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A Call to Action

Engage, Educate, and Empower Politically Disenfranchised Communities to Advocate for Environmental Justice

Policies designed to protect communities from environmental degradation are not consistent across the United States, particularly among low-income, underrepresented minority communities. Environmental degradation, i.e. air and water pollution, in these communities is often higher and more pervasive in comparison to affluent communities.

Additionally, underrepresented and minority groups (Asian, Hispanic, African-American), makeup only 16% of staff in U.S. environmental organizations and agencies (Taylor, 2014). Therefore, it is crucial for low-income communities to be introduced to and engaged in environmental science and policy to empower community members and create environmental change.

Here, we discuss engagement by participation in citizen science programs, education achieved through a Science, Technology, Engineering, and Math (STEM) training program, and empowerment through the Congressional Hispanic Caucus Institute Fellows program. We intersperse the discussion of these programs in relation to environmental justice with the experiences of participating undergraduate and graduate students.

ENGAGE: Citizen Science *Citizen Science in Action in Urban Environments*

The innovation of Citizen Science projects involves ordinary people in scientific discovery. These projects are of particular importance to disenfranchised communities because they engage members and identify environmental issues within the community.

Earthwatch is a worldwide, non-profit environmental organization focused on connecting everyday people with the world's top scientists to conduct vital field research.

This organization has been collaborating with California State University, Los Angeles for the past two years in collecting data on tree species across the city to identify those that provide the greatest amount of benefits (e.g. shade) with the least amount of resources (e.g. water).

In 2016, twenty students from the upper division "Fundamental Writing for Biologists" class participated in a tree sampling event—recording tree GPS locations and measuring canopy sizes, diameters, and ground permeability—in Ascot Hills Park, East Los Angeles (Fig. 1).



Figure 1. Students from California State University, Los Angeles sampling an endemic species of tree, Engelmann Oak (*Quercus engelmannii*), in Ascot Hills Park, Los Angeles, California in Summer 2016.

The activity immediately transformed into a scientific scavenger hunt for the students. Groups would approach each tree and after a short pause to assess and compare the tree's morphological features to those described in the tree guides, the reaction was either sadness, followed by footsteps, or rejoice having found the target species.

The summer heat wave did not dampen the student's enthusiasm. They added 36 new trees and increased the regional goal to 40%. As Citizen Scientists, the students gained an appreciation for the ecological role and health ben-

efits of trees to their everyday life in an urban environment. In addition, each student made a direct scientific contribution, improving tree planting and planning for Los Angeles communities.

This is a prime example of the impact of Citizen Science in underrepresented communities through education, research, and active participation with minimal training. Long-term investments into Citizen Science projects in politically disenfranchised communities could generate additional unforeseen benefits and environmental improvement.

Citizen Science as a Mitigation Tool for Politically Disenfranchised Communities

The involvement of the participant in Citizen Science can range from voluntary data collection (as above) to a **co-creative equal partnership** (Shirk *et al.* 2012). In the latter approach, a community's issues or needs drive the development of the research with an equal partnership between scientists and participants in all stages of the project.

This co-creative equal partnership Citizen Science model is ideal for underrepresented communities as the members designate the questions of importance in relation to environmental concerns. The findings of these studies then empower the community to make informed decisions to mitigate the issue and influence policies.

To execute these projects, collaboration across a wide array of participants is necessary, including university and college students, local community groups, non-profit organizations, and the private sector to host community conferences, education and training workshops, sampling events, and disseminate research findings. The implementation of co-creative Citizen Science projects in marginalized communities provides an integrative program of training, research and outreach.

Although examples of Citizen Science as a method to engage, educate, and empower are very few (e.g. grassroots groups monitoring environmental impacts of the oil and gas business development in the Northeast U.S.; Jalbert, 2016), they represent a type of initiative that can give a voice to politically disenfranchised communities.

