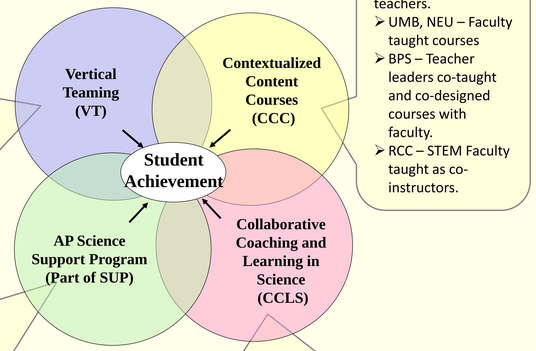
The Boston Science Partnership: A New Vision of Urban Education

Roles of Project Partners

Teams of k-12 teachers and higher education STEM faculty examined AP tests to increase rigor.
- CB – provided facilitators and framework
- BPS – teachers participated and links made to k12 curriculum
- UMB, NEU, RCC – Faculty participated



Team-taught content courses for BPS teachers.
- UMB, NEU – Faculty taught courses
- BPS – Teacher leaders co-taught and co-designed courses with faculty.
- RCC – STEM Faculty taught as co-instructors.

Year-round, comprehensive program for students with their teachers.
- UMB, NEU and HMS – hosted summer and afterschool lab times for 300 students
- UMB – hosted practice exam for 500 students
- CB – provided practice exams and urban-focused APSI
- BPS – supported training of teachers, committed to sustainability, provided teacher-leaders

Professional learning communities of building-based teachers who engage in a sustained lesson study.
- BPS – Designed CCLS, recruited and trained teacher leaders, supported groups running in schools.
- CCLS forms the basis of the Noyce-funded teacher leader fellowships and the Phase II: BEST

NEU = Northeastern University
UMB = University of MA Boston
RCC = Roxbury Community College
BPS = Boston Public Schools
CB = The College Board
HMS = Harvard Med. School

Research and Evaluation Questions

Research Questions (Education Development Center, Inc.)
- What roles do the BSP strategies play in the development of highly qualified teachers?
- What is the nature and extent of out-of-field science teaching?
- What roles do the BSP Strategies play in the development of high quality instruction?
  Do highly qualified teachers deliver high quality instruction?
  Do teachers who are not highly qualified deliver high quality instruction?

Evaluation Questions (PERG at Lesley University)
- Has the BSP achieved its project goals? How? What has been the influence of each of the primary strategies on achieving those goals?
- What is the design, implementation, quality and contribution of each strategy? What are the benefits, issues, lessons learned, sustainability factors and impacts?

STEM Pipeline Study (University of Massachusetts Boston)
This research sought to investigate how teacher quality, organized STEM pathway support programs, students' study habits, and their course choices explain retention of students, as well as reasons they leave, along the STEM pathway from high school through graduation from university with and without passage through community colleges.

Science Teachers Content Knowledge and Retention Study (University of Massachusetts Boston)
This research examined how teaching science affects the understanding and retention of associated content knowledge learned by teachers during professional development.

Definition of and Conditions for Student Success

The BSP is guided by a set of assumptions (or theories) of change

1. Providing **high-quality professional development** experiences to BPS science teachers to raise their quality and qualifications will have a positive impact on student learning outcomes.
2. **Contextualizing** the PD provided to teachers will help ensure transfer to classrooms.
3. Maintaining and building **BPS teacher leadership** will expand capacity and resources for current and future BPS science education efforts.
4. Expanding direct **supports for AP students and teachers**, a greater awareness of the AP program, and better student preparation before reaching AP courses will increase access to and success with this level of academic work.
5. An interrelated set of project activities will produce **synergies that add benefits** beyond those provided by each activity alone.

. . .About what teachers need . . .And about what districts need

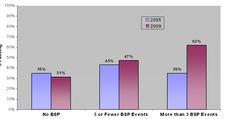
- ✓ Content knowledge
- ✓ 7E pedagogy
- ✓ AP and AP Pipeline support
- ✓ Climate for conversations about science teaching
- ✓ Opportunities for growth
- ✓ Capacity building
- ✓ Teacher leaders
- ✓ Fidelity to district-wide curriculum
- ✓ Science leadership

. . . In order for students to succeed. . .

