

Review

Sustainability in Higher Education during the COVID-19 Pandemic: A Systematic Review

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Abstract: The COVID-19 pandemic has created cause for rapid innovation in, reimagining of, and pivoting of higher education institutions. Prior to 2020, the global higher education sector began to radically focus their efforts on creating sustainable institutions, and incorporated the United Nations' Sustainable Development Goals (SDGs). The novel coronavirus pandemic may have changed that. This systematic review examines eight manuscripts, identified through a systematic search strategy on sustainability during the COVID-19 pandemic across 2020–2021. Interestingly, the low volume of manuscripts identified highlights potential learning and teaching risks, as priorities may have shifted during rapid digitalization and emergency remote teaching practices. These manuscripts focused on Goal 4, inclusive and equitable quality education (50%); Goal 8, decent work and economic growth; Goal 9, industry, innovation, and infrastructure (37.5%); and goal enabling through integrating and embedding sustainability into the curriculum (12.5%). The implications of this systematic review highlight a need to rebuild efforts to focus on the Sustainable Development Goals, particularly considering the evolving higher education landscape during COVID-19. While there were still considerable volumes of manuscripts on higher education and sustainability during 2020–2021, the lack of contextualization to current higher education conditions should be of concern for sustainability scholars. This systematic review creates a critical foundation for accelerating our understanding of achieving SDGs in higher education during and beyond the pandemic.

Keywords: United Nations Sustainable Development Goals; higher education; coronavirus; systematic review



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1. Introduction

“Transforming our World: Agenda 2030 for Sustainable Development” by the United Nations highlighted an important pivot in the global community toward developing a sustainable future [1]. The advent of the 17 Sustainable Development Goals (SDGs) and 169 associated targets offered a universal framework for individuals, organizations, and societies to begin to address independently and collectively. These goals have been implemented broadly across diverse sectors, and the research community has theorized and documented the response. Indeed, a search for “Sustainable Development Goals” in the major academic databases yields multiple results. EBSCOhost’s Academic Search Ultimate yields 5593 results and Google Scholar yields 330,000 results. Broadly speaking, sustainability is often defined environmentally, but can be more accurately defined as maintaining growth or current levels in ways that support future consistency of level or growth without unreasonable depletion of resources.

At the educational level, sustainability has acquired a fundamental role over the years, and can be defined as developing educational practices which can be scaled or right-sized without unreasonable exhaustion of resources, or to the exclusion of some populations. Education for Sustainability (EfS) is also the practice of embedding educational practices that enable sustainable knowledge development in discipline contexts. Proof of its growth

in education was the creation of the Decade of Education for Sustainable Development 2005–2014 by UNESCO [2,3]. Education for sustainable development can help future professionals make decisions aimed at achieving a more sustainable world [4–6].

In higher education, the role and importance of sustainability has also grown in recent years, with institutions developing bespoke medium- and long-term strategic plans aligned to their SDG response [7–9]. These plans value the role of creating an organization that is sustainable—economically, socially, and environmentally—in an increasingly complex world. Higher education is increasingly also recognizing the role that it plays in developing future leaders who have the knowledge and skills to create and sustain in their future career pathways. However, the COVID-19 pandemic has created a pause in the implementation of some strategies.

The COVID-19 pandemic has severely affected the education system [10–12]. Teachers and students have had to adapt to a new teaching methodology, and many of them were not sufficiently prepared. Some teachers were not familiar with information and communication technologies, and some students did not have adequate resources to follow online teaching and had problems concentrating and adapting to this method of teaching [10,13,14].

Universities in particular are beginning to recognize their role in setting a clear sustainability precedent as key institutional actors in their local communities. Many universities have sustainability within their key strategies, visions, and missions. For example, the Harvard University sustainability mission is [15]:

Our mission is to advance solutions to evolving global health and environmental challenges that benefit the common good by translating research into practice and empowering people to be stewards for the future.

And the University of Tasmania sustainability vision is [16]:

The University of Tasmania plays a vital role in leading our place-based and globally-connected communities in understanding and delivering sustainable futures.