The Flint Water Study is an example of this type of Citizen Science initiative and a result of concerned community members in the quality of the tap water in Flint, Michigan. Residents noticed color, odor, and taste differences, as well as a rise in health problems in children, after the state switched from Lake Huron

to the Flint River as the main water source. The Michigan Department of Environmental Quality failed to treat the corrosive water after the switch, which began dissolving the city's iron and lead pipes, causing lead to leach into the drinking water.

Despite the alarm raised by residents of Flint, a population composed of 56.6% African-American and 41.2% of residents living below the poverty line (U.S. Census Bureau, 2016), they were ignored by the city. A team of researchers at Virginia Tech University united with community members to collect and process samples. The results found lead levels were 2.5 times higher than hazardous waste threshold designated by the Environmental Protection Agency.

A state of emergency was declared in Flint, which helped initiate some of the changes residents has been demanding from their local and state government. The water source was changed, the process of replacing the lead pipes was started, emergency federal funding and assistance was requested, and criminal cases were filed against local and state officials. Despite the long-term ramifications of city officials' negligence in exposing a community to lead, The Flint Water Study exemplifies the potential of Citizen Science in gaining access to new information, skills, and political strategies to create environmental change and emphasizes the importance for co-creative equal partnerships.

EDUCATE: Training Programs Advancing Minorities in the STEM Fields

Historically, science was once only accessible to the elite. However, the rise of the middle class and increased access to research institutions has made science more accessible to a broader American public, yet a gap still exists. Today, full-time professors in the STEM fields are made up of only 4% Black/African-American, 3% Hispanic, and 9% Asian/Pacific Islander (U.S. Department of Education NCES, 2016). Training programs provide the skills necessary for future employment and are necessary for the advancement of the STEM disciplines. In underrepresented



Figure 2. Instructor Adam Deras and NHEC students processing soil samples in Great Kills Park, Staten Island, New York, a part of the Staten Island unit of Gateway National Recreation Area in Summer 2015.

communities, these programs provide access and economic opportunities that provide long-term benefits to society. The National Hispanic Environmental Council (NHEC) is a pioneering organization with a record of accomplishment attracting, training, and advancing the next generation of minorities in STEM fields.

Since 1997, NHEC has filled a void and become a leading voice for minorities on environmental issues at the national level. The NHEC STEM Institutes, 7-10-day training course held every summer held since 2001 in New Mexico, New York, and California, has the goal of training top students from across the country on environmental issues, federal quantitative environmental assessment methods.

and environmental mitigation practices. The National Hispanic Environmental Council has secured funding for this STEM-focused initiative from federal agencies including the National Parks Services, U.S. Forest Service, Natural Resources Conservation Service, and the Environmental Protection Agency.

A unique aspect of the NHEC STEM Institutes is facilitating employment into these agencies through the Student Career Experience Program, Student Temporary Employment Programs, and Youth Conservation Core. In the last three years, 70% of the participants funded were female, reflecting changing societal dynamics, i.e., 57% of the workforce being women (U.S. Department of Labor, Women's Bureau, 2016). In contrast to

other programs, the NHEC instructors and role models reflect the population diversity and the students they serve. The success and impact of NHEC in federal, industry, and leadership positions across the nation is reflected in the current positions of past alumni, for example Jasmine Benitez is Assistant Director of Public Programs at Rocking the Boat Inc. in the Bronx, NY and Victor Medina is a Park Ranger for the National Park Service at Lowell National Historic Park in Massachusetts. NHEC has recently partnered with the 21st Century Conservation Service Corps (21CSC), a conglomerate of organizations aimed to increase civilian national service positions on public lands, to further advance the mission of NHEC in diversifying the STEM workforce.

