# Development and implementation of a formalized academic program for community-engaged scholarship within neuroscience graduate education


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Netter Center for Community Partnerships, University of Pennsylvania

Neuroscience Graduate Group, University of Pennsylvania

## Introduction

Governmental and philanthropic agencies provide resources to scientists with the expectation that the knowledge we generate will benefit society in an equitable fashion. It is clear, however, that scientists are not adequately sharing their discoveries with the public, given the disparities in health care, technology access, and environmental conditions, particularly for marginalized groups. A partial explanation for scientists falling short in translating their expertise with the broader community is the lack of training and experience they have received in science communication as part of their doctoral education. Here, we describe the creation of a new program, Community-Engaged STEM, in the Neuroscience Graduate Program at the University of Pennsylvania (Penn). Penn's Neuroscience Graduate Program, the Neuroscience Graduate Group, is part of the Biomedical Graduate Studies Program in the Perelman School of Medicine. As a first step, we launched an academic course for graduate students entitled *Research & Community: Biomedical Science in the Urban Curriculum*. The course partnered with Paul Robeson High School, a nearby public high school that has inadequate resources to offer grade-appropriate lab activities, leaving students disadvantaged in their access to a STEM education. At the end of the semester, the graduate students reported feeling better equipped to communicate with the broad community and were more interested in incorporating community concerns into their future research programs. Building on this initiative, we have created a new Graduate Certificate in Community-Engaged STEM that was launched in August 2023. Completion of this certificate requires graduate students to engage in course work experiences, direct community partnerships, and an independent community-based scholarship project. The goal of the certificate is to allow trainees to individualize their community-engaged work to align their scientific research projects with relevant needs of the local community. We believe this certificate will both provide valuable professional skills for the graduate students and ensure that the local community benefits from our research resources and endeavors.

## Academically Based Community Service

Academically Based Community Service (ABCS) courses are a unique format of courses at Penn where students and faculty work with a local group, such as a public school, a faith-based organization, or a neighborhood organization, to help solve critical community problems. ABCS courses focus on a broad array of subjects - ranging from environment, health, arts, and education. Across all subjects, the key component of ABCS courses is to integrate service with research, teaching, and learning. In this way, ABCS courses can combine the academic expertise with the expertise of the community to create mutually beneficial, mutually transformative partnerships. In other words, the collaborative problem-solving not only improves the quality of life and learning in the community, but also adds to the impactful scholarship of the university.

ABCS courses are implemented by the Netter Center for Community Partnerships, which is the primary vehicle for advancing community engagement at Penn [1]. It serves as a nexus to bring together people and assets of both the university and the wider community to solve pressing problems such as poverty, health inequities, environmental sustainability, and inadequate, unequal education. These partnerships between Penn and Philadelphia communities advance research, teaching, learning, and service - improving the quality of life on campus and in the community.

In addition to implementing ABCS courses, a major component of the Netter Center's work is to help traditional public schools become and function as innovative University-Assisted Community Schools (UACS), in which Penn serves as the lead partner in providing broad, sustained support. UACS are comprehensive neighborhood centers that educate and serve students, their families, and other members of the community. Universities are particularly well-suited to be a lead partner in the creation, growth, and ongoing development of community schools, including providing academic, human, and material resources.

There are currently over 80 ABCS courses offered at Penn. *Research & Community: Biomedical Science in the Urban Curriculum*, described below, was the first ABCS course created specifically for doctoral students in the Biomedical Graduate Studies Program at Penn.

[1] http://www.nettercenter.upenn.edu/

## Research & Community: Biomedical Science in the Urban Curriculum

*Research & Community: Biomedical Science in the Urban Curriculum* is an activity-based course with three major goals. First, the course is an opportunity for Biomedical Graduate Studies doctoral students to develop their science communication skills and share their enthusiasm for neuroscience with high school students at a nearby public high school in West Philadelphia. The course partners with Paul Robeson High School, located a few blocks from Penn's campus. Graduate students create and conduct engaging, hands-on science activities with ninth-grade students to increase their knowledge in science and ultimately promote their interest in science-related careers. Second, the course considers the broader educational context, such as the conditions of the local high school and its overall progress in science education. Graduate students discuss the problems they encounter and learn how to develop effective, concise policy proposals to address real-world challenges in science education, taking into account the participants and the origins of current policies. Third, the course requires critical readings and small group discussions about the historical role of science in underrepresented communities, the connection between students' biomedical research at Penn and the local Philadelphia community, and opportunities to increase science-oriented engagement throughout their doctoral training. This course was first launched in the January 2023 and is taught in conjunction with the undergraduate ABCS course *Everyday Neuroscience* [2,3], which has partnered with Paul Robeson High School tenth grade students for 13 consecutive semesters.

