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GLOBE Investigation 2023 – 2024

Title – Investigating climate's effect on soil temperature and moisture

Organisation: Gozo College, Ġuże Aquilina, Sannat Primary and Special Unit, Gozo

Students: Year 3.1

Grade Level: 3rd Grade (Lower Primary, 5-8 years old)

GLOBE Teachers: Mr. Joseph Debrincat & Ms. Karen Attard

Report Type: International Virtual Science Symposium Report

Protocols: Pedosphere

Presentation Type: Poster

Optional Badges: I am a Data Scientist, I make an Impact, I am a STEM storyteller

Summary

GLOBE students at Gozo College in Sannat, Malta, carried out an investigation as part of the GLOBE Malta Soil Project to learn about soil's role in ecosystems and agriculture. They collected data on soil temperature, air temperature, and soil moisture content over several weeks. Through their observations, they found that high air temperatures led to increased soil temperature, which in turn reduced soil moisture. They also noticed that when air temperatures were lower, soil moisture content increased. The students concluded that climate change is impacting soil, particularly due to unpredictable and unreliable rainfall, causing soil to become dry and compact. The students did not stop there, they wanted to make an impact and be part of the change by proposing to grow their own crops at school, promoting the consumption of local seasonal food to reduce their carbon footprint and mitigate the effects of climate change on the soil.

Research Questions

- Is climate change affecting the soil temperature?
- What affect is the lack of rainfall having on soil moisture content?

Research Methods

Gozo College, Ġuże Aquilina, Sannat Primary and Special Unit, is located in Sannat, a small settlement in the island of Gozo (Fig. 1). The School wanted to investigate more about soil and decided to participate in the GLOBE Malta Soil Project, Exploring the Hidden World, which ran between November 2023 and January 2024. The GLOBE team, consisting of a Year 3 class, met several times with the GLOBE teachers to plan this investigation (Fig. 2).

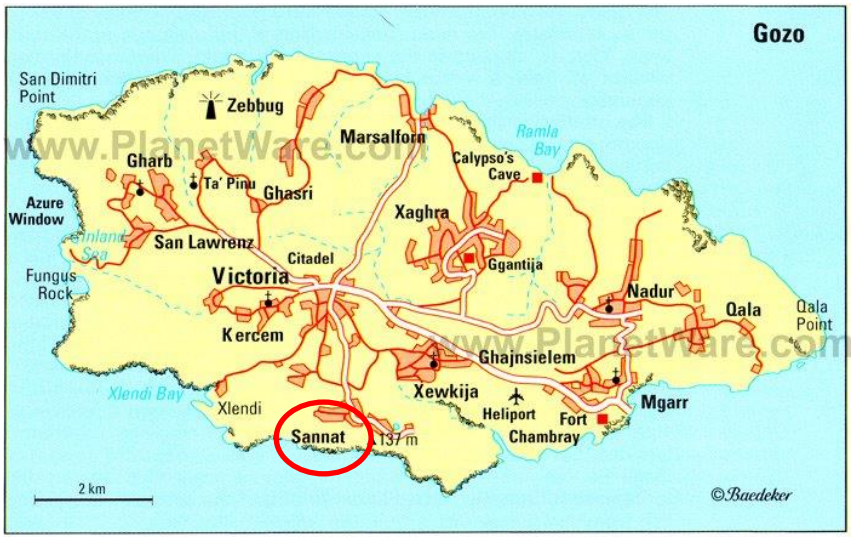

Figure 1 Map of Gozo with our School Locality marked in red

Figure 2 Meeting with GLOBE team

The main aim of this investigation was to learn about the significance of soil in sustaining ecosystems and supporting agriculture. Through hands on activities the students on a daily basis collected soil surface temperature using an infrared thermometer (Fig. 3) and measured weather parameters, including air temperature, air pressure, humidity and cloud cover using a data logger (Fig. 4). Moreover, the students collected a soil sample (Fig. 5) which they weighed (Fig. 6) and then left exposed to dry and measured again the following week (Fig. 7). This procedure was done once a week. All data was recorded and reported on a data sheet (Fig. 8) and later uploaded to the GLOBE database (Fig. 9).

Figure 3 Student measuring soil surface temperature using an IRT

Figure 4 Students measuring weather parameters using a data logger

Figure 5 Student collecting soil sample

Figure 6 Students weighing soil sample

Figure 7 Student weighing soil sample after a week

Figure 8 Students recording data on the date sheet

Figure 9 Students uploading data to the GLOBE database

Results

The screenshots below show data uploaded on GLOBE website during the observation period between November 2023 and January 2024 (Figs. 10, 11 and 12). The students collected daily readings of air temperature and soil surface temperature. Whereas soil moisture was sampled once a week. All data was collected following the GLOBE Protocols guide.