Prior to 2020, universities began to respond to institutional challenges to sustainability through fossil fuel divestment, constructing green star buildings, and signing on to the United Nation SDGs. The United Nations Global Compact [17] offers an introductory glance at institutions highly committed to achieving SDGs. Between 2003 and 2019, 11 Australian universities signed on to the Global Compact, in 2020 and 2021 no Australian universities signed on. In recent years, 37 (2021) and 64 (2020) academic institutions signed on to the Global Compact, contrasted with 577 academic institution signatories added between the years of 2003 and 2018. While the Global Compact is broader than the SDGs, the change in signatory volume across 2020–2021 highlights institutional reprioritization over these two years. This change is largely based on a need to prioritize continuity of core business (education and research) over value-added and social good initiatives during the pandemic [18]. Indeed, we posit that this offers a critical challenge for the continuity of progression towards sustainability in higher education and embedding sustainable curricula.

The COVID-19 pandemic has had significant implications for higher education, with a focus on pivoting educational outcomes toward online and digital curricula to enable education during lockdowns and emergency remote teaching [19,20]. These rapid system-level changes have led to declines in student and staff wellbeing [21–23]. The pandemic has created a need for critical divergence from the pre-pandemic social missions of universities and higher education institutions. The implications of this are that organizational resources were diverted away from non-core strategies such as sustainability. This is increasingly evident within the literature identified in this study.

This study features a systematic literature review of manuscripts published during 2020 and 2021 that discuss sustainability in higher education within the COVID-19 context. The pandemic is a societal catalyst for an evolution in human behavior, and it is likely that the post-pandemic environment will be a different society than was present in 2019. There is a continuation of pre-pandemic research in sustainability since 2020, yet many of these

lack careful situating within the pandemic literature. This study seeks to understand the higher education sustainability literature that does exist within the pandemic landscape. To do so, we begin with an overview of the systematic review method used in this study (Section 2). Next, we present an exploration of the emergent themes against United Nations SDGs (Section 3), followed by a careful discussion of the implications of this research for future higher education sustainability research and practice (Section 4).

2. Materials and Methods

2.1. Search Strategy

The search strategy for manuscripts included two search phrases. The first search yielded a small number of results, so the framing was expanded in the second search, yielding more results. The second search yielded higher volumes of results (see Table 1), but typically had anecdotal references to the pandemic rather than genuine situating of knowledge within the pandemic context:

1. Sustainability (in title) AND COVID-19 OR pandemic OR coronavirus (in title) AND “higher education” (in abstract);
2. Sustainability (in abstract) AND COVID-19 OR pandemic OR coronavirus (in abstract) AND “higher education” (in abstract).

In the search, only English-language academic journals were included, with a time-based limit of January 2020 to December 2021. PsycInfo, ERIC, and Academic Search Ultimate were used as database searches, in line with numerous previous educational reviews [24]. Journals were not restricted to education literature only, given much of the scholarship of teaching and learning (SoTL) research is published in discipline-specific journals. For a third search, Google Scholar and snowballing were used. An additional manual search of the first 10 pages of Google Scholar results with the same phrase was also included to sense-check the data; one additional manuscript was identified for inclusion. A snowball search of the final sample was included to identify any references used by the final sample for inclusion [25].

Table 1. Search strategy initial results.

Database	Search 1	Search 2	Search 3
PsycInfo	0 results	40 results	
EBSCOhost—ERIC	4 results	226 results	
EBSCOhost—Academic Search Ultimate	3 results	380 results	
Google Scholar			1 result
Reference review			0 results
Total			654 results

2.2. Selection Procedure and Quality Assessment

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses [26] statement was used to present the search results and selection procedure (see Figure 1). This is commonly used in educational and sustainability research [27]. A single screening of the titles and abstracts was conducted to ensure the manuscripts were relating to (a) sustainability, (b) higher education, and (c) situated in COVID-19. This resulted in excluding 601 manuscripts. The full-text review followed with included studies, and subsequently excluded four additional manuscripts. The ratio of results is consistent with recent published works on sustainability in education [28].

Following final inclusion, a quality assessment was conducted to consider the rigor of the manuscripts featured in the sample. There was a predominance of practice-based papers (e.g., reflections, short practice notes), however, this was likely given the recency and currency of the pandemic. Table 2 provides an overview of the final sample.

Table 2. Final sample.

