

A University and Public High School Partnership for Personalized, Accelerated Science Learning

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Abstract

Many public schools serving students who are under-represented in STEM fields lack the resources to provide the science education expected in the twenty-first century economy. Universities can deploy their infrastructure and human capital to better support local public schools, better preparing the next generation of college students for success in higher education and access to STEM-related careers. This article describes a university-public school partnership between the University of Pennsylvania (Penn) and Paul Robeson High School designed to accelerate the science learning of Paul Robeson High School students by having Penn college students teach hands-on lab activities on the college campus. Here, the partnership is described from the perspective of the school principal and school-based teacher leader for science and math at Paul Robeson High School. We discuss results from recent state standardized exams suggesting that these activities improve science knowledge and understanding for the high school students. A key ingredient for the improved science skills may be the broad social aspects of feeling included in the university setting.

This article summarizes a conversation between community members, Mr. Louis Lozzi and Mr. Richard Gordon, with university members, Erin Purvis and Dr. Loretta Flanagan-Cato. Mr. Louis Lozzi is a teacher at Paul Robeson High School. Mr. Richard Gordon was the principal of Paul Robeson High School from 2013–2023. Dr. Loretta Flanagan-Cato is an associate professor of Psychology in the School of Arts and Sciences at the University of Pennsylvania. Erin Purvis is a sixth-year PhD candidate in the neuroscience graduate program in the Perelman School of Medicine at the University of Pennsylvania. Erin Purvis and Dr. Loretta Flanagan-Cato are both affiliated with the Netter Center for Community Partnerships at the University of Pennsylvania. Our team has worked together for over five years to strengthen science education in a public high school in Philadelphia.

Purvis

I am really looking forward to discussing our partnership today. Can you each provide a brief description of who you are and what your position is at Paul Robeson High School or the University of Pennsylvania (Penn)?

Gordon

I am the proud principal of Paul Robeson High School. I'm entering my eleventh year as principal at this location. I'm Philadelphia's very first and only

state and national principal of the year. I've been the 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. This is unprecedented in Philadelphia. I was recently promoted to assistant superintendent of the School District of Philadelphia. My promotion was a direct result of this work, which is supported by amazing school partners like Dr. Flanagan-Cato and Penn.

Lozzi

I am the school-based teaching leader for math and science at Paul Robeson High School. I'm responsible for both curriculum and managing classrooms. This is my twentieth year teaching and my seventh year at Paul Robeson.

Flanagan-Cato

I am an Associate Professor of Psychology at the University of Pennsylvania and co-director of the undergraduate neuroscience major. I teach the undergraduate course called *Everyday Neuroscience*.

Purvis

Dr. Flanagan-Cato, what led you to develop this college course at Penn?

Flanagan-Cato

A major motivating factor was the lack of diversity in science, technology, engineering, and mathematic (STEM) professions. Many public schools serving students who are under-represented in STEM fields lack the resources to provide the science education expected in the twenty-first century economy. In my view, universities can deploy their infrastructure and human capital to better support local public schools, better preparing the next generation of college students for success in higher education and access to STEM-related careers. *Everyday Neuroscience* is designed to accelerate the science learning of Paul Robeson High School students by having Penn college students teach hands-on lab activities on the college campus.

Purvis

Can you summarize the *Everyday Neuroscience* course?

Flanagan-Cato

Everyday Neuroscience is a college course that was designed to invest in college students a discipline-relevant, mutually impactful community engagement experience. The first few weeks of the semester are spent providing context about the poorly resourced local public education system. In addition, teaching strategies are discussed, with an emphasis on flexibility to individualize lessons, frequent comprehension checks, and reinforcing effort. The college students then design and teach weekly hands-on biology and neuroscience activities for 10 consecutive weeks to high school students at Paul Robeson High School. The first five activities strengthen the high school students' foundation in cell biology, macromolecules, diffusion and osmosis, DNA structure, and genetics. The final five activities introduce neuroscience topics—specifically reflexes, taste, vision, attention, and memory. Teaching-learning teams are created to include three college students and two to four high school students, and membership in these groups remains consistent across the semester. This consistent social contact is associated with the college students developing a positive social bond with the high school students. Groups are free to use their judgment in deciding to work one-on-one or as a group on the activities, based on social dynamics and learning styles within the group.

Purvis

Where do these activities take place?

Flanagan-Cato

Robeson is a few blocks away from Penn's college campus. Initially, the activities took place in the Robeson high school cafeteria. Since fall 2021, the high school students have come to a university space for these activities. The university classrooms offer better accommodations than the high school, including better lighting and seating, presence of whiteboards, and access to some activity-relevant facilities such as lab classrooms. Plus, the high school students gain the experience of being on a college campus. As well, Penn's Netter Center for Community Partnerships provides funding to cover the cost of lab materials, the short ride on public transportation that brings the students to campus, and the stipend of the teaching assistants who escort them to campus.

Purvis

Mr. Lozzi and Mr. Gordon, can you provide a brief summary of Paul Robeson High School?

Lozzi

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. 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.

Gordon

Our students are 100% minority, 95% African American, and 80 to 90% living in poverty, according to the district's data.

Purvis

Mr. Gordon, what is the greatest asset of Robeson?

Gordon

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. However, our students have demonstrated a significant academic gap before they even walk in the door. The state evaluates us based on the students' progress, and

we have a three-year window to demonstrate that progress as a school.

Purvis

What is one of the biggest challenges faced by Robeson?

Gordon

There is a huge poverty issue here in Philadelphia. Philadelphia has been in the top three cities in poverty for the last few decades. And it's projected to hit 30% in the next 10 years. 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. I had a student who was recently shot a month ago, and he texted me last week asking me to send him money so he could go buy a cheesesteak because he was hungry. His mom wasn't home because she works two jobs, six days a week. And I did it because those are the experiences students remember. "Hey, Mr. Gordon and my teachers all care about me, so I'm going to give them the best effort I possibly can." It's a symbiotic relationship. 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.

