Attention Towards Distance Education Tools During COVID-19 Pandemic: Evidence from Google Trends

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**Abstract**

A brief summary of our work

Keywords: rmarkdown, templates

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1 Introduction

The ongoing pandemic of COVID-19 is still one of the most important priorities of governments and media of many countries all around the world. Due to the alarming levels of spread and severity, the World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern (PHEIC) on 30 January 2020, and then a pandemic on 11 March 2020 (World Health Organization 2020). As of 29 September 2021, more than 232.7 million cases of COVID-19 have been reported in over 192 countries and territories, resulting in more than 4.7 million deaths (Dong, Du & Gardner 2020). In response to the pandemic, health authorities worldwide have taken many steps including vaccination development and deployment to minimize the spread of the virus. In addition, authorities worldwide have also taken many non-pharmaceutical interventions and preventive measures such as travel restrictions, lock-downs, workplace hazard controls, school/university closures, facility closures, reduction of mass gatherings to reduce the spread of the virus (Chang et al. 2020).

The ongoing COVID-19 pandemic has brought the world to a standstill. Many sectors have been affected ever since the outbreak of COVID 19, worldwide. Among these many sectors education is one of the most affected sectors with a near-total closures of schools, colleges and universities, all around the world (Daniel 2020). Figures 1 shows the evolution of global school closures and reopening since mid February 2020. With the start of the pandemic a near total closure of schools were observed all around the world. Over time, Africa and Oceania demonstrated better
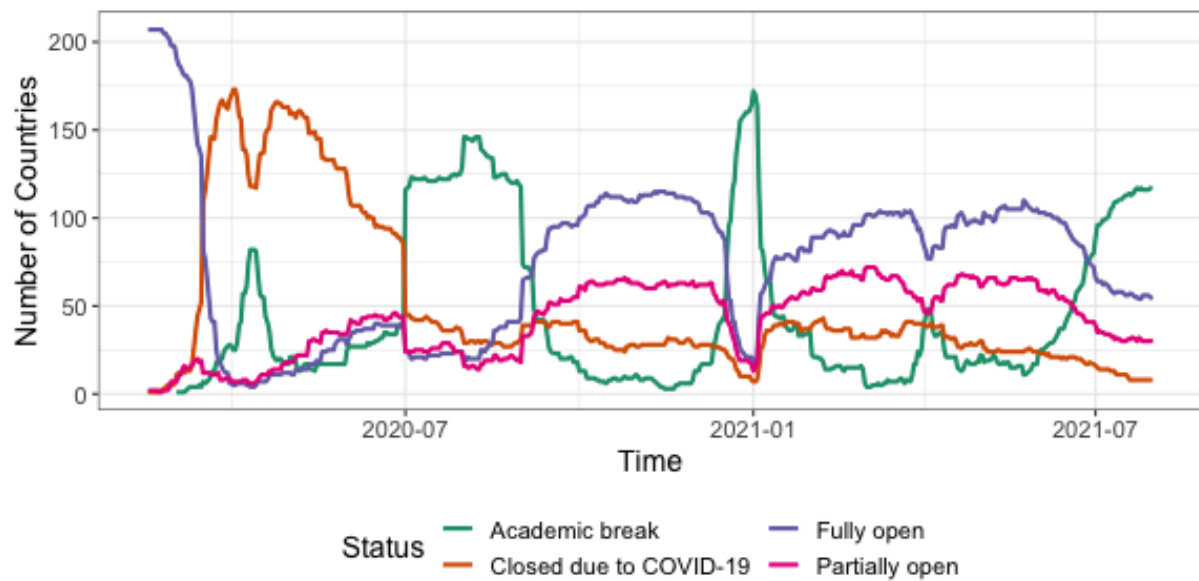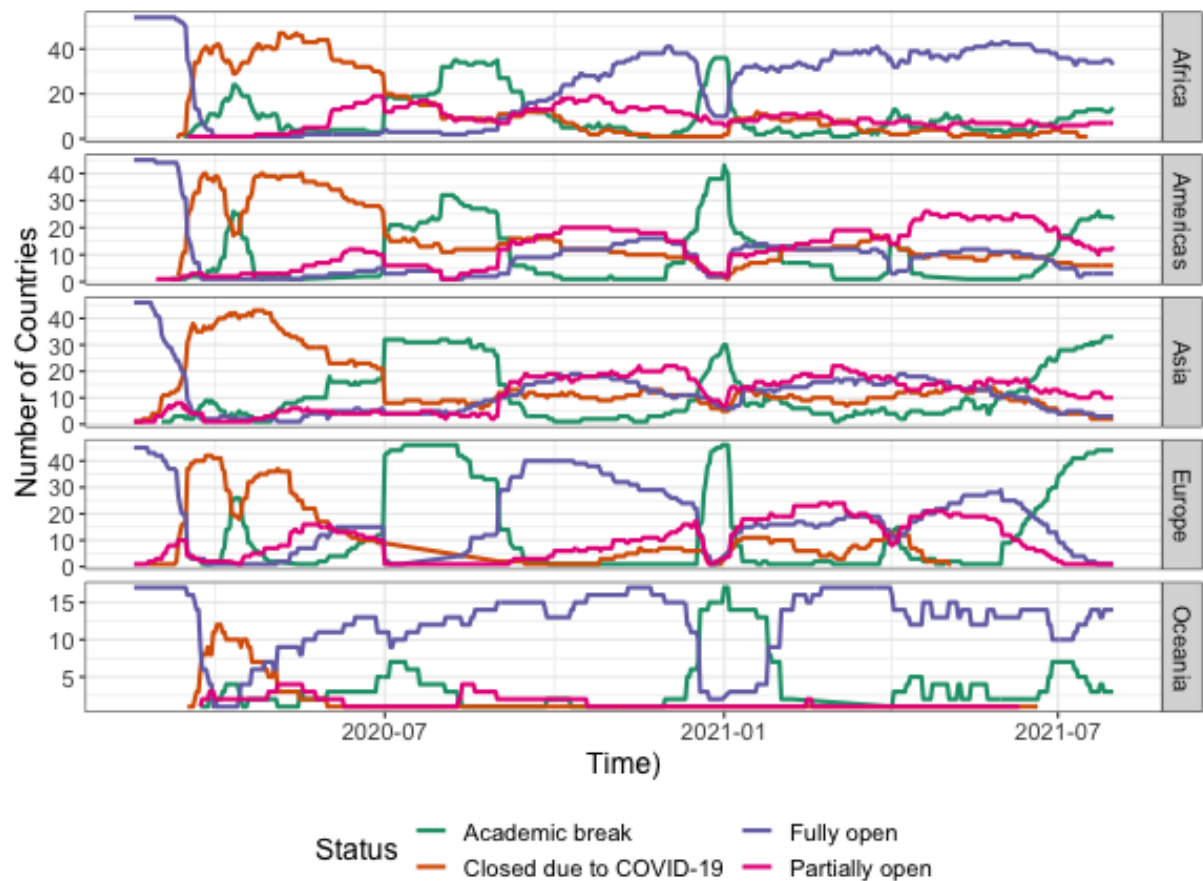
Figure 1: *Global tracking of COVID-19 caused school closures and re-openings*

recovery in comparison to other regions with their increasing number of fully open schools (Figures 2).

Eventhough distance education has a long history that goes back to almost two centuries with significant modifications, alterations, and addition in the process of delivery and communication (Moore, Dickson-Deane & Galyen 2011; Spector et al. 2014), COVID 19 certainly made a new era of distance education while encouraging various stakeholders of education to take the concept of distance education seriously (Richmond et al. 2020). Sudden unexpected movement from classrooms to home schooling at large scale made students, teachers and parents vulnerable, leading to millions of education related internet searches being performed during the period of COVID 19 pandemic (Figures 3) (Carter Andrews, Richmond & Marciano 2021). Surprisingly, the search spikes of distance education related searches (Figure 3 (c)) coincide with increasing Covid-19 counts (Figure 3 (a)) and related internet searches (Figure 3 (b)), eventhough distance education has a long history in contrast to Covid-19 pandemic.

