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"From Global Indicators to Local Applications"

#STI2022GRX

*Research in progress*

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26<sup>th</sup> International Conference on Science and Technology Indicators | STI 2022

## “From Global Indicators to Local Applications”

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#STI22GRX

### Case Study: Mapping the impact of science on education policy during the COVID-19 pandemic<sup>1</sup>

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#### Introduction

In response to the COVID-19 pandemic, governments worldwide enacted sudden school closures, impacting more than 1.2 billion students globally (UNESCO, 2022). In addition to disruptions to education, students also faced the challenges from other measures, including distance learning, lockdowns, social distancing, and mask mandates (Thorn, W. & S. Vincent-Lancrin, 2021).

The measures were implemented or commented on through more than 28,000 policy documents published by governments, think tanks, non-governmental organisations, and international organisations (Overton, 2022). This case study seeks to understand how scientific articles, especially those conducted during the pandemic, influenced education policy decisions in the United Kingdom (UK), United States of America (US), European Union (EU) and across International Organisations (IGOs). Ongoing research is utilising scientometrics and semantic analysis to map the evidence-base for education policy response to COVID-19. Results will inform the development of frameworks for measuring the impact of science on policy as well as the design of new systems for improving the collective intelligence of governance.

The study leverages the databases of Elsevier’s International Centre for the Study of Research (ICSR) and Overton. The ICSR database provides access to research articles indexed by SCOPUS and article level metadata pooled from across Elsevier’s various products, including societal impact indicators. Overton’s data comprises a repository of policy documents, as well as their citations to each other and to scholarly articles.

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<sup>1</sup> Basil Mahfouz is a doctoral candidate at UCL’s Department of Science, Technology, Engineering, and Public Policy (STeAPP) and is supported by Elsevier’s International Centre for the Study of Research (ICSR).

<sup>2</sup> The search was run on 15 April 2022. New research articles are published and indexed every day on SCOPUS. The same query will return larger pool of articles if run at a future date.

### Assessing the impact of COVID-19 scholarly research on education policy

The first phase of the case study focuses on understanding how scientific research on the impact of COVID-19 on education influenced policy. A combined search over frequent author generated and indexed keywords related to COVID-19 and education identified 21,743 relevant scientific publications<sup>2</sup>. Results were refined by omitting articles tagged by irrelevant keywords or published in unrelated journals. The final SCOPUS query is outlined in Table 1 below. Random articles from the corpus were sampled and manually evaluated by the research team for their relevance to the topic. Over 90% of the articles in the corpus were deemed relevant.

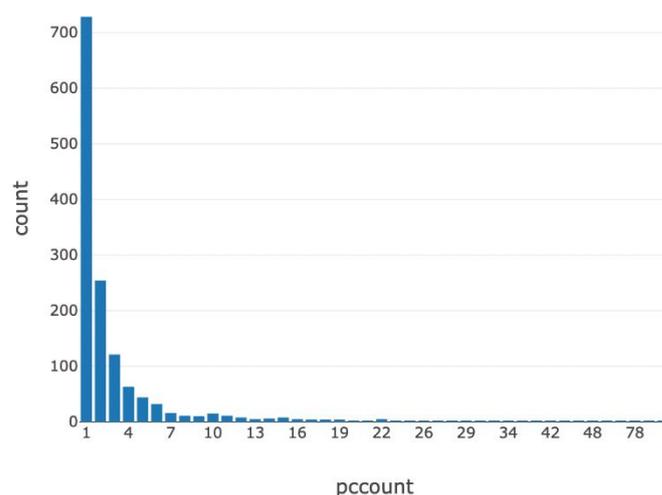
Table 1. ICSR sequential SCOPUS search query.

	COVID-19 and related top keywords	Published after 2019	Including top keywords related to education or demographic	Excluding irrelevant keywords	Excluding articles published in irrelevant journals
Sequence	1	2	3	4	5
Search Query	KEY ({COVID-19})OR {SARS-CoV-2}OR {Coronavirus Disease 2019}OR {Pandemic}OR {Severe Acute Respiratory Syndrome Coronavirus 2}OR Coronavirus*OR {Coronavirus Infections}OR {Coronavirus Infection}OR {Covid-19}OR {COVID-19 Vaccines}OR {SARS-CoV-2 Vaccine}OR {COVID-19 Testing}OR {SARS Coronavirus}OR {COVID-19 Pandemic})	AND PUBYEAR > 2019	AND KEY(Education OR E-learning OR Learn* OR Student? OR Child OR {Young Adult} OR {Young Adults} OR Adolescent? OR School* OR {Distance Learning} OR {Educational Measurement} OR Universit* OR {Education Program}OR {Education Programme} OR {Educational Status} OR {Academic Achievement} OR {School Child} OR Teach* OR Curriculum	AND NOT {Middle Aged}AND NOT {Very Elderly} AND NOT {Elderly}AND NOT {Nonhuman}AND NOT {Newborn}AND NOT {Infant, Newborn}AND NOT {Medical Student}AND NOT {Patient Care}AND NOT Pregnancy AND NOT {Adult})	AND NOT SUBJAREA(MATH OR ENER OR PHYS OR AGRI OR MATE OR DENT OR CHEM OR CENG OR VETE OR EART)
Article count	229,827	229,602	48,762	24,803	21,743

### Initial results

The initial 21,753 publications selected were cleaned and processed, resulting in a reduced corpus of 18,000 scientific publications. Of the remaining corpus, less than 7.6% (n=1382) of papers had at least one policy citation. Policy counts, as shown in Figure 1, were also highly skewed, with 75% of articles having 3 or fewer citations each.