Purvis

The Robeson school building was built in 1960 and never renovated. Mr. Lozzi and Mr. Gordon, can you describe how this impacts teaching at Robeson?

Lozzi

Technically, the building itself has been deemed unsustainable. It is just beyond what we think is capable of repair.

Gordon

We feel as though we have a building that doesn't facilitate academic progress. It actually hinders and limits us, which is why with our partnerships, in particular with Penn, we try to make sure that we do all we can to get students off campus to have those experiences that will motivate them and engage them in learning. The limitations of our building don't always motivate our students to learn at the optimum level.

Purvis

Mr. Gordon, how do you view the partnership between Robeson and Penn?

Gordon

I have a firm belief that partnerships must have a purpose. They must have a reason. I've had experiences where partnerships were for the benefit of the outside partner so they could feel good about themselves and feel like they've done some measure of community service. I don't let anybody get away with that. We're not going to use our kids for that. Our purpose for partnering is to figure out how to provide some measure of support and resources for our students. Our partnership with Penn has been extremely significant for the growth and development of all our students, particularly those who have come in with so many challenges and limited experiences. We're now able to partner with a university that is a stone's throw away, where we provide several opportunities for our students to engage and fully take responsibility for their own growth and development.

Purvis

Dr. Flanagan-Cato, will it be possible to document academic benefits for the Robeson students through this program?

Flanagan-Cato

Recent data from the Pennsylvania Keystone mandatory standardized test in biology show that Robeson students are beating their projected scores, suggesting concrete learning benefits from our partnership program. During the academic year 2021–2022, only 4% of the tenth graders were projected to score "proficient" on this test based on their eighth-grade academic progress. Instead, 20% performed at that level, all of whom participated in the Penn program. Additionally, Robeson students had 95-100% academic growth in all state tested subjects for three years in a row — the 2020-2021, 2021-2022, and 2022-2023 school years. Robeson was the top academic growth high school in the City of Philadelphia. Of course, the success of the program depends on the excellent daily lessons of the Robeson science teaching staff.

Purvis

Mr. Lozzi, what are the key successes of the Robeson-Penn partnership?

Lozzi

We have strong, objective data suggesting that the partnership has helped us address things that the state requires from us. I also 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.

Purvis

Mr. Gordon, beyond standardized test scores, do you have any comments about the impact of our partnership on Robeson students?

Gordon

We've been making great improvements, but if those improvements don't at some point start transitioning to actual proficiency rates, then we're still going to continue to struggle to get kids to show mastery in STEM and then take that mastery into some type of workforce development opportunity beyond high school. The purpose of education is to provide the opportunity for students to reach their goals and dreams, for the personal and professional lives that they aspire to. How do we measure that? How do we facilitate that? Those are the conversations that I'm having with our leadership: changing the perspective on what success looks like for schools with limitations in their ability to provide resources and opportunities for STEM in their building.

Purvis

An important aspect of this partnership is the cultivation of social connections between Penn students and Robeson students on the college campus. Mr. Lozzi and Mr. Gordon, can you describe the Robeson student feedback regarding the partnership?

Lozzi

I see students' faces light up. I see them coming back and saying, "Wow, we learned this, we learned that." They like going. And what's not to like? I think a couple of the kids are going to be extremely excited because they passed the standardized state biology exam and didn't expect to, and they're going to say, "I learned because of the relationships." One or two kids are just not interested in going. They just didn't want to leave the building. But overall, students want to go. The first thing most of them want to do is get out of the building.

Gordon

Their feedback has always been mostly positive. Our students are having a ball when it comes to being on campus and interacting with Penn mentors. I think they like the Penn students more than they like the actual classes. 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.

Flanagan-Cato

I would also like to add that surveys of the high school students also show that they develop a personal connection with the Penn students during the semester. On a scale of interpersonal closeness, the initial average rating was 3.6 out of 7. By the end of the semester, the average interpersonal closeness score was 4.9. That was a statistically significant change.

Purvis

Mr. Gordon, what can our partnership do in the future that we are not doing now?

Gordon

How can we evolve and expand the program to create a clear, long-term pipeline from experiences of learning in *Everyday Neuroscience* to continuing to do more for the students over the next few years? Investment and support will allow us to scale our program, build capacity, and

pursue additional transformative initiatives. We aim to develop a model to share across West and Southwest Philadelphia and further across the city. Opportunities could be created for children and families of color that would start the process of actually turning around Philadelphia. We want our students to reach beyond a limited vision for themselves. That's what education means to me, thereby conveying the narrative out there that students of color can get it done. We need to cultivate the narratives about the capabilities of our students of color, vital members of our society.

Purvis

Mr. Lozzi, do you have any final thoughts about our partnership?

Lozzi

Collaborations like this should have been going on a long time before we started this. I really see a connection with improvement in the high school kids, and I also see a lot of enriching experiences for the college kids.

Purvis

Thank you all so much for sharing your perspectives about our Robeson-Penn partnership. I'd also like to highlight that our partnership was awarded the Penn Provost-Netter Center Faculty-Community Partnership Award in 2022. Dr. Flanagan-Cato and I are thrilled to continue our collaboration with Paul Robeson High School. We look forward to brainstorming ways to further expand our *Everyday Neuroscience* program in future semesters.

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Competing Interests

The authors have no competing interests to declare.

Authors' Contributions

Lozzi, Gordon, and Flanagan-Cato shared their perspectives with Purvis. Purvis and Flanagan-Cato then wrote a draft of this article. All authors approved the final version of the paper.

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