The speed of the physical classroom closures and the rapid move to online delivery of education allowed little time for planning or reflection on potential risks that could happen to its various stakeholders: teachers, students and parents. Teachers were not fully aware of their obligations and how to maintain connections with students to support thier learning. Lack of preparation, lack of tools and techniques for distance education, lack of awareness of the availability of the existing tools and techniques and their effectiveness, lack of interaction and communication with the students, lack of awareness of students' ongoing problems were some of the major

Figure 2: *Region wise tracking of COVID-19 caused school closures and re-openings*

issues they encountered during COVID 19 pandemic. Students on the other hand who tend to have fewer educational opportunities beyond schools and universities severely affected from this sudden unexpected movement. Further, the impact was not limited to students' learning but also to other aspects of their lives such as student debt, digital exclusion, lack of technology, lack of access to internet-enabled device or a stable internet connection, long-term educational disengagement, poor nutrition and food insecurity, increased psychological challenges, childcare problems, exploitation, school dropouts and lack of disability services, long-term educational disengagement, digital exclusion, poor technology management, increased psychosocial challenges, decreases in mathematical achievement, a lack of engagement, increased early marriages , psychosocial challenges (Drane, Vernon & O'Shea 2020; Daniel 2020; UNESCO 2020a; Richmond et al. 2020; Carter Andrews, Richmond & Marciano 2021). This also put an extra burden on parents, specially with limited education and resources, as they were expected to facilitate the required learning environment at home. Working parents also found it difficult to work during school closure due to childcare obligations that result from unexpected school closures. Further, every single step including planning, developing new tools and techniques, conducting awareness programmes about distance education, shifting towards distance education, happened
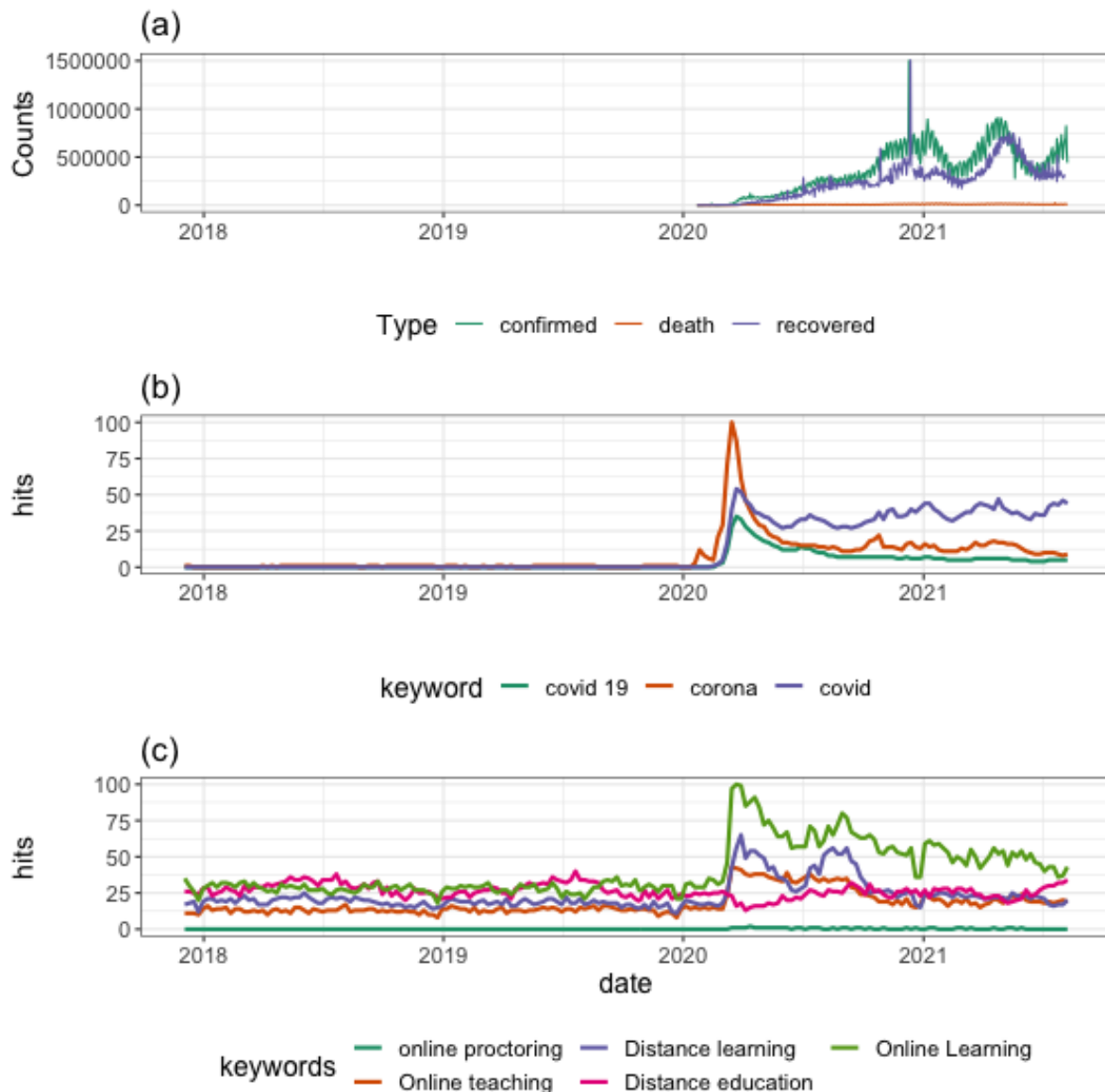
Figure 3: *Visualization of data from Goolge search trends. (a) COVID-19 cases worldwide (b) Google search trends of COVID-19 related terms (c) Google search trends of distance education related terms.*