Soil Temperature

Figure 10 Soil Temperatue plot of VIZ GLOBE

Soil Moisture

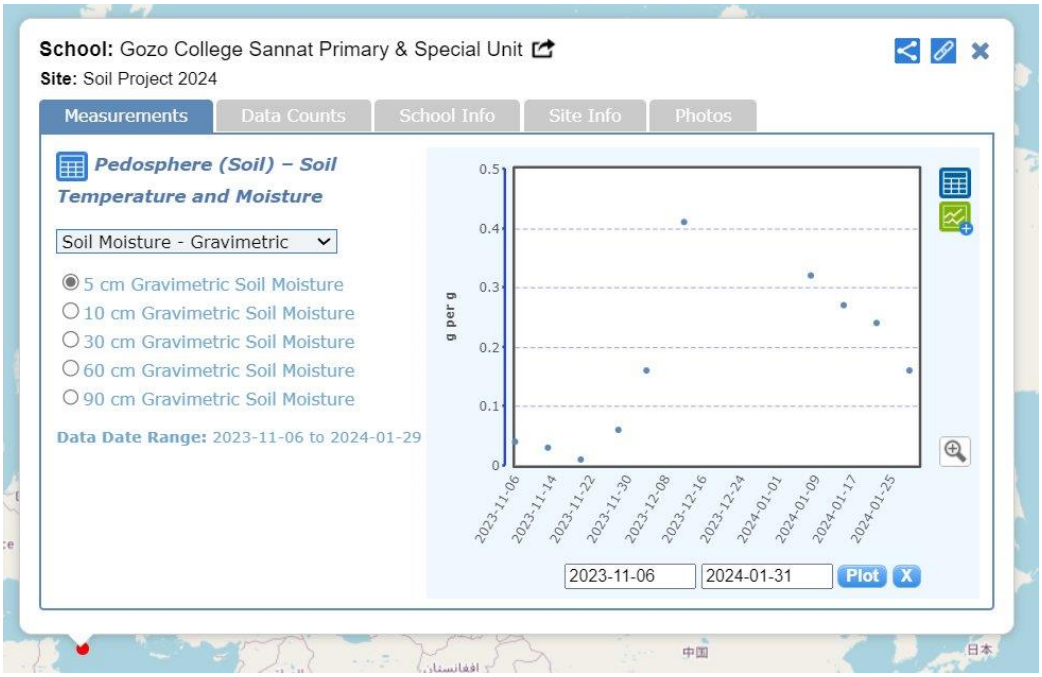

Figure 11 Soil Moisture plot of VIZ GLOBE

Air Temperature

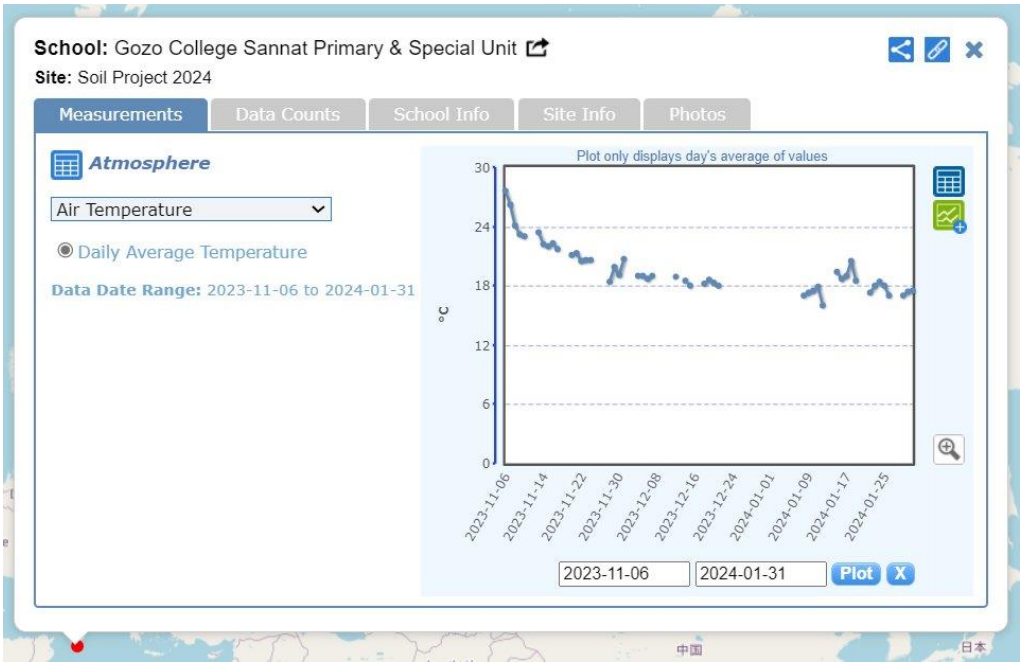

Figure 12 Air Temperature plot of VIZ GLOBE

Conclusion

From this investigation, the students were able to answer their research questions. When analysing the graphs, the students noticed that there is a relationship between air temperature, soil temperature and soil moisture content. Thus, they came to the conclusion that when the air temperature is high, the soil temperature increases and in turn this reduces the moisture content of the soil. Infact on the 8th of December, we noticed an increase in the soil moisture content and this was recorded when the air temperature was low.

Even though our data is limited, we can still come to the conclusion that climate change is having an impact on soil. Like any other country, our islands are experiencing a change in climate. Unfortunately, rainfall in Malta is becoming unreliable and unpredicable which is causing our soil to become dry and compact.

This investigation helped students realise the importance climate has on soil as an ecosystem and how it sustains life on earth. In an effort to reduce our carbon footprint the students came up with the idea to grow their own crops at school. In this way the school is promoting the idea of eating local seasonal food (Fig. 15).

Badge description

I am a Data Scientist: Students analysed their own data from their own measurements (Fig. 13). They were able to interpret graphs. From the data analysis, the students answered their research questions.

Figure 13 Students collecting data and recording it on the Data Sheets

I am a STEM storyteller

The GLOBE students shared their findings with the whole School population during morning assemblies (Fig. 14). Moreover, they disseminated their findings with their family, friends and wider community through the school Facebook Page.

Figure 14 GLOBE students sharing their findings during morning assemblies and on the School FB page.

I make an Impact

The research helped students and the whole school community to recognise the importance of soil as a vital resource. Using activities from the GLOBE Elementary the students had the opportunity to engage with and explore the soil within their school. After learning about the impact of climate change they decided to use the school garden to start growing their own crops in an effort to promote the consumption of local seasonal products thus reducing their carbon foortprint. Photos below (Fig. 15) show students in action.

Figure 15 Students using the tractor and hand tools to prepare the soil before sowing potatoes.