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# Learning from a Distance: Assessing the impact of the Pandemic through a Virtual Reference Service

## Feature Article

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**Abstract**

With the onslaught of the global COVID19 pandemic, universities were forced to quickly pivot to exclusively remote and virtual service options. To further complicate the situation, many international student populations at these institutions were forced to study remotely in their home countries due to the pandemic and visa restrictions. In Canada and Ontario, International students make up a major revenue source for post-secondary institutions, making the need to find viable solutions to continue to serve these populations essential to their financial stability.

The *Ontario Council of University Libraries* (OCUL) runs a shared virtual reference service called *Ask a Librarian* (Ask). This paper assessed the global pandemic's impact through a comparative study of the service before, during, and after the pandemic's height. Using IP addresses, this study evaluated the impact of geographical location on the user's access to virtual library resources, as well as identified any barriers, shifts, or trends in the service. The COVID-19 pandemic has changed the face of education and remote learning indefinitely. The hope of this study is to assess the overall success and pitfalls of our current virtual reference services and suggest future improvement areas.

### Ask A Librarian Service Background

*Ask A Librarian* is a consortial virtual chat service provided by Scholars Portal, the executive arm of the Ontario Council of University Libraries (Barret, Pagotto 2022). The web chat service was launched in 2011 with seven universities across Ontario, Canada. Since then, the service has grown to include 17 participating schools and, with the addition of the University of Ottawa,

includes service in French. In 2020, the service further expanded to include chat over SMS. In the last four years, Ask has received at least 25 000 chats per year.

**Literature Review – Geolocation and the Importance of International Students**

Geolocation is the process of using technology or methods to identify the location of a user in the world. This is becoming more important because more and more people, and connected objects are using the internet. Many studies reveal this interest. One study binds geolocation to images to know how geolocation is connected to things like images shared on social media websites (Liu, B., Yuan, Q., Cong, G., & Xu, D. 2014). Many studies focus on Twitter: (Tang, H., Zhao, X., & Ren, Y. 2022) uses various statistical techniques to retrieve the geographic coordinates of tweets. Another study (Mourad, A., Scholer, F., Magdy, W., & Sanderson, M. 2019) demonstrates that using the right data and metric is important to better geolocate Twitter user. This research aims at using geolocation services to get a better idea of where our users are contacting us from when they want to use our chat service.

International students play a key role within Canadian universities. As publicly funded institutions, the additional revenue generated by international students is essential to the overall financial health of these schools (Ballard 2021) (Butler, 2020). The COVID-19 pandemic created some major barriers for these students and resulted in many schools across the country facing financial challenges (Sciarpelletti, 2020) (Xing, 2020). For many international students, education is used as a pathway for permanent residency and work permits, and not being able to enter the country affects their eligibility for these pathways ("Fewer International Students", 2020). This study's main goal was to compare the difference in international access to OCUL's Ask a Librarian service to track and quantify some of these challenges.

**Methodology and Data Gathering**

The chat service provider, LibraryH3lp, provides an Application Programming Interface (API) that administrative users can access to send specific requests to the chat server using Python programming language script (LibraryH3lp 2016). Using the LibraryH3lp API as a starting point, a script was written to select chats from a specific range of dates (Mondésir, 2022), representing the full service times during the Fall 2019, 2020, and 2021 semesters. At this point, the only metadata taken from the dataset was the date and IP address. The results were filtered to include only web chats, removing all SMS and practice chats.

Next, IPInfo service was used to retrieve the geolocation of each IP address (Grosser, 2017). This information comes in two-letter country codes. An Excel file was generated that contained the IP address, the chat date and the country code name retrieved from the service. The website Laendercode, was then used to convert the two-letter country codes into a dataset of country names (Laendercode 2022).

The results were then converted to pivot tables (see Appendix A) divided by year to find the distribution of accesses by country. From there, the data was analysed by comparing the number of international chats, the number of countries, and the differences between the years. The results were then transferred to a map for visualization (see Appendix B).

**Data Cleaning**

IPInfo was used to retrieve the geolocation of the pulled IP addresses from LibraryH3lp. IPinfo is an online service that retrieves geographical location of Internet devices (Komosny, Dan, et al, 2017) IPinfo has been selected in this study because it has been referred to as the trusted source for IP address data (United States, 2021) The researcher should be aware that this service limits the number of IP requests that can be submitted; beyond this, there is a service fee. At the time of this research, there was a limit of 50 000 IP addresses that a user could retrieve per month.

In our data set, there were instances of chats with two IP addresses. Due to the rarity of this instance (34 out of 47,775 files), these chats were disregarded. According to LibraryH3lp, this double IP address is due to the user's computer using a proxy server. Therefore, one IP address identifies the proxy, while the other the user's device.