through online, due to the unexpected massive global shutdown. This situation left internet as the only medium to support all these educational processes.

In response to this gray situation and urgent requirement of massive transformation from physical classroom to virtual learning environment, UNESCO took immediate and timely action by publishing a long list of distance learning solutions that can be used to facilitate student distance learning during the period of school closure. There are many different distance learning solutions. Yet very little is known about the uptake of different solutions or about their effectiveness. The design of different types of distance learning solutions can depend

on the learning objective, target audience, access, and type of content (Moore, Dickson-Deane & Galyen 2011). However, getting familiar with all these available distance solutions is not feasible or practical due to limited time availability and need of urgent responses. According to Carter Andrews, Richmond & Marciano (2021), for educators to continue to teach inclusively, they need support to connect with the students through a variety of strategies so that students feel not only connected to their teachers, but to the subject matter being taught.

Connectivity, flexibility and ability to promote varied interactions are some critical aspects, educators consider when selecting distance education solutions. Further, according to Ahn (2006), the popularity of a product can also greatly influence consumer purchasing decisions as popularity can indicate the prominence of the product in the market, its usability and its impact. Further, according to Willis & Tranos (2020), developers also tend to improve their products and services in response to increasing online search. Therefore, the internet represents a great opportunity to learn about public attention towards a product or service. It is also a way to narrow down the search space and thereby identify most suitable product and services that meets customer needs.

Google Trends is an open source web analytics tool that allows users to interact with Internet search data, which can provide deep insights into population behavior (Nuti et al. 2014). As there is still the main struggle as to what technologies should be used to facilitate student learning, in this study we test whether the Google Analytics search index series can be used as a proxy of the popularity and the public interest in different distance education solutions. In line with that, this paper makes three fundamental contributions to distance education by exploring three main questions: (1) What is the impact of COVID 19 pandemic on education? (2) What solutions are in place to meet the need of distance education in terms during COVID 19 pandemic? (3) Which distance learning solutions have a wide attention and public interest during the COVID-19 pandemic? We primarily analyze quantitative digital footprint data on the internet from December 2019 to August 2021. The resulted google trend footprint provides a fast first step to identify the most popular distance education tools available for different education purposes. It also allows the teachers to narrow down the search space and deepen their exploration on prominent distance education solutions to support their online teaching. Further, identifying most popular tools and techniques will allow everyone to focus on those methods and develop a sustainable learning environment by advancing the existing features.