Manuscript	Country	Purpose of Study	Design	Key Findings	SDG
Almazroa (2021) [29]	Saudi Arabia	Review and analyze ophthalmic teaching practices during the pandemic	A scoping review	Ophthalmic training has diverse global responses with adaptations primarily relating to practice changes over educative changes	Goal 8/9
Anholon et al. (2020) [30]	Brazil and Germany	Consider sustainable development requirements for engineering education during the pandemic	Critical reflection on practice	Greater business management education is needed for engineers to support their capability in managing competing economic, environmental, and social demands	Goal 12
Faura-Martinez et al. (2021) [31]	Spain	Identify student perceptions and preparedness for online teaching during COVID-19	Survey ($n = 3080$)	Household technology investment was necessary to support students, with reduced student preparedness, despite the equity issues this posed for vulnerable populations	Goal 4
Hadjeris (2021) [32]	United States of America	Examine Algerian higher education institutions against UN SDG 4	Structured interviews ($n = 7$)	COVID-19-driven changes to digital learning created exclusive and inequitable education in Algeria through lack of staff digital preparedness, and technology resourcing and access	Goal 4
Leal Filho (2020) [33]	Germany	Outline the impact of COVID-19 on university sustainable development	Practical description	For universities to develop sustainability through COVID-19, they should consider health burdens, socio-economic problems, disrupted routines, trauma, and income reductions	Goal 8/9
Munna (2021) [34]	United Kingdom	Consolidate ‘common facts’ relating to COVID-19 and higher education sustainability	Reflective review	COVID-19 has created ‘immense risk’ in the sustainability of pre-pandemic higher education, with government financial intervention argued as a key response	Goal 8/9
Petronzi and Petronzi (2021) [35]	United Kingdom	Review blended learning literature to propose a response to COVID-19 education	Critical practice review	The use of a specific blended learning model (OaC) offered a sustainable response to educative changes brought on by the pandemic	Goal 4

2.3. Thematic Analysis

With the final sample ($n = 7$), Braun and Clarke’s [36] method for thematic analysis was applied. This method includes transparently progressing through and presenting six steps: data familiarization, data coding, theme searching, thematic review, defining each theme, and naming themes. In this review, we familiarized ourselves with the data by carefully reviewing each manuscript and identifying themes. During data coding and theme searching, it was recognized that the themes being identified corresponded well to a few United Nations Sustainable Development Goals (see Table 3). Through re-review of the themes, as well as documentation surrounding the development goals, the work was organized by goal response. We initially held the Goal 8 and Goal 9 themes separate; however, we ultimately combined these as the included manuscripts tended to discuss similar response approaches. We also found one manuscript [30] which spoke more to education of sustainability. This could align to Goal 4, yet the content spoke more

specifically to future engineering requirements to be sustainable rather than pedagogical or andragogical practices [37]. The aim of this was to identify the most relevant Goals, but we recognize that there were much shorter references (e.g., passing comments in manuscripts) that could have been aligned to other goals.