Advancing Minorities in the STEM Fields

“This was the first site where we were going to put our knowledge from the classroom to the test”, recalls Daniel Dallate (second from the right in Fig. 2). “We arrived at the beach and our team was responsible for conducting soil testing under the guidance of our Instructor, Adam (Conservation Biologist from Los Angeles, CA).” “We took samples along a perpendicular transect to the beach and as we identified the soil types and processed samples, we told a couple jokes.” Adam spent his vacation from his position as the Wildlife Refuge Specialist at US Fish and Wildlife Service in Medicine Lake serving as a great mentor and dedicated instructor.

At the completion of the Institute, Daniel and four other participants became employed for the U.S. Forest Service for the remaining summer at the Chippewa National Forest in Walker, Minnesota under the mentorship of Sherry Fountain (District Ranger). In the fall, following his internship, Daniel became a freshman at Ohio Wesleyan University as an Environmental Science and International Studies major and part of the Track & Field Team. This summer he is working 3,600 feet above sea level at the Shasta-Trinity National Forest as a Student Trainee for the U.S. Forest Service, where he is learning about recreational use and management strategies of the forest. The long-term effects of NHEC on the



Figure 3. Congressional briefing on the reclamation of abandoned mines in Washington, D.C. (April 2016).

lives of young adults like Daniel are countless and highlight the need to support and expand these types of programs.

EMPOWER: Environmental Policy

The political needs of disenfranchised low-income minority communities often go unrepresented at the federal and state level in the United States. Unfortunately, opportunities that expose underrepresented youth to the legislative process and policy making in natural resource management and environmental science are minimal.

The Congressional Hispanic Caucus Institute (CHCI), Congressional Black Caucus Foundation (CBCF), and the Asian Pacific American Institute for Congressional Studies (APAICS), bridge this critical gap through policy training programs that focus on educating and empowering emerging leaders from politically disenfranchised communities to tackle issues that disproportionately impact ethnic and minority groups. These unique programs provide emerging leaders with the opportunity to learn the government protocol on policy development and implementation, as well as the opportunity to network with successful role models in public service, industry, and scholars. These programs recruit college students and recent college graduates to experience the development of legislation and public policy in Washington, D.C.

Uncovering the Development of Environmental Policy on Capitol Hill

As a past Congressional Hispanic Caucus Institute fellow, the co-author (G.S.; 2015-2016) worked in the Committee on Natural Resources in the U.S. House of Representatives to explore the topic of abandoned mines in the U.S. Southwest. This is a serious environmental issue that disproportionately impacts minority and disenfranchised communities.

In April 2016, a public policy briefing and roundtable discussion was held in the Cannon House Office Building on the reclamation of over 100,000 abandoned mines in federal lands among congressional staff, national public policy experts, and academics (Fig. 3). Subsequent research led to the publication of a white paper as a feature article in the Harvard Journal of Hispanic Policy (Sosa, 2017). The fellowship experience provides valuable knowledge on the legislative process, empowering individuals to advocate at the highest levels of government and provides a voice to promote environmental justice on behalf of disenfranchised communities.

A Call to Action

As demographics of the American population shift (54% will be from Black, Hispanic or Asian decent by 2065; Pew Research Center, 2015), the

continued development of innovative programs like those mentioned above are needed to engage, educate, and empower politically disenfranchised communities. Citizen Science programs can be successfully employed using the co-creative equal partnership approach to directly involve communities in scientific research to mitigate environmental degradation.

Implementing education and training models led by a diverse staff with subsequent employment into the STEM fields has proven fruitful and greatly improves the likelihood of minority leaders in non-profits, federal agencies, and the private sector. The NHEC model can be duplicated, improved, and expanded to generate a well-educated demographically representative community to spearhead conservation/environmental efforts and create a pipeline for a demographically balanced STEM workforce.

The next generation of advocates fighting for environmental justice in these at-risk communities should have the knowledge to navigate the policy development process. These efforts can be effectively supported in collaboration among community members, local and national organizations, non-profits, scientists, and government agencies to serve as a catalyst for change in creating a healthier environment for generations to come. □

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