Helping all kids discover and achieve their dreams

American Institutes for Research
Using Research to Inform Policies and Practices in STEM Education Symposium
September 2013
An innovative model

We expand a middle school’s learning day by connecting a team of adults to provide relevant learning experiences that give students the skills, access, and beliefs they need to succeed in school, college, and careers.
http://www.youtube.com/watch?feature=player_embedded&v=U1X6TyyDhO8
Enrichment Expenditure on Children by Family Income

Bottom quartile: family income

Top quartile: family income

When Steve Jobs was a teenager a neighbor who worked as an engineer at Hewlett-Packard got him into the H-P Explorer's Club, a group of about 15 students that met every Tuesday evening at the company cafeteria. Jobs reflected on how this exposure to real world technology and the engineers who made it was a life-changer for him: “Every week they would get an engineer from one of the labs to come and talk with us about what he or she was working on. My dad would drive me there. I was in heaven.”
“When we look at the **positive deviants** – the hospitals who are getting the **best results** at the lowest costs -- we find the ones that look most like systems are most successful. They found ways to get all the pieces to come together into a whole. …

**Making systems work, whether in health care, education, climate change, or pathways out of poverty, is the great task of our generation.** In every field, knowledge has exploded, but it has brought complexity, it has brought specialization. We have no choice but to recognize, as individualistic as we want to be, **complexity requires group success. We all need to be pit crews** and not cowboys or cowgirls.”

- Dr. Atul Gawande
New 2013 OECD “Survey of Adult Skills” shows the 21st century skills gap that exists for America. **And on most domains, scores are lower for younger Americans than older Americans.**

Source: Organization for Economic Cooperation and Development; graphic by New York Times
American results are among the most polarized between high achievement and low. Compared with other countries with similar scores, America has more people in the highest proficiency levels and more in the lowest levels.

Source: Organization for Economic Cooperation and Development; graphic by New York Times
Citizen Schools’ Partnerships From Coast to Coast

7 states ▪ 32 schools ▪ 14 communities ▪ 5,300 students

244 AmeriCorps members ▪ 4,700 Citizen Teacher volunteers
The Citizen Teacher Journey...

Sign Up
Complete application, background check and select training date. Work with a staff member to choose a campus and a topic to teach.

Get Trained
Meet your staff partner. Learn how to work with middle school students. Learn how to model skills. Finalize apprenticeship and WOW! plans.

Teach
Get to know your students. Share your career pathway. Model and teach skills. Invite a guest speaker. Prep for WOW!

WOW!
Students demonstrate the skills they've mastered. Invite friends, family, coworkers to attend. Celebrate accomplishments.

Celebrate
Reflect on student success. Complete Citizen Teacher survey. Follow us on Facebook, Twitter, and LinkedIn.

Advocate
Share your apprenticeship story on our website and with your network. Sign up to teach again. Recruit a friend or colleague to teach. Donate. Attend future WOW! events. Host an event.
National Teaching Fellowship: Teach, Serve, Grow

**A Week as a Teaching Fellow**

<table>
<thead>
<tr>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
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<td>Campus Role</td>
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<td><strong>Professional Development</strong></td>
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<td>Staff Meeting</td>
<td>Staff Meeting</td>
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<td>Snack</td>
<td>Snack</td>
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<td>Snack and Circle</td>
<td>Snack and Circle</td>
<td>Snack and Circle</td>
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<td>AIM/Academic League</td>
<td>AIM/Academic League</td>
<td>AIM/Academic League</td>
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<td>Apprenticeships</td>
<td>Apprenticeships</td>
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<td>Exploration</td>
<td>Exploration</td>
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<td></td>
<td>Post-Program Staff Meeting</td>
<td>Post-Program Staff Meeting</td>
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<td>Post-Program Staff Meeting</td>
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Each Fellow specializes in one role in the school partnership, which they work on while the regular school day is in session:

- Family-Student Engagement Lead
- Citizen Teacher Lead
- Data Lead
- College Readiness Lead
- Academic Program Lead

Teaching Fellows work 50-55 hours per week.

**Citizen Schools Program Elements**

- **Academic League**
  Math & ELA lessons that align with material learned throughout the day

- **AIM**
  Homework support and one-on-one grades and goals conferences

- **Apprenticeships**
  Hands-on classes taught by volunteer professionals and community members

- **Circle**
  Celebrate student achievement and practice collaboration skills

- **College-to-Career Connections (C3)**
  Build study skills and college knowledge to make higher education a real and tangible option

- **Exploration**
  Activities and field trips that reflect the needs and opportunities of communities
The National Teaching Fellowship Class of 2015 is ready to serve!