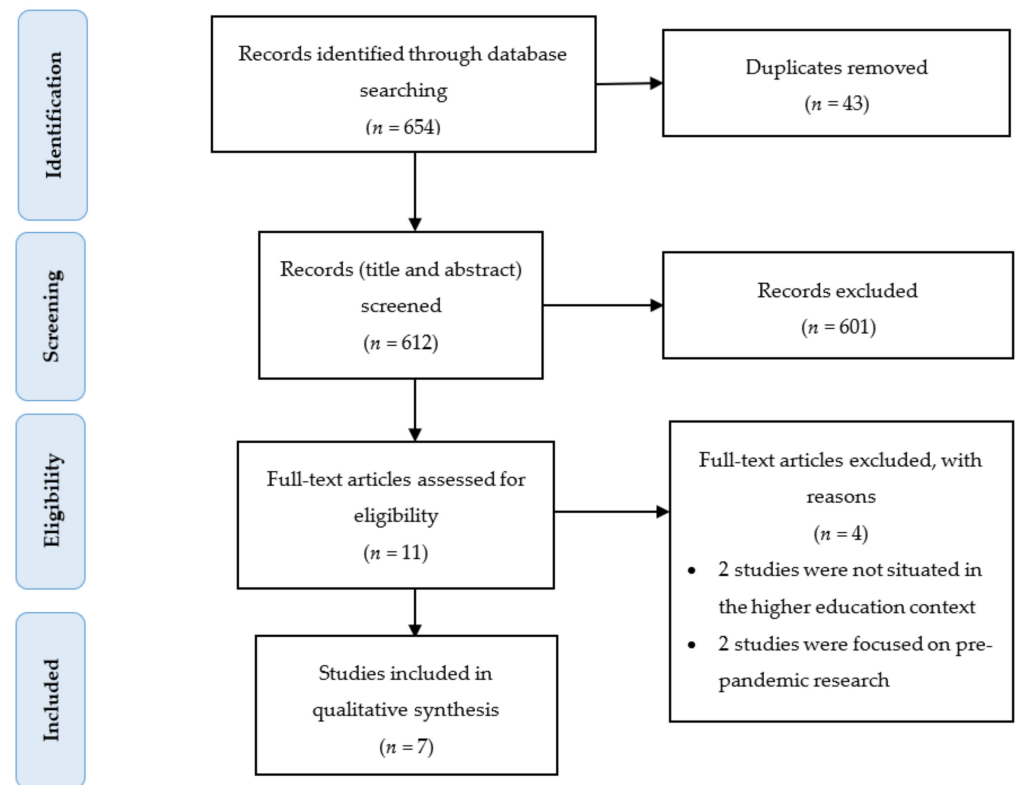


Figure 1. PRISMA statement.

Table 3. Sustainable Development Goal themes and definitions.

Sustainable Development Goal	Definition	Manuscripts Included
Goal 4. Quality education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Faura-Martinez et al. [31]; Hadjeris [32]; Petronzi and Petronzi [35]
Goal 8. Decent work and economic growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Almazroa [29]; Leal Filho [33]; Munna [34]
Goal 9. Industry, innovation and infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
Goal 12. Responsible consumption and production	Ensure sustainable consumption and production patterns	Anholon et al. [30]

Note: definitions quoted from United Nations [1].

3. Results

The identified manuscripts, while small in volume, highlight three broad thematic areas being considered within the scholarly literature on sustainability in higher education

during the pandemic. These three thematic areas align well to Goals 4, 8 and 9, and 12 of the United Nations' Sustainable Development Goals.

3.1. Goal 4: Quality Education

Goal 4 of the United Nations' Sustainable Development Goals highlights that to be sustainable we must "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". For higher education institutions, as education institutions foremost, this goal is most closely aligned to core business and the vision and mission of the organization. For this theme, there were three key manuscripts. The focus on quality education explicitly aligned to the SDG was rarely discussed in the pandemic literature. Faura-Martinez et al. [31] discusses what changes in student access to education means for achieving inclusive education, Hadjeris [32] discusses this from a staff perspective, and Petronzi and Petronzi [35] propose a blended pedagogy solution.

In a study of 3080 participants from 17 Spanish universities, Faura-Martinez et al. [31] identified significant increases in technology consumption and purchasing (e.g., 23% increase in webcams) and reduced technology access (e.g., 8.4% decrease in quality internet access). The rapid increase in the use of digital resources speaks directly to more broad sustainability concerns (e.g., sustainable consumption and production), however from a Goal 4 perspective, this speaks directly to the inclusivity and equitability of education. Rapid increases in demand tend to reduce access to that product or raise the base price of those products. The latter often happens when individuals are forced to purchase higher-quality and higher-priced products due to lack of availability of cheaper products. During the pandemic, there has been a global shortage of products that use a limited supply of electronic microchips. The pressures thus created resulted in vulnerable student populations with reduced, limited, or no access to the technology that other students had. In Spain, this existed in the context of poor access to good-quality internet. For those students with poor access, 72 percent tended to have difficulties following curriculum progression. Interestingly, students found social networks the least useful digital resource, in stark contrast to prior evidence that emphasized its benefits [38]. The rapid changes created a 53-percent decline in self-reported academic performance as well, highlighting that quality education may not have been achieved during this time.

