

# CHANGING THE FACE OF SCIENCE: PROJECT EXPLORATION'S PERSONALIZED APPROACH<sup>1</sup>

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## **ABSTRACT:**

Traditional approaches to science education are failing to ensure access for students of color, girls and students who are poor, despite decades of interventions aimed at leveling the playing field. Relationships between students and adults are the most critical factor for closing the achievement gap and engaging historically under-represented populations in Science. Project Exploration's personalized approach, which straddles science education and youth development, offers a model for engaging students of color and girls as well as students who are struggling academically with science. Based on Project Exploration's decade of work addressing issues at the intersection of science education and equity, this proposal recommends:

- 1) Aligning formal and informal science education efforts;
- 2) Prioritizing personalized program strategies that connect students and scientists via community-based organizations; and
- 3) Creating community science centers and science education "ecosystem" networks aimed at increasing opportunities for students to find, participate in and stay on paths to science and academic success.

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<sup>1</sup> **Key research informing this paper includes:** *A Broader, Bolder Approach to Education* (2008); *Engagement, Capacity, and Continuity: A Trilogy for Student Success* (2004); *The Opportunity Equation: Transforming Mathematics and Science Education for Citizenship and the Global Economy* (2009); and *the STEM Education Coalition Report Card* (2008).

## **BACKGROUND**

Project Exploration is working, literally, to change the face of science, by engaging under-represented youth through personalized experiences with science and scientists. Founded in 1999 by University of Chicago Paleontologist Paul Sereno and Educator Gabrielle Lyon, Project Exploration expands access to science by building collaborations between scientists and educators with a social mission aimed at equity. Our model is designed to *get* students interested in science, *keep* students interested in science, and *equip* students with what they need to pursue science through high school and into college.

In the past 10 years Project Exploration has involved nearly 1000 Chicago Public School students of color and girls in Science. We work with school partners to target students who may not be academically successful. Project Exploration alumni are significantly more likely to graduate high school, go to college and major in science than their peers and they attribute their persistence in school and science to participating in our programs.

## **OVERVIEW: SCIENCE EDUCATION**

National science education efforts since the 1950s have invested in:

- Curriculum
- Teacher professional development
- Labs
- Advanced coursework, such as AP classes

The majority of science education efforts target and attract academically successful students who have a demonstrated interest in science and who come from families who can afford to pay for programming. Science experiences in school are often focused on abstract principles and facts rather than authentic, hands-on experiences that equip students with widely-accepted 21<sup>st</sup> Century skills. Out-of-school science education efforts, although proven to be highly effective, are frequently overlooked as a core science education strategy.

## **CHALLENGES TO PARTICIPATION IN SCIENCE**

In 1957 Sputnik triggered public demand for expansion of science education and unprecedented federal support for a national science education agenda. We are now poised at a similar moment of opportunity as we enter a new century of science.

### ***If science is the future, who will take us there?***

Science today does not reflect the diversity of America. Science participation and achievement remains remarkably low for minorities and women despite decades of education programs aimed at leveling the playing field. The US Census Bureau reports 39% of the population under the age of 18 is a racial or ethnic minority yet in 2000, only 4.4% of the science and engineering jobs were held by African Americans and only 3.4% by Hispanics. Gender disparities are also a major concern.

Traditional education investments are failing to ensure high-caliber science is available to students who need it most and who have the least access. Studies have shown science in school is necessary but not sufficient for engaging and sustaining students' involvement in science through high school and into professional science careers. Meanwhile, two-

thirds of the overall achievement gap between lower and higher income youth can be explained by unequal access to summer learning opportunities.

The economic and learning opportunities science provides remain out of reach for many students of color and students who are poor. At a time when 4 out of 5 jobs require fluency with science and technology, these jobs remain unavailable to students who don't have the skills or propensity to pursue them. Obstacles to participating in science are different for different populations.