Figure 1: Number of articles (y=count) with corresponding policy citation counts (x=pccount)



### Analysing the scholarly references of COVID-19 Education Policy Documents

The second section of the case study assesses the total body of scientific research cited by COVID-19 education policy documents. To identify the relevant policy documents, a query was run on the Overton database based on the keywords of the previous SCOPUS search. The query had to be adapted to fit the specific criterion for the Overton database. Unlike SCOPUS, which has indexed and author-generated keywords, the search query for Overton had to be run through the text of the policy documents. The corpus was further refined using Overton's built-in topic modelling tool, resulting in a total of 28,422 policy documents. The search query is outlined in table 2.

Table 2. Overton sequential search query.

	COVID-19 and related keywords	Including keywords related to education	Filtered to include only policies categorised as "Education"
<b>Sequence</b>	1	2	3
<b>Search Query</b>	"COVID-19" OR "SARS-CoV-2" OR "Coronavirus Disease 2019" OR "Pandemic" OR "Severe Acute Respiratory Syndrome Coronavirus 2" OR "Coronavirus" OR "Coronavirus Infection" OR "Covid-19" OR "COVID-19 Pandemic"	AND (Education OR "E-learning" OR Learn OR Student OR "Young Adult" OR "Young Adults" OR Adolescent OR School OR "Distance Learning" OR "Educational Measurement" OR "Educational Measurement" OR "Education Program" OR "Education Programme" OR "Educational Status" OR "Academic Achievement" OR "School Child" OR Teach OR Curriculum)	With topic "Education"
<b>Article count</b>	306,209	134,091	28,422

Less than 55% of the 28,422 identified policy documents cited external research (see Table 3). Of these, less than 1% of the policy citations referenced the scientific papers identified in our SCOPUS query. This could imply that policy makers relied on research that did not specifically tackle the challenges of the pandemic on education or children.

Table 3. Overview of policy documents and their citations

	International Organisations	United States of America	United Kingdom	European Union member states	All data
Total Policies	4772	7062	6000	3500	28,000
% of policy documents with >1 citation	63%	50%	58%	60%	53%
Total scholarly citations	40,000	15,000	12,000	11,500	95,115

The citations derived from policy documents were then extracted for a comparative analysis of evidence usage between the USA, UK, EU and IGOs. Initial results, outlined in Table 4, show that each of these jurisdictions relied on a different body of scientific evidence. Only 0.62% of citations were shared across all four jurisdictions. Scientific articles referenced by IGOs were most ubiquitous, accounting for over 10% of citations across all other policies. Using metadata from ICSR Lab, this research will continue to explore the dynamics of evidence gathering by policy makers in each of these jurisdictions, and the extent to which the difference in evidence had an impact on policy outcomes.

Table 4. Evidence sharing between political entities

	% references in International Organisations policies shared	% references in USA policies shared	% references in UK policies shared	% references in EU policies shared
IGOs	N/A	10.6%	12.57%	13.5%
USA	4.1%	N/A	5.4%	4.2%
UK	3.9%	4.3%	N/A	5.4%
EU	4%	3.16%	5.13%	N/A
Common across all entities	0.62%			

Finally, the case study will explore the corpus of policy documents that does not cite any scholarly reference using semantic analysis. By applying a language model over the executive summary of the policy documents, the research will seek to identify relevant scholarly articles that are most similar to the content of the policies.

## Discussion

The impact of research on education policy during the COVID-19 pandemic provides a rare opportunity to analyse how governments leverage science during a crisis. This case study utilises a dual approach, first studying the policy impact of new research published on the effects of COVID-19 on education and then analysing the entire body of policy document citations. Key limitations in this project, especially with corpus selection, remain. There is a risk of biased data primarily because the research includes only documents indexed by SCOPUS and Overton.

Due to time sensitivities, scientists during the pandemic opted to share results in alternative, faster forms to conventional peer-reviewed journals. These sources are not included in this

analysis. Further, the Overton database, which is being utilised to identify the core set of policy documents, is dominated by North American and European sources (Szomszor & Adie, 2022), which may limit the internationalisation of results. Finally, a significant set of policy documents do not have any scholarly citations, often by key institutions, which hinders the outcome of this analysis.

Beyond mapping the dynamics of scientific evidence and education policy during COVID-19, this case study seeks to identify the feedback loops which influence the impact of science on policy and vice versa, which could unlock new indicators for measuring the policy impacts of science.

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