IP info service constantly updates their algorithm and data sources. We noticed that for some ip addresses, when executing the code again, a couple of weeks later, to retrieve the geolocation, the result differs slightly. For example, one time an IP address might be found in Kenya, but a few weeks later it might be found in Ethiopia. This research used the latest result from when the code was run. The researcher should be aware that discrepancies when using IPInfo. Some study mentioned that the IPinfo service does not make publicly available information about the level of accuracy of their service. (Komosny, Dan, et al, 2017)

**COVID-19 Timeline**

- March 18, 2020, 15 schools out of the 17 *Ask A Librarian* participating schools cancelled face-to-face classes for the term.
- March 18, 2020 (21st for USA), the Canadian border implemented restrictions for foreign nationals entering the country (students with visas issued before this date were still able to enter the country)
- Fall 2020, 89% of *Ask A Librarian* participating schools were offering classes mostly remotely or virtually, with some exceptions (e.g. labs)
- October 10, 2020, international students are now able to travel to Canadian schools with an approved COVID-19 readiness plan (generally including two weeks of isolation at the expense of the student and additional testing)

- August 3, 2021, the Ontario Chief Medical Officer announced that all post-secondary institutions are required to have a mandatory vaccine policy
- Fall 2021 classes from *Ask A Librarian* participating schools were offered in a mixture of in-person, hybrid, and virtual offerings, with a strong push for in-person for many institutions

**Findings**

As seen in the table below, Fall 2020 saw a significant increase in chats overall, with international chats nearly doubling. Fall 2020 had 41 new countries with chats, and 39 of the countries with chats previously saw an increase in number as compared to Fall 2019 (See Appendix A & B). By Fall 2021, the total number of chats was still higher than Fall 2019; however, the number of international chats decreased by about 100.

There are too many variables to determine the reasons for these shifts. However, the COVID-19 pandemic clearly impacted this service, particularly with the increase in chats in Fall 2020. To determine the full impact of Fall 2021, more data from semesters prior to the pandemic is required to see if this variation is unusual or within the average chat service usage.

| | *Fall 2019* | *Fall 2020* | *Fall 2021* |
|---|---|---|---|
| Total Chats | 13292 | 18539 | 15210 |
| International Chats | 596 | 1137 | 494 |
| Percentage of International Chats | 4% | 6% | 4% |

**Next Steps**

The study thus far has led to more questions and areas of potential study than conclusions. One of the next points of investigation is applying a user experience perspective, identifying common trends and questions, and examining chat transcripts and user satisfaction surveys. As Shaw and Spink (2009) discuss, FAQs are an essential library reference and information tool that are cost-saving. Having an idea of common questions will allow schools to update and clarify information or make more prominent needed information.

Additionally, a user-experience focused analysis would benefit from an Equity, Diversity and Inclusion lenses. Hamer's (2021) study on racial bias in virtual reference services highlights the difference in service level for individuals with racially diverse names. With the results of our study supporting the strong usage of this service internationally, an understanding and assessment of how our operators are currently serving these students would be beneficial.

Another element to consider in future studies is time zones and when students are accessing and have access to the chat service. Mawhinney's (2020) evaluation of all types of virtual reference services found that chat services were the most preferred. Chat provides synchronous, instantaneous, and easy access to answers. Mawhinney found that users would wait until the service reopened to ask a question rather than try any other virtual reference method (2020, p. 7). Finding ways to ensure international students have equitable access to this service, no matter what time zone they are located in, becomes essential with this lense.

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**Appendix A: Pivot Table**

| Countries | 2019 | 2020 | 2021 | 2020vs2019 | 2021 vs 2019 |
|---|---|---|---|---|---|
| Albania | | 1 | | | |
| Algeria | 2 | 2 | 1 | 0% | -50% |
| Antigua and Barbuda | 1 | 2 | | 100% | -100% |
| Argentina | 2 | | 1 | -100% | -50% |
| Australia | 4 | 5 | 6 | 25% | 50% |
| Austria | 1 | 2 | 4 | 100% | 300% |
| Azerbaijan | | 4 | | | |
| Bahamas | | 6 | 1 | | |
| Bahrain | | | 1 | | |
| Bangladesh | | 13 | 6 | | |
| Barbados | 1 | 3 | | 200% | -100% |
| Belgium | 1 | 3 | | 200% | -100% |
| Benin | | 1 | 1 | | |
| Bermuda | | 2 | | | |
| Bhutan | | 2 | | | |
| Bolivia, Plurinational State of | | 1 | | | |
| Brazil | 10 | 16 | 4 | 60% | -60% |
| Brunei Darussalam | | 1 | | | |
| Burkina Faso | | 4 | | | |
| Cameroon | 1 | | 1 | -100% | 0% |
| Canada | 12788 | 17368 | 14608 | 36% | 14% |
| Cayman Islands | | 3 | | | |
| China | 6 | 25 | 18 | 317% | 200% |