Quality education is essential to sustainable development and it is a key United Nations (UN) sustainable development goal. Having the right tool is imperative to successful completion

of a task at hand. The findings of this study provides an initial guidance to select a right tool. Therefore, the findings of this study directly contribute to UN's sustainable development goals of quality education.

The remainder of this paper is organized as follows. Section 2 presents the related work to lay the foundation for the Google footprint analysis. Section 3 presents the methodology followed in the study. Section 4 includes Google footprint analysis. Section 5 concludes the article and presents future research directions.

1.1 Background

Google Trends, is a freely accessible website sponsored by Google that analyzes spatio and temporal patterns of search queries in Google Search, across various regions, subject domains and languages (Carneiro & Mylonakis 2009). Therefore, Google trends provide a quantifiable and valuable measure of emerging public concerns and trending topics together with their geographic distribution (Alicino et al. 2015; Cook et al. 2011). According to Jarynowski, Wojta-Kempa & Belik (2020) the public concerns on different matters can also take an epidemic nature starting with the phase of growing interest which is known as "early adoption", to the phase of general interest which is known as "majority" to eventually lose popularity which is known as "lagers stage". Figure 3 also confirms this life cycle explanation.

The use of google trend search queries has become a popular data source in monitoring and modeling the dynamics of different domains such as disaster management (Kam, Stowers & Kim 2019), transportation (Willis & Tranos 2020), business (Chumnumpan & Shi 2019) and health care (Nuti et al. 2014; Alicino et al. 2015; Arora, McKee & Stuckler 2019; Carneiro & Mylonakis 2009; Cook et al. 2011) as it provides data about social phenomena in a more timely manner than traditional data collection processes (Vaughan & Romero-Frias 2014). According to the study conducted by Willis & Tranos (2020) on taxi preferences found that online queries can provide a proxy of quality of taxi services and thereby provide a means to investigate service quality and public concerns on the service provided. In November, 2008, Google launched an internet-based surveillance tool, Google Flu Trends (GFT), that uses aggregated Google search data to provide a near real-time support in predicting influenza outbreaks (Cook et al. 2011). Several recent studies have also been conducted to investigate the relation between Google search trend patterns and the COVID-19 related concerns (Husnayain, Fuad & Su 2020; Effenberger et al. 2020). The study conducted by Husnayain, Fuad & Su (2020) focuses on search terms related to the coronavirus, handwashing, and face masks to monitor public restlessness toward COVID-19. However,

there are only a limited number of research attempts related to education section using Google trend search query data (Vaughan & Romero-Frias 2014). The study conducted by Vaughan & Romero-Frias (2014) have used google trend search queries to predict academic fame by testing the correlation between search volume data and university ranking data. Kansal et al. (2021) have used a text mining approach to identify emerging patterns of words and phrases during COVID-19 pandemic, keeping education prospects as the focus. However, their study was limited to a small number of learning platforms. However, according to Moore, Dickson-Deane & Galyen (2011) the design of different types of learning environments can depend on the learning objective, target audience, access (physical, virtual and/or both), and type of content. Therefore, this study provides a detailed investigation on distance education solutions focusing on different distance learning needs. In contrast to the work in Kansal et al. (2021), the work in our paper has a very specific focus: the distance learning solutions for various education purposes.

Eventhough google trend search quiries provide massive amount of data, more care should be given when utilizing it as a research tool. It may contain inaccuracies (Carneiro & Mylonakis 2009). According to Nuti et al. (2014) the data retrieval process should be transparent. This will increase the trustworthiness of both the results and the generalizability of the findings. Furthermore, researchers should clearly document the rationale and data retrieval process to ensure the reproducibility of results (Nuti et al. 2014). .