- ✓ Passing scores on standardized tests
- ✓ Pathways and access to, enrollment in and success with advanced course work
- ✓ Engaged mode of learning
- ✓ Teachers who bring deep content knowledge and effective teaching strategies
- ✓ Perception of self as college-bound science student

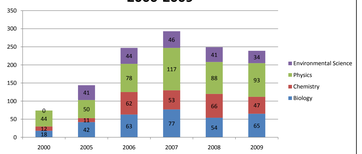
By demonstrating higher achievement and & Demonstrating increased interest in science.

Percentage of Students Passing the 8th Grade Science MCAS Exam in 2005 and 2009 by Teachers' Level of BSP Participation



The BSP professional development was contextualized, raised the quality of science teachers and were synergistic for increased benefits to students.

Number Students Passing AP Exam: 3, 4, 5 2000-2009

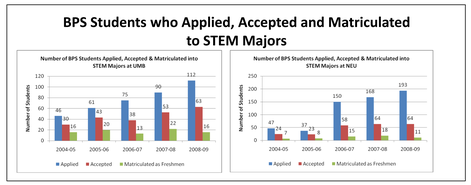


The BSP prepared over 65 Boston teachers to teach AP science. As well, the project created a "pipeline to AP" for ALL students through articulation. A comprehensive set of supports led to success.

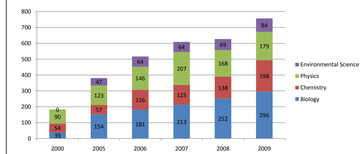
SAT II Subject Test Scores

SAT II subject tests are considered to be good predictors of college majors and course taking by the College Board. Boston students showed increases in three of the four science exams over five years. (Test scores are between 200 – 800 points.)
- ❖ Ecological Biology scores increased by 34 points
- ❖ Molecular Biology scores increased by 27 points
- ❖ Physics scores increased by 13 points

BPS Students who Applied, Accepted and Matriculated to STEM Majors

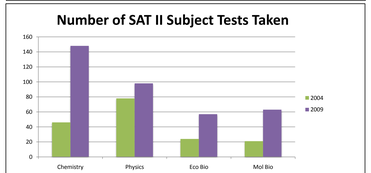


Number of Students Taking AP Exams 2000-2009



AP science students gained perspective of themselves as college-bound and stepped up to the AP exam. Lab time at universities familiarize students with life on campus and a practice exam supports confidence.

Number of SAT II Subject Tests Taken



Sitting for the SAT II science tests indicate interest in pursuing science in college. Tests in the district more than doubled in five years (169 vs 366).

Challenges and Questions

Making the Most of BSP Data and Experience

The BSP has been able to show significant gains in student achievement based on the participation by teachers in the professional development offered. However with a plethora of data, there are many more investigations that would yield important findings. A few of these include:
- Understand the difference in student and teacher outcomes between professional development centered on content (e.g. chemistry) versus concept-driven topics (such as Energy). (See BSP Phase II)
- Follow students for additional years to track the long-term impacts of BSP professional development on student outcomes
- Follow teachers longitudinally to see how their work evolves as BSP investments mature
- Determining attribution of impacts among the BSP work, overlapping Urban Systemic Project work and other large-scale projects with Boston teachers.

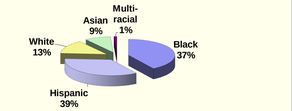
Persistent achievement gaps

While subgroups increased the percentages passing state exams, not all subgroups increased at the same rates. Challenges remain in regards to achievement gaps among racial groups and other sub-groups in the district, most notably English Language Learners and Special Education students.
Progress can be seen in the enrollment into AP science courses, suggesting that greater progress can be made.

AP Science Students, by Race

Race	2001-2002	2005-2006	2008-2009
Black	22%	27%	31%
Hispanic	8%	14%	20%
Asian	47%	40%	31%
White	23%	19%	15%

Racial Composition of BPS Students



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