. Available from: <http://revistas.mpmcomunicacao.com.br/index.php/saudecoletiva/article/view/1755/2046>
6. Newman NA, Lattouf OM. Coalition for medical education—A call to action: A proposition to adapt clinical medical education to meet the needs of students and other healthcare learners during COVID 19. *J Card Surg* [Internet]. 2020 Jun 30;35(6):1174–5. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/jocs.14590>
7. Lall S, Singh N. CoVid-19: Unmasking the new face of Education. *Int J Res Pharm Sci* [Internet]. 2020 Apr 17;11(SPL1):48–53. Available from: <https://pharmascope.org/ijrps/article/view/2122>
8. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med* [Internet]. 2018 Oct 2;169(7):467. Available from: <http://annals.org/article.aspx?doi=10.7326/M18-0850>
9. Ashokka B, Ong SY, Tay KH, Loh NHW, Gee CF, Samarasekera DD. Coordinated responses of academic medical centres to pandemics: Sustaining medical education during COVID-19. *Med Teach* [Internet]. 2020 Jul 2;42(7):762–71. Available from: <https://www.tandfonline.com/doi/full/10.1080/0142159X.2020.1757634>
10. Chick RC, Clifton GT, Peace KM, Propper BW, Hale DF, Alseidi AA, et al. Using Technology to Maintain the Education of Residents During the COVID-19 Pandemic. *J Surg Educ* [Internet]. 2020 Jul;77(4):729–32. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1931720420300842>
11. Daniel SJ. Education and the COVID-19 pandemic. *Prospects* [Internet]. 2020 Apr 20;(April). Available from: <http://link.springer.com/10.1007/s11125-020-09464-3>
12. Fernandez AA, Shaw GP. Academic Leadership in a Time of Crisis: The Coronavirus and COVID 19. *J Leadersh Stud* [Internet]. 2020 May 11;14(1):39–45. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/jls.21684>
13. Iyer P, Aziz K, Ojcius DM. Impact of COVID-19 on dental education in the United States. *J Dent Educ* [Internet]. 2020 Jun;84(6):718–22. Available from: <http://doi.wiley.com/10.1002/jdd.12163>
14. Kohan L, Sobey C, Wahezi S, Brancolini S, Przkora R, Shaparin N, et al. Maintaining High-Quality Multidisciplinary Pain Medicine Fellowship Programs: Part II: Innovations in Clinical Care Workflow, Clinical Supervision, Job Satisfaction, and Postgraduation Mentorship for Pain Fellows During the COVID-19 Pandemic. *Pain Med* [Internet]. 2020 Aug 1;21(8):1718–28. Available from: <https://academic.oup.com/painmedicine/article/21/8/1718/5831836>
15. Longhurst GJ, Stone DM, Dulohery K, Scully D, Campbell T, Smith CF. Strength, Weakness, Opportunity, Threat (SWOT) Analysis of the Adaptations to Anatomical Education in the United Kingdom and Republic of Ireland in Response to the Covid 19 Pandemic. *Anat Sci Educ* [Internet]. 2020 May 9;13(3):301–11. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/ase.1967>
16. Majowicz SE. What might the future bring? COVID-19 planning considerations for faculty and universities. *Epidemiol Infect* [Internet]. 2020 Apr 29;148(May):e92. Available from: [https://www.cambridge.org/core/product/identifier/S0950268820000898/type/journal\\_article](https://www.cambridge.org/core/product/identifier/S0950268820000898/type/journal_article)
17. Menon A, Klein EJ, Kollars K, Kleinhenz ALW. Medical Students Are Not Essential Workers: Examining Institutional Responsibility During the COVID-19 Pandemic. *Acad Med* [Internet]. 2020 Aug 28;95(8):1149–51. Available from: <https://journals.lww.com/10.1097/ACM.0000000000003478>
18. Mukhopadhyay S, Booth AL, Calkins SM, Doxtader EE, Fine SW, Gardner JM, et al. Leveraging Technology for Remote Learning in the Era of COVID-19 and Social Distancing. *Arch Pathol Lab Med* [Internet]. 2020 Sep 1;144(9):1027–36. Available from: <http://meridian.allenpress.com/aplm/article/144/9/1027/442318/Leveraging-Technology-for-Remote-Learning-in-the>
19. Murphy MPA. COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemp Secur Policy* [Internet]. 2020 Jul 2;41(3):492–505. Available from: <https://www.tandfonline.com/doi/full/10.1080/13523260.2020.1761749>
20. Nassar AH, Zern NK, McIntyre LK, Lynge D, Smith CA, Petersen RP, et al. Emergency Restructuring of a General Surgery Residency Program During the Coronavirus Disease 2019 Pandemic. *JAMA Surg* [Internet]. 2020 Jul 1;155(7):624. Available from: <https://jamanetwork.com/journals/jamasurgery/fullarticle/2764317>
21. Soled D, Goel S, Barry D, Erfani P, Joseph N, Kochis M, et al. Medical Student Mobilization During a Crisis: Lessons From a COVID-19 Medical Student Response Team. *Acad Med* [Internet]. 2020 Sep 4;95(9):1384–7. Available from: <https://journals.lww.com/10.1097/ACM.0000000000003401>
22. Wendelboe AM, Miller A, Drevets D, Salinas L, Miller EJ, Jackson D, et al. Tabletop exercise to prepare institutions of higher education for an outbreak of COVID-19. *J Emerg Manag* [Internet]. 2020 Mar 16;18(2):183–4. Available from: <https://wmpllc.org/ojs/index.php/jem/article/view/2725>
23. Varalakshmi R, Arunachalam K. COVID 2019: role of faculty members to keep mental activeness of students. *Asian J Psychiatr* [Internet]. 2020 Jun;51(April):102091. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1876201820302021>
24. Liu Y, Jin GF, Wang JM, Xia YK, Shen HB, Wang CQ, et al. [Thoughts on the reform of preventive medicine education in the context of new medicine]. *Zhonghua Yu Fang Yi Xue Za Zhi* [Internet]. 2020 Jun 6;54(6):593–6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/32253890>
25. Kania K, Abu-Ghname A, Agrawal N, Maricevich RS. Four Strategies for Plastic Surgery Education amid the COVID-19 Pandemic. *Plast Reconstr Surg* [Internet]. 2020 Aug 5;146(2):252e–253e. Available from: <https://journals.lww.com/10.1097/PRS.00000000000007122>
26. Ellaway R, Masters K. AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. *Med Teach* [Internet]. 2008 Jan 3;30(5):455–73. Available from: <http://www.tandfonline.com/doi/full/10.1080/01421590802108331>
27. Teräs M, Suoranta J, Teräs H, Curcher M. Post-Covid-19 education and education technology 'Solutionism': a seller's market. *Postdigital Sci Educ* [Internet]. 2020 Oct 13;2(3):863–78. Available from: <http://link.springer.com/10.1007/s42438-020-00164-x>