Prospect Park-as-Lab: Place- and Inquiry-Based Learning in an Urban High School

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Abstract

The National Science Foundation Teaching Fellows in K-12 Education (GK-12) program, sponsored by Brooklyn College, promotes relationships between scientists in graduate education and inner city public schools. Working with underrepresented minority students in Brooklyn improves the Fellows' teaching and communications skills while enriching the Earth Science Regents Curriculum for the students of S.T.A.R (Science Technology and Research) Early College High School. The Prospect Park-as-a-Lab project was designed to introduce students to authentic, research-based experiences in which they collect data and perform geospatial analysis using GPS and GIS. The study, conducted over the course of one academic year, focuses on the effects of climate on trees, soils, and water systems of Brooklyn's largest public park. This project also aims to provide a sustainable public project that can be used in the future in Prospect Park, in other parks around the country, and globally.

STAR students, teachers, and GK-12 Fellows on first field trip to Prospect Park.

Place- and Inquiry-based learning

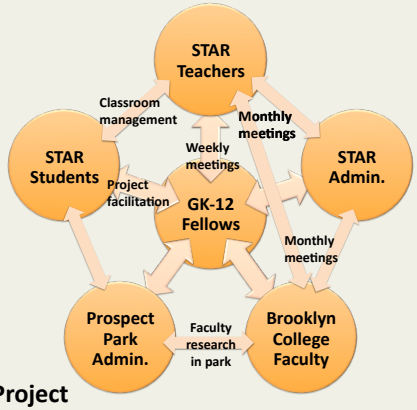
To deepen students' motivation, peak their interest, and promote student empowerment and ownership of the project, the Prospect Park-as-Lab project relies on the education philosophy of Confucius: "Tell me and I will forget; show me and I may remember; involve me and I will understand." From this premise the Fellows involve the students of S.T.A.R academy in Place-Based Learning (PBL) and Inquiry-Based Learning (IBL) throughout the project. As students learn about the connections between the community, the environment, and their personal lives, they become engaged and active learners (Gruenewald 2003, 2005).

Recent research has demonstrated that both PBL and IBL foster increased engagement, mastery goal orientation, and improved understanding among disadvantaged students (Hmelo-Silver et al. 2007). Working with a 99% minority student population in Brooklyn, NY, the Fellows are committed to incorporating several field studies in Prospect Park to process, analyze, and collect data on site and in the lab. Fellows scaffold inquiry-based, hands-on-activities to guide students through the project during their designated Earth Science Regents' lab periods. These experiences are instrumental in creating a cognitive apprenticeship between the students and the Fellows, whereby the students improve their scientific capabilities as problem solvers through structure and guidance from the Fellows.

Collaboration

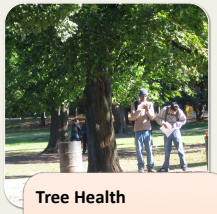
Essential to the success of the Prospect Park-as-Lab project, and the GK-12 Teaching Fellowship program at large, is extensive communication and collaboration between a number of entities.

At the center of these collaborations are the GK-12 Fellows, who interact directly and frequently with each of the other groups.



The Prospect Park-as-Lab Project

Prospect Park serves as an nearby, accessible laboratory for hands-on investigation of natural processes in the urban environment of Flatbush, Brooklyn. Furthermore, research in the park reinforces S.T.A.R.'s vision to foster a new generation of scientists by invigorating the New York Earth Science curriculum, making ES topics more interesting and relevant to students' lives. Three year-long studies on trees, soil, and water elaborate upon the basics of research and the scientific method. By combining field research and data collection with laboratory analyses, the Prospect Park-as-Lab project allows students to both ask and answer questions about their local environment, and extrapolate these findings onto a larger scale.

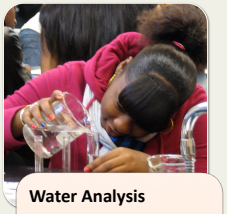


Tree Health

- Assessing the health of individual trees over the course of the academic year allows students to track changes over both time and space.
- For many students, this is their first exposure to research-based scientific inquiry.

Soil Analysis

- Students analyze soil samples taken from various locales around Prospect Park in terms of physical characteristics, pH, and nutrient content.
- By considering the different physical and chemical properties of soils, students better understand how soils effect the biotic communities around them, and vice versa.



Water Analysis

- Water samples taken from Prospect Park Lake are analyzed for pH and nutrient content, paralleling the measurements taken for nearby soils.
- Adding upon similar data from previous years, students can identify trends in the lake over time, and how this relates to both soils and trees.

Students also learn how to use GPS collection devices in the field, and how measures of latitude and longitude relate to maps and real-world locations. GIS software programs such as Google Earth and My World are also used to input meaningful data collected by students during both field research and laboratory analyses. By using such GIS programs, students are able to generate spatial data and interpret trends across space such as it relates to their immediate environment.

Discussion

- Through the collaboration of Fellows, students, teachers, STAR administration, Brooklyn College faculty, and Prospect Park administration, students have welcomed an enriched curriculum that is focused on improving the connection between community, content, and self.
- Fellows have improved their communication skills as they learn how to communicate complicated scientific processes to a wide range of audiences.
- There is an established framework with the community to expand relationships and learning opportunities outside of the classroom.
- Students are exposed to unique opportunity to take part in year long independent research opportunities with Brooklyn College faculty.
- Fellows have gained invaluable teaching experience with adolescent students.

Prospect Park: sampling locations

Far left: Brooklyn
Left: Prospect Park
Below: Locations of soil samples taken by STAR Earth Science students.

References

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