| | | | | | |
|---|---|---|---|---|---|
| Colombia | 7 | 9 | 5 | 29% | -29% |
| Congo | | 1 | | | |
| Congo, the Democratic Republic of the | | 1 | 2 | | |
| Costa Rica | | 3 | 1 | | |
| Côte d'Ivoire | | 2 | 2 | | |
| Czech Republic | 1 | 3 | 5 | 200% | 400% |
| Denmark | | | 1 | | |
| Dominica | | | 1 | | |
| Dominican Republic | 1 | 2 | 1 | 100% | 0% |
| Ecuador | | 1 | 1 | | |
| Egypt | 6 | 7 | 5 | 17% | -17% |
| Ethiopia | 2 | 7 | | 250% | -100% |
| Finland | 7 | | 1 | -100% | -86% |
| France | 7 | 10 | 5 | 43% | -29% |
| Germany | 5 | 11 | 3 | 120% | -40% |
| Ghana | 1 | 17 | 4 | 1600% | 300% |
| Gibraltar | | 1 | | | |
| Greece | | 1 | 1 | | |
| Haiti | 2 | | 1 | -100% | -50% |
| Hong Kong | 1 | 36 | 13 | 3500% | 1200% |
| Hungary | 1 | 1 | 1 | 0% | 0% |
| Iceland | | 1 | | | |
| India | 22 | 156 | 53 | 609% | 141% |
| Indonesia | | 20 | 6 | | |
| Iran, Islamic Republic of | 3 | 12 | 23 | 300% | 667% |
| Iraq | | 1 | 1 | | |
| Ireland | 1 | 4 | 2 | 300% | 100% |
| Israel | 1 | 5 | 2 | 400% | 100% |
| Italy | 4 | 6 | 6 | 50% | 50% |
| Jamaica | 2 | 8 | 11 | 300% | 450% |
| Japan | 1 | 10 | 4 | 900% | 300% |
| Jordan | 1 | | | -100% | -100% |
| Kazakhstan | 1 | | | -100% | -100% |
| Kenya | 3 | 12 | 4 | 300% | 33% |
| Korea, Republic of | 1 | 11 | 8 | 1000% | 700% |
| Kuwait | 1 | 6 | 2 | 500% | 100% |
| Lao People's Democratic Republic | | 1 | | | |
| Lebanon | 1 | 6 | 1 | 500% | 0% |

| | | | | | |
|---|---|---|---|---|---|
| Lithuania | | 1 | | | |
| Macao | | 2 | | | |
| Malaysia | 1 | 10 | | 900% | -100% |
| Mali | | 1 | 3 | | |
| Mauritius | | 3 | | | |
| Mexico | 5 | 11 | 9 | 120% | 80% |
| Mongolia | | | 1 | | |
| Morocco | 2 | 5 | 1 | 150% | -50% |
| Myanmar | 2 | | | -100% | -100% |
| Nepal | | 2 | 1 | | |
| Netherlands | 5 | 3 | 7 | -40% | 40% |
| Nigeria | 8 | 30 | 9 | 275% | 13% |
| Norway | | 1 | | | |
| Oman | | 2 | | | |
| Pakistan | 7 | 23 | 5 | 229% | -29% |
| Palestinian Territory, Occupied | | | 2 | | |
| Paraguay | | 1 | | | |
| Peru | | 5 | 1 | | |
| Philippines | 1 | 2 | 12 | 100% | 1100% |
| Poland | | | 2 | | |
| Portugal | 4 | 1 | 3 | -75% | -25% |
| Puerto Rico | | | 1 | | |
| Qatar | 1 | 13 | 4 | 1200% | 300% |
| Romania | | | 1 | | |
| Russian Federation | | 4 | 13 | | |
| Saint Lucia | | 1 | | | |
| Saint Vincent and the Grenadines | 1 | | | -100% | -100% |
| Saudi Arabia | 3 | 24 | 17 | 700% | 467% |
| Senegal | | 2 | 1 | | |
| Singapore | | 9 | 4 | | |
| Somalia | 1 | | | -100% | -100% |
| South Africa | 3 | 3 | 2 | 0% | -33% |
| Spain | 3 | 6 | 2 | 100% | -33% |
| Sri Lanka | | 1 | 10 | | |
| Sudan | 1 | | | -100% | -100% |
| Sweden | | 2 | 4 | | |
| Switzerland | 2 | 3 | | 50% | -100% |