[2] Flanagan-Cato, 2019, *J Undergrad Neurosci Educ.*; [3] Flanagan-Cato et al., 2023, *J Undergrad Neurosci Educ.*

## About Our Community Partners

Paul Robeson High School is a public high school in the School District of Philadelphia, located in West Philadelphia, a few blocks from the University of Pennsylvania campus. Below, Mr. Louis Lozzi and Mr. Richard Gordon describe Raul Robeson High School and our partnership. Louis Lozzi is the school-based teaching leader for math and science at Robeson. Richard Gordon was the principal of Robeson from 2013-2023, and recipient of the National Principal of the Year Award by the National Association of Secondary School Principals (NASSP) in 2021, by the National Alliance of Black School Educators in 2019, and by Education Dive Magazine (K-12) in 2017.

*"We are a small school, 300 students. We have students that come from all over the city; students are placed in Robeson by a lottery. There are no academic requirements."* - Lozzi

*"Our students are 100% minority, 95% African American, and 80 to 90% living in poverty, according to the district's data. The first thing I noted about Paul Robeson was the potential of the students. They are students who really want to learn and deserve equal opportunities to thrive and be successful. Our students have demonstrated a significant academic gap before they even walk in the door. A lot of our students are coming from very impoverished, challenging communities. It's very hard to get a student to understand the importance of the things being shared with them during the school day when they live in a home with the electricity off, or their mom lost her job again, or there's nothing in the refrigerator. We have to care about what our students are experiencing, particularly with poverty, if we really want to get them to improve academically and socially."* - Gordon

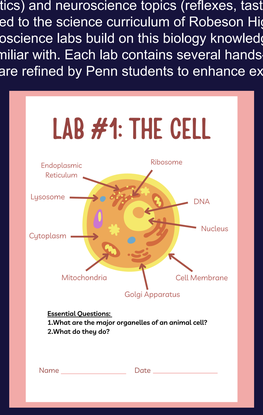
*"We have strong, objective data suggesting that the partnership has helped us address things that the state requires from us. I see the relationships that are forged between our students and the Penn students having an overall benefit, and I don't think it's easy to quantify something like that."* - Lozzi

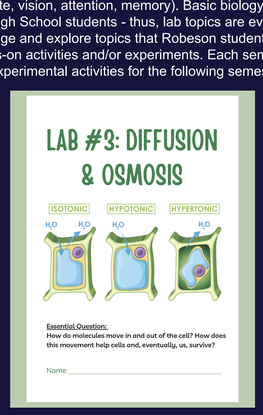
*"Our students are having a ball when it comes to being on campus and interacting with Penn mentors. Interactions with individuals that are different from you can give you another worldview, which is extremely important. High school is about social development. Kids come to school because they want to be social. The social development that comes with interacting with individuals whose backgrounds are different from yours, having those very candid conversations can lead to a better understanding, both socially and academically. The program can fill learning gaps, but also give our students learning experiences they generally would not have had. The academic then translates to workforce development. Penn students understand the importance of being able to offer life experiences to our students and offer them a different perspective on how life can be lived. The Penn students are cognizant of the challenges that the Robeson students face and the privileges that they have not been afforded. Our students feel so welcomed and part of this special community. Previously, they knew about Penn, but they've never had any experiences with it. Now they're walking over there on a weekly basis and hanging out in Penn dorms or classrooms and interacting with Penn students. These opportunities are validating."* - Gordon

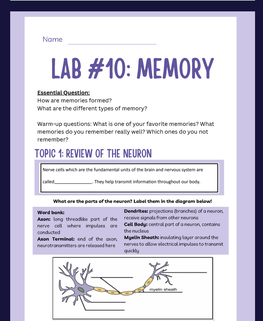
[4] Purvis et al., 2023, under review

## Lab Activities

Current lab activities cover basic biology topics (the cell, macromolecules, diffusion & osmosis, DNA, genetics) and neuroscience topics (reflexes, taste, vision, attention, memory). Basic biology labs are tailored to the science curriculum of Robeson High School students - thus, lab topics are evolving. Neuroscience labs build on this biology knowledge and explore topics that Robeson students may be unfamiliar with. Each lab contains several hands-on activities and/or experiments. Each semester, labs are refined by Penn students to enhance experimental activities for the following semester.






## Robeson & Penn Students in Action

Building cell organelles

Learning about DNA

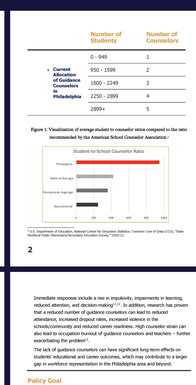
Modeling diffusion

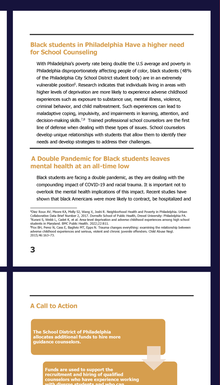
Exploring the pupillary light reflex

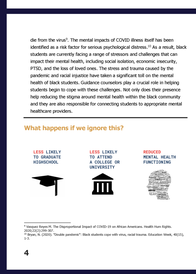
Playing a memory game

## Education Policy Proposals

Graduate students developed policy proposal focused on real-world challenges in the Philadelphia Public School District. Below is an example policy proposal created by one of our students.



## Graduate Student Reflections

The experience of *Research & Community: Biomedical Science in the Urban Curriculum* is best summarized by our graduate students themselves. Below are excerpts from their final reflections.