Hadjeris [32] conducted structured interviews with seven female (primarily English department) academics in Algeria. Interestingly—and to the confirmation of Faura-Martinez et al. [31]—staff tended to report similar challenges to the delivery of quality education. In Algeria, government mandates as reported by participants were to upload simplified lesson plans into the Learning Management System that were 'basic' and asynchronous. Staff tended to have low previous capability in digital or online education, and were not prepared for this mandate. Consistent with the previous paper, staff tended to have internet access challenges, were demotivated to teach at a high quality, had software and hardware issues, and operated inside an absent online teaching culture. While the notion of decent work will be discussed shortly, from a quality education perspective, when staff are not equipped to succeed in their teaching, those who suffer will likely be the students least prepared for self-directed and self-motivated learning.

In their paper, Petronzi and Petronzi [35] propose a response to create a sustainable education environment post-lockdown. This involves a balanced model of online modalities (asynchronous knowledge introductions, synchronous conceptualization and embedding work) with application and knowledge challenges through on-campus delivery. The proposed model argues to be a sustainable step forward in contemporary higher education in the post-pandemic landscape, but likely replicates existing work [39]. To summarize, quality education has been directly challenged by the COVID-19 pandemic, and it is primarily influenced by the digital access and technical capability of academic staff and students; highlighting that to create inclusive and equitable education, a response must be devised for all students and staff within an institution.

3.2. Goal 8: Decent Work and Economic Growth, and Goal 9: Industry, Innovation, and Infrastructure

Goal 8 of the United Nations' Sustainable Development Goals highlights that to be sustainable, we must "promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all". Goal 9 likewise highlights the need to "build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation". While higher education emphasizes quality education first, Goals 8 and 9 represent the organizational component of creating a sustainable business model that is both internally (staff, revenue, resources, etc.) and externally (leading communities) viable, often on economic, social, and environmental grounds ('triple bottom line' logic).

In academic medical centers [29] the ability to deliver quality, safe education and training to ophthalmology students was identified as a sustainability challenge during COVID-19. Indeed, this was particularly relevant as students were transitioning to clinical practice, where substantial increases in personal protective equipment (PPE) and environmental adaption were required to keep staff and students safe. Interestingly, this manuscript spoke more closely to protocols within academic medical centers, without significant reference to student populations. The aim of this work was to identify sustainable development and decent work conditions for staff and students within tertiary institution-administered medical practices.

Leal Filho [33] explored sustainable development and quality work for staff in developing a brief recovery model involving consideration of: health burdens, socio-economic problems, disrupted routines, trauma, and income reductions. In this, 'stopping the spread' was recommended for prioritizing a return to normality. Underlying the work was a focus on mobilizing staff and students as actors in the response, which may add additional challenges to the aim of decent work for staff. Indeed, one of the greater COVID-19 challenges for sustainability is the need for higher rates of unsustainable consumption to meet new needs (e.g., digital technology for learning or single-use plastics for minimizing viral spread). Munna [34] begins to further explore this in his reflective review. Indeed, sustainability is achieved through flexible models of work, stabilizing student demand, reprofiling resources, and supporting bridging financing. Yet, a challenge to many of these conditions may be the issue of prioritizing the immediacy of sustainability initiatives against long-term targets that universities set out to achieve pre-pandemic.

3.3. Goal 12: Responsible Consumption and Production

Goal 12 of the United Nations' Sustainable Development Goals highlights that society must "ensure sustainable consumption and production patterns". In the education context, we take this to mean developing capability in graduates to build sustainable consumption and production patterns in the future. Only one of the manuscripts from the sample spoke explicitly and primarily to this, although others briefly mentioned consumption or production. For example, Munna [34] highlighted the need to stabilize European Union student demand in his review.

In a review of engineering education literature, Anholon et al. [30] recognize the need to focus more deeply on education that may support business management capability in engineers. This is an interesting pivot, given the other literature spoke more to challenges of embedding sustainability (particularly environmental: Leal Filho [33]) into curricula. The focus on business management stemmed from a need to support sustainable business model development in future engineering enterprises, to enable organizations to be stable enough to invest in their business as well as social and environmental opportunities. However, Anholon et al. [30] also caution against the over-emphasis of business management skills without careful embedding of sustainability principles; that is, without the latter, students may believe that the financial viability of a business is the only priority, instead of prioritizing sustainable production and consumption of goods and services.