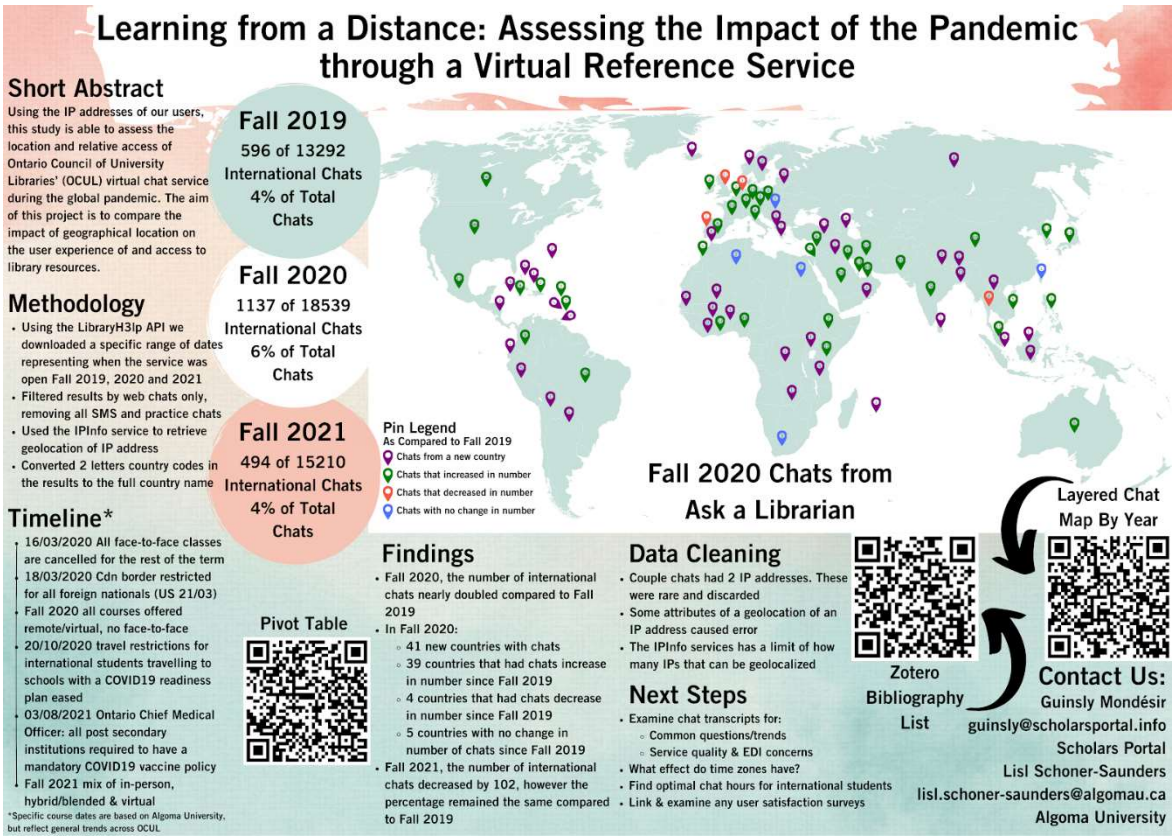
| | | | | | |
|---|---|---|---|---|---|
| Taiwan, Province of China | 1 | 1 | 1 | 0% | 0% |
| Tanzania, United Republic of | | 3 | 3 | | |
| Thailand | 3 | 2 | | -33% | -100% |
| Trinidad and Tobago | | 5 | 4 | | |
| Tunisia | | | 1 | | |
| Turkey | | 21 | 6 | | |
| Turks and Caicos Islands | | 1 | | | |
| Uganda | | 1 | 1 | | |
| United Arab Emirates | 4 | 43 | 6 | 975% | 50% |
| United Kingdom | 33 | 31 | 19 | -6% | -42% |
| United States | 287 | 384 | 220 | 34% | -23% |
| Viet Nam | 2 | 5 | | 150% | -100% |
| Zambia | | 1 | | | |
| Zimbabwe | 2 | | | -100% | -100% |
| #N/A | 47 | 35 | 29 | -26% | 1394% |

N/A represents ip adresses where either IPInfo couldn't get a geolocation or that the metadata from the chat didn't register the IP address field

## Appendix B: Mapped Data Fall 2020 - 2019 Comparison


https://doi.org/10.5281/zenodo.7641945

## Appendix C: Poster Image




https://doi.org/10.5281/zenodo.7641945