*"This course has truly re-shaped my understanding of community-engaged science. I used to think that occasional volunteering and outreach could be sufficient to foster relationships within my community… I am now very sure that I want to pursue a career that focuses on community outreach. As a female scientist from an underrepresented background, this course has inspired me to do more for my peers and the community around me."* - Student X

*"Through this experience, I was able to see the clear gap in resources between students at a private university such as Penn and high school students in the public system. This has made it clear to me that institutions such as Penn have a moral obligation to use every resource at their disposal, including students, to have a positive impact on the community… Thinking about my research in terms of how it can affect the community around me has also helped me think more deeply about the people I want to help, instead of keeping it all on a lab bench for five or more years."* - Student Y

*"After taking this class, I realized that incorporating community engagement into my research on ACL reconstruction could lead to better patient outcomes. With community needs and concerns in mind, researchers can develop more effective interventions and better support patients during their recovery. We need more people trained to solve real-world problems, and this class has helped me to better understand how I can make a positive impact."* - Student Z

## Graduate Certificate Program in Community-Engaged STEM

The Graduate Certificate in Community-Engaged STEM, launched at Penn in Fall 2023, is designed to complement a student's disciplinary training by adding the community perspective and practical skills needed to engage with members of the public on vital issues. Incorporating coursework, research, and community engagement, students gain both an enriched understanding of relevant topics, as well as significant experience in working with non-academic stakeholders. The training is meant for a broad spectrum of career paths, including medical and academic positions. The research, training, and real-life lessons gained from completing this Certificate provide experience in developing productive relationships between the university and community partners. This experience enhances pedagogical and communication skills as trainees work with community groups with different levels of STEM background. In addition, students deepen their understanding of how their scholarship connects with society.

### Certificate Requirements

Coursework

Two graduate-level ABCS courses (including *Research & Community: Biomedical Science in the Urban Curriculum*) and one asynchronous online course.

Research Seminar

Participation for at least one year in a monthly research seminar. Seminars focus on readings about the nature of science literacy and STEM community engagement, cross-disciplinary work that includes STEM, aspects of engagement with community partners, and similar topics. Additionally, seminars are a community where students can develop, hone, and share their capstone projects (see below). The seminar includes sessions designed to assess the students' developing competencies in best practices in community engagement, social determinants of health, and education inequities.

Engagement

A minimum of 40 hours of STEM-related engagement with members of the public. This can take several forms, that include, but are not limited to, teaching and/or facilitating discussion among pre-college students or members of other community groups, making presentations to out-of-discipline audiences at conferences/events, and working with the leadership of a community organization for capacity building.

Capstone Project

A scholarly product of the student's Community-engaged STEM work, which can take the form of a research paper, a presentation at a professional conference, or a contribution to an annual Penn STEM and Community Workshop.

Faculty Advisory Committee

The certificate program is overseen by a Faculty Advisory Committee consisting of Penn faculty involved in engagement work. Each certificate student is mentored by a faculty member within the advisory committee. Following an initial planning meeting with their Advisor upon commencement of the Program, students then meet periodically to plan service opportunities as well as pre-approved electives and capstone experiences.

Scan the QR code to check out the certificate program website!

Community-Engaged STEM Seminar Series

## Future Directions

Research & Community: Biomedical Science in the Urban Curriculum is offered annually at Penn during the Spring semester. We had graduate students from three different graduate programs (neuroscience, cell biology, and engineering) enroll in our course during the inaugural Spring 2023 semester. We are expecting the course to grow substantially in subsequent semesters. In collaboration with our community partners at Paul Robeson High School, we are brainstorming ways to expand the course to engage with a higher percentage of the Robeson student population and to cultivate long-term mentor-mentee relationships between Penn and Robeson students.

The Community-Engaged STEM certificate program is currently open to Penn graduate students in the Perelman School of Medicine and the School of Arts & Sciences. Current efforts are further developing the certificate for students in the School of Nursing, School of Engineering, School of Dental Medicine, School of Veterinary Medicine, and School of Design. We are working with Penn administration to expand this initiative to a university-wide certificate program, creating an infrastructure for sustainable and widespread doctoral student community engagement across Penn's campus. Additionally, we urge other universities adopt similar initiatives to connect academic work to improving the quality of life in local communities.

## Acknowledgments


**References**:

[1] http://www.nettercenter.upenn.edu/

[2] Flanagan-Cato LM. Everyday Neuroscience: A Community Engagement Course. *J Undergrad Neurosci Educ.* 2019 Dec 21;18(1):A44-A50. PMID: 31983899; PMCID: PMC6973297.

[3] Flanagan-Cato LM, Plate RC, Steele C, Jenkins AC. Effects of a Service-Learning Neuroscience Course on Mood and Intergroup Anxiety. *J Undergrad Neurosci Educ.* 2023 May 19;21(2):A159-A165. doi: 10.59390/HXTQ3326. PMID: 37588647; PMCID: PMC10426822.

[4] Purvis EM, Flanagan-Cato LM. A University and Public School Partnership for Personalized, Accelerated Science Learning. *Under Review*.



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