3.4. SDGs Not Included

Interestingly, there were many goals which did not have a clear alignment to the literature published during the pandemic, and relating to pandemic education. We found this curious, and perhaps pointed to a need for more explicit research on how higher education seeks to support and enable the achievement of a more diverse range of SDGs. This research is novel, not just in its approach of identifying which SDGs are currently being embedded in higher education and published on, but also by understanding those goals that did not feature in the pandemic literature between 2020 and 2021. It provides an important foundation for the types of higher education research that still need to be contextualized within COVID-19 conditions.

4. Conclusions

The aim of this study was to better understand the landscape of sustainability in higher education during the pandemic, and to cast an eye over how the pandemic is reshaping priorities for higher education actors and institutions confronting COVID-19. It was evident that, even with a low sample of studies, there were critical effects on university practices in learning and teaching. For example, educators tended to be unprepared for online delivery, and students had reduced access to digital technology and stable and reliable internet. This likely affected low socioeconomic and vulnerable student populations most, failing to uphold Goal 4 of inclusive and accessible education for all. Likewise, university business was affected by changes in staffing profiles, revenue streams, and capability to deliver core business. This often led to sustainability initiatives being deprioritized, and the reduction in literature on the topic in 2020–2021 demonstrates this. There were some efforts to train future graduates in sustainable practices in order to enable future delivery of sustainability goals in the workplace, however, these still remained limited in the pandemic literature.

4.1. Implications

The implementation and embedding of sustainability was a high priority for many institutions prior to the global spread of the COVID-19 pandemic in 2020. Abad-Seugar and Gonzalez-Zamar [40] highlight that higher education institutions deploy global (e.g., international societies), academic (promotion of research and teaching), economic (economic value, industry partnerships), research (scholarships, open access publishing), societal (access, gender equity, integrity), and governmental (leadership diversity, strategic public sector relationships) strategies to enable their sustainable development. Across the 1990–2018 sample, they identified an exponential increase in scientific literature on sustainable economic development in higher education institutions, reaching more than 250 publications identified in 2018. Yet, in this study, there appears to be a significant decline in the 2020–2021 period pertaining to COVID-19-specific higher education challenges. This can be recognized as concerning, given that COVID-19 offers a genuine challenge to sustainable practices in all organizations, and creates the need to learn and unlearn [41].

There is a critical need to better understand the effects of the COVID-19 pandemic on the sustainability of learning and teaching practices, but also on how this has changed institutional priorities in relation to embedding sustainability into curricula [42], developing sustainable higher education business models [43], and developing sustainable workforce strategies [44–48]. There is a need for the re-emergence of an integrated literature that considers how sustainability is to be achieved in the ‘new normal’, particularly considering the unique challenges of developing nations [49,50]. That is, at present, a small stream of research (featured in this manuscript’s sample) that contextualizes knowledge in the current climate of reinterpreting pre-pandemic literature. In parallel, there is an increasing volume of sustainability research that is COVID-19 blind [50–54]. To elaborate, papers in the category of COVID-19 blind were published during the pandemic without reference to said pandemic. This offers an incredible risk to the contextual validity of the research, given that the post-pandemic environment will not return to pre-pandemic conditions, and

some of the studies may be working on an environmental assumption that is unlikely to be true.

4.2. Strengths and Limitations

This study was strengthened by a rigorous and well-considered method, adopting previously-published practices where possible. The systematic review method is sound when administered effectively, and likewise the use of the thematic analysis offers a structured method to respond effectively to the final sample. Regarding the final sample, this was a limitation. While the sample was well-sourced, it was small in nature. The size was due to the lack of manuscripts available, which presents a limitation to this work but also a critique of the current scholarship in the area. A greater focus is needed on understanding how sustainability in education practices, sustainability in university business, and curriculum-embedded sustainability for future work practices are affected by the COVID-19 pandemic. This should emphasize a particular focus on adopting more rigorous methods of research. While some manuscripts conducted large-scale studies, systematic reviews, and structured interviews, others were brief practice notes that could have been extended to more evidence-based research practices.

We encourage scholars to continue to contextualize their work in the broader pandemic and pre-pandemic literature, to ensure their work will be relevant beyond the lifespan of COVID-19.

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