***Girls:*** Girls are closing the gap in course-taking and achievement in high school. There have been increases in participation by women in all fields of science, though to varying degrees depending on the field. Women tend to leave science as a field as they move from college science into graduate study. *There remains a distinct need for single sex science programming for underserved populations in pre-collegiate programs.*

***Students of Color:*** Challenges for students of color, particularly African American, Hispanic and Native American students, have to do with access to opportunity. Specific issues include:

- Low expectations by adults of these students for participation in science
- Less access to skilled and qualified teachers and fewer opportunities to prepare for and take high-level courses
- Poorly-equipped school facilities and science labs
- Little to no access to information about careers and science paths
- Dearth of science opportunities out of school
- Lack of transportation and financial means required for participation in out-of-school science programs.

***Students from Low Socioeconomic Status:*** Research on the persistence of the achievement and participation gap for low income students is extremely relevant to science education.

- Students fall behind during critical after school and summer, during which their more affluent peers are participating in enrichment programs
- While formal school curriculum efforts may be effective with students who are academically engaged they fail to fundamentally impact students who are not academically engaged
- Doing well in school is a prerequisite for participation in high caliber science experiences in and out, of school. *Science learning tends to be cumulative* and is hard to build if you're not interested in the first place.

There is a significant opportunity to complement existing science education strategies and fundamentally improve the status quo of science participation and achievement.

**Relationships are the most critical factor for involving students in science and closing the achievement gap.**

## **ABOUT PROJECT EXPLORATION**

Project Exploration, a Chicago-based nonprofit science education organization, provides communities traditionally overlooked by science – particularly students of color and girls – personalized experiences with science and scientists.

**Youth Programs:** Project Exploration annually serves 300 students aged 12-18 from 40 Chicago Public Schools with free after-school, service learning and immersive field programs. 85% of our students come from low income families. Eighty-one percent of program participants are female, 19% are male; 73% are African American and 25% are Latino. We run programs in partnership with schools, museums, universities and community-based organizations. We particularly target students who otherwise might not become involved with science due to academic achievement or socio-economic status. We foster and support long-term relationships providing:

- Multi-year science and leadership opportunities
- One-on-one interaction with scientists
- Opportunities for students to co-create programs and curricula based on their interests
- 21<sup>st</sup> Century skills including collecting, analyzing and critiquing information, communicating ideas and supporting evidence, working in teams, and tackling interdisciplinary problems

Project Exploration's students are significantly more likely to graduate from high school, go to college and major in science than their peers. They attribute their persistence in school and science to participating in Project Exploration's programs. Since 1999 93% of our field students have graduated high school (compared with 52% of Chicago Public School students generally); 61% have enrolled in a four-year college and 35% of all students and 43% of girls who graduate high school as Project Exploration field alumni are choosing to major in science. Our alumni tell us:

- "Project Exploration is the reason I'm in Montana, in college, and majoring in geology. Before, I didn't have an interest or a passion." *Andres, 21*
- "I think I have a future in science. Before Project Exploration, I didn't really think much about it." *Hasson, 17*
- "If it weren't for Project Exploration I wouldn't believe in the capabilities I have." *Tanya, 14*

**Public Programs:** We support youth programs with collaborative public initiatives:

- *Discover Your Summer* is an annual resource guide to summer science programs for middle and high school students across the Midwest. Project Exploration distributes the guide for free in print and online.
- *Bilingual traveling science exhibits* reach our most broad and diverse audiences. Chicago-land exhibit projects are located at free venues such as libraries and parks and serve as anchors for a wide range of community-based programming.
- *Online expeditions* and science news features provide a window onto "Science in Action" for students, teachers and families paired with opportunities to correspond virtually with scientists.
- Trainings for scientists and teachers focus on creating effective, accessible science learning environments.

**Building the Field:** Project Exploration advocates for the removal of barriers and creation of effective programs in out of school arenas in order to make science accessible to students most frequently left behind. Our programs have been replicated in Oklahoma for rural youth and staff members serve as local and National advisors on issues affecting participation in science. Project Exploration convenes individuals and organizations

interested in creating multiple pathways to science, particularly for students with lack of access due to lack of opportunity, funding or academic achievement. In 2008 we co-organized the first National Conference on Science and Technology in Out-of-School Time with the Coalition for Science After School. In 2010 we will convene a Regional coalition working at the intersection of science education and youth development and also release a report documenting a decade of work dedicated to changing the face of science.

