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INTRODUCTION

Students interested in geosciences, for the most part, missed out their traditional field- based research activities due to strict social distancing, travel restrictions and/or lacking financial support.

An absence of physical laboratory opportunities forced underserved students (Image 1) to choose topics deemed doable through online research and python-based programming language. Available data from online sources on extreme weather-related case studies, temperature fluctuations, flooding, droughts, groundwater depletion in urban and suburban areas, coastal erosion rate, sea level rise, landslides, earthquakes, volcanic eruptions, and atmospheric pollution became quite handy and lucrative. Readily available pertinent data sources enabled K9-16 students to conduct summer research at “stay home” situations (Image 2 through 10).

PEER MENTORING

Selective peer mentoring was also available remotely to representative students, mostly led by geology faculty. It certainly facilitated both individual and group-based learning of geoscience- related research. Group projects were very effective in promoting team dynamics by encouraging participating students to engage in discussions during breakout sessions. This aspect is very significant for students, considering geoscience-related research often requires close collaboration between multiple individuals (Image 11 through 13).

DATA RETREIVAL

The retrieval of online data mostly became available to students from regularly posted information by the NASA Earth Observatory, National Oceanic and Atmospheric Administration, American Meteorological Society, European Space Agency, United States Geological Survey, and Environmental Protection Agency. Filtering of critical data and establishing their relevance to a chosen topic often required patience and proper time management.

Image 1: K9-16 students' ethnicity

Image 2: Temperature anomaly in Celsius from 1961 to 1990

Image 3: K9-16 students attending Zoom meetings

Image 4: Python-based lessons on Loops and List.

Image 5: Learning Arduino-based digital circuits.

Image 6: Building an Arduino remote control car.

Image 7: A lesson on factorial using python.

Image 8: Lesson on Algorithm.

Image 9: Using programming language to solve physics problem.

Image 10: Using an Array to implement a Stack in Python.

Image 11: Map of Caumsett State Park showing Lloyd Harbor and locations of Cretaceous and Pleistocene glacial outcrops, Long Island, NY. Students analyzed geochemical data to differentiate exposed Cretaceous rocks and Pleistocene glacial sediments. Raritan clay is unconformably overlain by upper Pleistocene glacial deposits.

Image 12: Exposed Raritan clay of Cretaceous age (kaolinitic) with recently formed mudcracks on the exposed surface.

Image 13: Lloyd sandstone (Cretaceous) showing hoodoo like structure at the top (white unit) due to differential weathering of the host rock.

DATA ANALYSIS

Once the data were selected, students needed to run basic statistical investigations and produce graphical representations, document trends, and signify their bearing on the overarching research question.

SUMMARY

The outcome is that COVID 19 opened up a new dimension and pedagogical approach to engage K9-16 students in geoscience-related and python-based research investigation.

Engaged students became proficient in data collection techniques, acquired scientific communication skills, and learnt about time management.

Overall, the K9-16 students involved became self-motivated and were highly successful in reaching their research goals.

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ABSTRACT

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