1.2 Methodology

In this work we use Google Analytics search index series as a measurement proxy to investigate emerging evidence about distance learning and the popularity and the public interest in various distance education solutions. We use weekly Google Analytics search index series of various distance learning solutions during covid-19 pandemic. We limited all of our searches to the period from 1 December 2019 to 15 August 2021 to match the period of Covid-19 pandemic. Through this we want to capture the volume of interest in the public realm about distance education solutions and how this changes over time. We also study the correlation between weekly web searches and the number of weekly new cases of covid-19.

First "Distance education" and related terms were searched.

We visualise our data and we then employ time series modelling to capture

1.3 Keyword selection

There are different types of interactions that facilitate learners to construct knowledge in distance education environments. These are learner–content interactions, learner–instructor interactions, learner–learner interactions and learner–interface interaction (Wallace 2003).

Google Trends determines categories based on search patterns. According to Vaughan & Romero-Frias (2014) more relevant accurate data can be obtained by limiting the search in Google Trends to a specific category as it helps to reduce noise in the data. In this work our focus was given to education category. Google Trends does not provide the absolute search volume of a given search term. Instead it provides a relative search volume of a particular term adjusted according to the total searches of the geography and time range it represents. The resulted series scale from 0 to 100, where each data point in the series represents the search interest relative to the highest point on the series for the selected region and time. (Alicino et al. 2015; Vaughan & Romero-Frias 2014). A value of 100 represents the peak popularity of the term.

The term distance education is known by a variety of names. The terms such as distance learning, e-Learning, online learning environments, home study, independent study, external study, correspondence education, off campus study, open learning and open education are used commonly and interchangeably (Moore, Dickson-Deane & Galyen 2011). It often describes the effort of providing access to learning for those who are geographically distant. The definition also stated that distance education uses emerging media and associated experiences to produce distributed learning opportunities. Few common features found in all these terms is they all involve some form of instruction occurs between two parties; learners and teachers, different times, places and/or varying forms of instructional materials (Moore, Dickson-Deane & Galyen 2011). It is important to decide what term to search for in Google Trends as different terms have different search volumes. In the past literature several strategies have been used to select suitable search terms for a given study. Some studies have selected search terms based on intuition and some through brainstorming processes (Vaughan & Romero-Frias 2014). In this study our choice of search term took into account the list of distance learning solutions published by UNESCO (UNESCO 2020c). Eventhough, the solutions they had recommended do not carry their explicit endorsement, they tend to have a wide reach, a strong user-base and evidence of impact (UNESCO 2020c). Different solutions are categorized based on distance learning needs. For each keyword, the worldwide search queries were performed with a keyword being used as the "search term". That allowed us to search the exact string of text typed by the user. However, according to Vaughan & Romero-Frias (2014), short forms or acronyms had higher

search volumes than the corresponding complete names, in general. However we did not use the acronym in this study, as our focus is on specific tools and techniques available in the market to fulfill distance education needs and acronyms could be confused with another entity.

In google trend It is possible to search for up to five queries each time [21].

Google Trends does not report the absolute search volume of a single term but does report the relative search volumes for up to five multiple terms (Vaughan & Romero-Frias 2014).

We entered up to five universities at a time and recorded their relative ranking scores, we then entered a different group of universities, some of which overlapped with the previous group, and we recorded the relative ranking scores again. Through this repeated process of relative comparison, we were able to obtain relative ranking scores for all uni- versities in the study. (Vaughan & Romero-Frias 2014)

1.4 Analysis

bola the most searched item on Yahoo engine and the fifth most searched term on Google in 2014 [2, 3].

Duifferent attesnion for different etrms The lack of consistency in terminology inevitably affects not only the researchers who would like to build upon the findings, but also impacts designers who are creating similar types of environments. The findings show great differences in the meaning of foundational terms that are used in the field, but also provide implications interna- tionally for the referencing, sharing, and the collaboration of results detailed in varying research studies (Moore, Dickson-Deane & Galyen 2011).

1.5 exams

Strategies to postpone, skip or adminsiter examinations at a distance raise serious concerns about fairness, especialy when access to learning becomes variable. Disruptions to assessments results in stress for students and their families and can trigger disengagement. (UNESCO 2020b,a) ## Discussion and Conclusion

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