# *Mapping Our World: Geographic Information Sciences to Engage Students and Communities*

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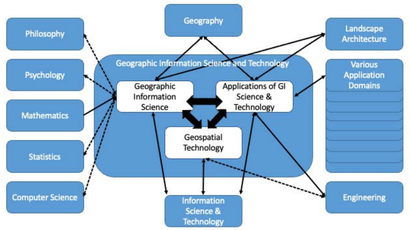
## Why GIS&T?

Geographic Information Sciences and Technology –GIS&T-, is the allows users to visualize and analyze spatial relationships. These technologies have experienced an important change in the last decade to a more user-friendly set of tools that has brought the attention of users outside geography. Technological advances have increased the options to use GIS and other mapping technologies in the classroom. There are certain advantages and benefits to including these technologies in the classroom. First, they allow students to visualize and interact with the data they are analyzing in class. These two actions have a strong relationship with their engagement in their process of learning (Egiebor & Foster, 2019).




GIS&T sub-domains in relation to allied fields. (DiBiase et al., 2006)

## Critical Spatial Thinking

Despite the increase in volume and access to spatial data in the last decades, the potential of applying GIS&T is still in development due to a reduced level of spatial literacy (Bearman et al., 2016). A theoretical understanding of spatial problems can close this gap.

The ability to visualize and interpret location, movement in space and time, or spatial thinking is inherent to all humans. However, the ability to understand spatial relationship and how to analyze them to take informed decisions is the result of a critical spatial thinking

The use of GIS for service-learning and place-learning projects allows students to develop their critical spatial thinking.

Geographic Information Sciences and Technologies –GIS&T- have been effective in achieving the objectives of citizen science and community outreach projects.

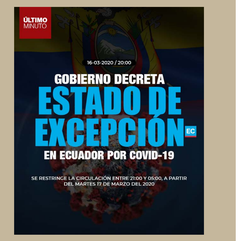
Mobile and online mapping tools enabled a smooth transition to remote classrooms during the pandemic, showing the versatility of these applications.

## Case study: Mapping for emergency response during the pandemic in Quito, Ecuador

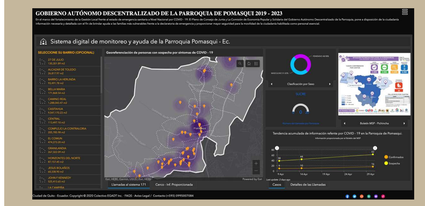
As part of their training, students of the geography program at Pontificia Universidad Católica del Ecuador in Quito, need to complete 160 credit hours of service learning. The project started as a citizen science and mapping activity to identify walking accessibility inequalities in Pomasqui, a rural township 10 miles from the Ecuadorian capital city. On March 25th of 2020, the Ecuadorian Government declared a national lockdown amid the coronavirus pandemic. As in many other countries, all courses went online, and teachers and professors had to re-design learning activities to be remote. In this complex scenario, students were not able to leave their homes to do fieldwork for their service learning. As a result, a different approach to the service-learning project was designed.

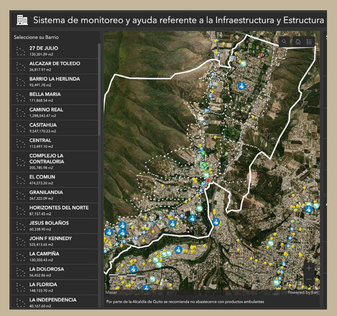
Students collect spatial data using mobile technologies and paper maps on public spaces on February 2020.

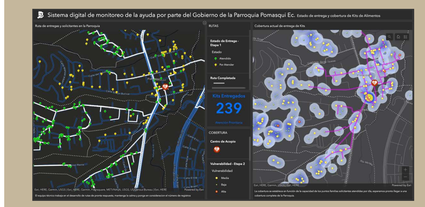
Students witnessing and assessing pedestrian accessibility.




On March 16, 2020, the Ecuadorian government decreed a curfew throughout the country.




Screenshots of three map dashboards designed by the students. In the upper left corner, the dashboard shows information on the number of COVID-19 cases in the city along with the location of calls received by the local government health call center.
The dashboard on the lower left corner shows the location of population in need of food aid classified by their vulnerability. The colors of the points on the map on the left show which families or individuals received food aid. The white lines show an optimized delivery route.
The map on the right shows an updated inventory of services and points of interest and its location.

## On-line turn: remote Community Geography

The Pomasqui local government was contacted and asked about their actions and needs to respond to the emergency during the pandemic outbreak. One of the goals of the local government was to assist vulnerable population with access to healthy food during the period of lockdown. Using online mapping tools, the students designed a mobile accessible form to identify population with lack of access to food. The form included demographic questions along with the reasons for the food inaccessibility and the location of the households or individuals. The survey results were mapped and analyzed before they were presented to the local authorities. They used the maps and information to prioritize food kits deliveries and for the design of optimal routes each time.

The students were self-organized in teams in charge of designing and testing the survey form, answering calls and helping people fill the survey form, data cleaning and analysis, web map and dashboard design. Each team was leaded by one or two senior students and composed by four to ten sophomore and junior students. All activities were supervised by a professor and consulted with local government employees.

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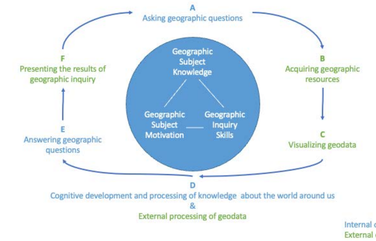
## GIS&T for Teaching and Research

Learning GIS as a technical skill has become fundamental for certain careers in the last decades and the demand continues to grow. GIS can also be used as a tool to develop students' critical spatial thinking skills (Bearman et al., 2016; Jo et al., 2016; Steiner et al., 2014). As Aladag (2014) suggests, the use of GIS as a teaching tool increased content retention, provided hands-on learning, and encouraged critical thinking.




The process adopted when answering geographic questions. (Favier, 2011)

The use of GIS in the classroom empowers students to take ownership of their own learning process (Egiebor & Foster, 2019). Further, when the course objectives are shifted towards "real-world" or Place-Based Learning, the benefits of using GIS are even greater as it adds interactivity to activities related to citizen science and active citizenship (de Miguel González & de Lázaro Torres, 2020; Langran & Dewitt, 2020; Puertas-Aguilar et al., 2021).

**Want to know more about how to use GIS in your classes?**

- Visit our GIS and Mapping guide at https://guides.temple.edu/gis-mapping
- Schedule an appointment with the GIS specialist https://library.temple.edu/people/felipe-valdez

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