***Project Exploration's Science Community Center: A National Demonstration Site***

Project Exploration is working to establish a science community center located on Chicago's south side. This center will bring our youth services, scientists and teacher professional development and public outreach under one roof. Students and scientists will anchor visitors' experiences through exhibits, classes, and field programs. The Science Community Center will serve as a regional hub for convening professional and amateur scientists and will foster a community of people who can work together to create sustainable science pathways. Project Exploration's Science Community Center will serve as a demonstration site for a new, highly personalized approach to science education.

**A PERSONALIZED APPROACH TO SCIENCE EDUCATION**

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Project Exploration serves as a bridge between scientists and students, helping each group get ready to "make the most" out of their time together and providing the organizational infrastructure to support multi-year relationships. Project Exploration's personalized approach is characterized by the following:

***Students:***

- Participate because they are curious;
- Interact and collaborate directly with scientists;
- Engage in project-based, authentic experiences in the lab and in the field;
- Analyze information, communicate and reflect on the nature of science, design and manage short and long term projects;
- Design and shape curriculum based on their interests;
- Participate in program planning and evaluation.

***Scientists:***

- Teach based on questions they are investigating in their day to day work;
- Share life experiences as well as questions driving their research;
- Engage with students on more than one occasion;
- Participate in Project Exploration training.

***Program facilitators:***

- Create high-content, high-intensity learning environments
- Foster and support long term relationships;
- Focus on knowing students by what they like and are interested in, as well as what they can do in science;
- Connect students' activities in out- of- school time to their academic lives through structured partnerships with schools and teachers;
- Train scientists and teachers to create accessible science programs;
- Publicly recognize students work and progress with teachers, families and community members;

- Forge and leverage community-based partnerships with higher education, science institutions and businesses to expand opportunities for students.

## **RECOMMENDATIONS FOR INCREASING ACCESS and EQUITY**

### ***Emphasize equity of opportunity in science as well as science literacy.***

- Create more opportunities for more kinds of students in more kinds of settings.
- Eliminate academic, fee-based and transportation barriers that reduce access.
- Ensure out-of-school science experiences are considered in tandem with formal K-12 science education efforts.

### ***Support a personalized approach to science education.***

- Focus on relationship-based program strategies.
- Put students at the center of systemic strategies rather than formal curriculum.
- Support scientists to interact directly with students.
- Build on existing efforts focused on *fostering interest* in science with efforts aimed at *keeping students involved* with science.

### ***Expand out-of-school efforts to target students currently left out of science.***

- Support service organizations to expand and sustain effective programs.
- Reframe achievement to include participation in out-of-school science.
- Support direct service organizations to connect students with institutions of higher education and business partners.

### ***Align formal and informal science education strategies.***

- Connect students' activities in science out-of-school with their academic lives.
- Provide high level public recognition for undergraduates, graduate students and scientists who are conducting effective outreach in partnership with community-based organizations.
- Support higher education institutions to partner in sustainable ways with community based organizations around science outreach.

### ***Create science "ecosystems."***

- Support the creation of integrated community-based networks of existing program providers (universities, businesses, youth development and community based organizations, and informal science organizations) which coordinate efforts to *get* students interested in science, *keep* students interested in science, and *equip* students with skills and experiences they will need to pursue science after high school and beyond.
- Map "science opportunity assets" across school, community, city and regional levels and help students know about and move through these (otherwise disparate) pathways. Structure work around the aim of collaborating to help students find, and stay on, paths that involve science.
- Support a cohort of National Science Community Centers in conjunction with Promise Neighborhood efforts to facilitate alignment of science pathway experiences. These can house science youth development programs as well as serve as regional clearinghouses for program information for students, teachers and families. Hubs can serve as training centers for curriculum and professional development on strategies that increase access and equity in science.

### ***For more information or to discuss these recommendations contact:***

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