

APPLIED LEARNING IN PRACTICE

Examples of Applied Learning as Practiced by the SUNY Schenectady's CSTEP+LSAMP Community Applying Scientific Research Projects to Better the Local Environment and Community Through Education

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Vale Park and Cemetery (VPaC) is a recreational site located at the core of Schenectady, NY. Vale Park and Cemetery host locals who enjoy the playgrounds and many other recreational activities such as fishing, hiking, swimming, picnicking, biking, birding, and walking around. The Union College, MiSci (Museum of Innovation and Science) and SUNY Schenectady County Community College utilize the cemetery and park for historical, research and academic purposes. The geographic location of the Vale Park is defined by DMS 42° 48' 26" N, 73° 55' 45" W and Geo URI 42.807222, -73.929167. The Vale Park is a 100 Acres (40 ha) land, with (two trails, including the main Greenway trail), two ponds (Tranquility and Schenectada) that are connected by the Cowhorn creek that flows throughout the park. Each pond has two drainage pipes from the Schenectady County floodwater runoff. Four drainage pipes flow into Cowhorn Creek. The ponds drain into underground systems that enter the Mohawk River near the SUNY Schenectady Science building.

Vale Park as an experimental learning opportunity has been the niche for the SUNY Schenectady's CSTEP program (faculty and students) to hold a series of umbrella research projects. Applying the scientific method, the team began surveying the wetlands and woods for vertebrate organisms. Input of different students' curiosities diverged into a series of studies, such as, the topographical analysis, development of a field guide, which includes fungi, flora and fauna, and a micro plastic study. Inquiry into a lack of salamanders inspired the finding of an invasive species *Amyntas agrestis* (aka the crazy worm). The presence of the *Amyntas* worm introduced other plausible inquiries concerning the effects on herpetological populations, soil and water ecology within the VPaC boundaries.

Decomposers such as *Lumbricus terrestris* (earthworm) are important to soil and water ecosystems because they bring humus to the deeper layers of soil where roots retrieve these

nutrients along with water, completing the nutrient cycle (Ziemba et al, 2015). The effect of leaving the decomposed organic matter on the soil surface in large, granulated mounds and the removal of the fallen leaves causes loss of amphibian's habitats and erodible soil. One of the two complementary studies address the effects on populations of amphibians and their predators. Due to snow melt, flooding and increased water movement, soil nutrients are washed into streams and ponds where the nutrients remain as part of the sediments; and dissolved in water. For the life of that water shed the nutrients remain deposited in the sediments, or until microorganisms are able to process them, which allow nutrient to reenter the cycle.



SUNY SCCC Vale Park LSAMP research team

Water samples were taken from Cowhorn Creek and the ponds to understand the chemistry of the aquatic ecology in the park. Chemical tests were performed to determine hardness and pH, and to test for the presence of sulfides, iron, phosphates, nitrates and chlorine. The pH and levels of various ions were high due to multiple sources of pollutants contributing to the water composition, creating a toxic environment supporting the life of opportunistic pathogens.

The study of microbes found in different VPaC water sources allowed for the identification of a group of opportunistic pathogens from the VPaC (NCBI published). This process

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SUNY SCCC LSAMP community outreach and mentoring opportunity. CSTEP college students running lab for Rise High Inc. students

began the SUNY Schenectady Organisms Universal Library (SOUL), which aims to serve and grow as a repository. The organisms kept in SOUL will form an accessible record of the population structure of the aquatic community over time. To identify the genus of these microorganisms, students learned best practices through sampling water from five water sources in VPAC, used multiple techniques to determine if microbes were gram positive or gram negative, among ten other different tests performed. In addition, SUNY Schenectady LSAMP students learned and practiced molecular biology techniques to isolate, amplify and sequence the microbial DNA. The obtained sequences were submitted in the National Center of Bioinformatics (NCBI) repository and species identification was completed for at least 70% of the samples isolated.

REFERENCES:

Ziemba, Julie, L; Cameron, Alex C., Peterson, Kim., Hickerson, Carri-Ann, M., Anthony, Carl, D., (2015). Invasive Asian earthworms of the genus *Amyntas* alter microhabitat use by terrestrial salamanders. Department of Biology, John Carrol University, Canadian Journal of Zoology, Iss 93: pg. 805-811.

Gülşen Altuğ*, Mine Çardak, Pelin Saliha Çiftçi Türetken, Samet Kalkan, Sevan Gürün (2020) Antibiotic and Heavy Metal Resistant Bacteria Isolated from Aegean Sea Water and Sediment in Güllük Bay, Turkey Johnson Matthey Technol. Rev., 64, (4), 507doi:/10.1595/205651320x15953337767424

Among the microbes identified, i.e: *Brevundimonas diminuta*, *Citrobacter freundii*, *Klebsiella oxytoca*, *Stenotrophomonas maltophilia* are gram negative and antibacterial resistant; and *Bacillus pumilus* is gram positive, also reported in the Aegean Sea and perhaps linked to the pollutants and heavy metals in the environment (Altug, et al 2020). Exposure to these microbes can cause infections that are difficult to treat. Therefore, Zorqane and Rivera presented this information to the Vale Park Task Force, which proposed signage to restrict fishing and swimming in these waters.

The SUNY SCCC CSTEP community hopes to use research geared scientific projects to build a better environment for the local community by creating awareness of VPAC and its ecosystem by being a part of it, learning from it, and making efforts to preserve it. CSTEP and LSAMP Students presented their research in different conferences both national to international events in a poster and oral presentations formats. Presentation of the findings have been made from state conferences and to the Vale Park Task Force. SUNY Schenectady students engaged in educational outreach through volunteering at MiSci Science Festivals, supporting educational tours, supporting educators in the Schenectady and NY State. In addition, Dr. Harris and Dr. Simons presented their findings to New York State educators in the STEM field. This model has been used as a case study to introduce the scientific method and STEAM methodology to the after-school professionals and educators that lead programs to empower the community and educate their youngsters through learning about their close-to-home parks and environment.