We’ve hired a bright, diverse bunch!

They represent 72 colleges and universities

and have an average undergrad GPA of 3.35

37% are STEM or Social Science Majors

40% speak a key language, such as Spanish

53% self-identify as a member of a minority group

35% are first generation college students
Theory of Student Impact: “Shooting Star”

**LONG-TERM OUTCOMES**
- Achievement
- Graduation
- College & career readiness

**MID-TERM OUTCOMES**
- Engagement
- Achievement
- Selection of a college-track high school

**SHORT-TERM OUTCOMES**
- ACCESS to successful people and experiences
- SKILLS academic and 21st century
- BELIEF in the connection between hard work, education and future success

**SUCCESS**
in college & career

**CITIZEN SCHOOLS PROGRAM**
- Apprenticeships
- Academic coaching
- College to career connections
Advancing Up & Across the STEM “Matrix”

- **15.2% of all students** (Low Interest, Low Proficiency)
- **17.3% of all students** (High Interest, Low Proficiency)
- **42.1% of all students** (Low Interest, High Proficiency)
- **25.4% of all students** (High Interest, High Proficiency)

*Source: ACT, Inc.*

Students taking ACT test in 2008.
CT of the Year Alan Su, Google software engineer. Alan Su is an engineer at Google, making the tubes of YouTube run smoothly. But for years, he has also spent an afternoon a week engineering young minds. His latest apprenticeship with Citizen Schools involved teaching kids how to build robots, and then program Android phones to make them perform various tasks. Check out the journey they go on together:

http://www.youtube.com/watch?feature=player_embedded&v=ijqDK2iERzQ
Dr. Randy Paush: The Power of “Specific Dreams”
WOW! Student presentation with Boston Mayor Tom Menino:
Apprenticeship Sector: STEM
Taught by: David Mantus
Partner Organization: Cubist Pharmaceuticals

Apprenticeship curriculum:
Students learn the basic concepts of physics and apply that knowledge to understanding both the possibilities and challenges of space travel.

WOW!: Students are given a distance-learning mission with the Challenger Learning Center and communicate live with scientists at the Center to complete the mission.
Middle Schoolers’ View of Society’s Top Contributors

...But this is **highly malleable:**

- Personal exposure to STEM professionals
- Learning more about what STEM professionals actually do
- Understanding impact on society
- Salary/financial considerations
- Promoting interest and skill in STEM fields:

- Over 80 percent of students who participated in a STEM-focused apprenticeship expressed interest in possibly pursuing a STEM career, more than double the national average of 33 percent for 8th graders.
“It was great to see my middle school apprentices have perhaps their first-ever experience with *telling* technology what to do, rather than just listening to what technology tells them.”

- Citizen Teacher, Fall 2012
<table>
<thead>
<tr>
<th>Apprenticeship Name &amp; Description</th>
<th>My Rank</th>
<th>My Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Footprint</td>
<td>1</td>
<td>I love science and experiments and I also want to be a doctor and science is a big part of doctoring.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Generation Technology (NASA)</td>
<td>1</td>
<td>Space is a big part of my life, I was also in a space exploration project last year so I real like space.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHESS</td>
<td>1</td>
<td>I have played chess before and it is not very interesting to me.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
“In 6th grade everything was hard, it seemed like everyone was smarter than me. I was failing in Math and struggling in other classes. I decided to do something about it this year in 7th grade.

…My teachers are helping me make better choices, and I'm seeing the progress. I'm proud to tell you that I now have a B in Math. Because I have a better expectation of myself, I hope I'll have an A soon! My mom always said when I leave her house I’m going to be a decent man and I know all my teachers have the same expectation of me. A year ago I didn’t believe it myself but today I do.”

- Jason Ponce, Citizen Schools student in New York City
A substantial and growing portfolio of evidence, including rigorous external evaluations, demonstrates that Citizen Schools partnerships are closing the opportunity and achievement gaps:

**ENGAGEMENT**
- Citizen Schools attendance is higher than matched peers, reducing absenteeism by 43%.
- 70% of students at Citizen Schools ELT campuses report that they have the opportunity to learn about college and careers during the school day, nearly double the rate for their matched peers.

**MIDDLE SCHOOL ACHIEVEMENT**
- Preliminary results from the evaluation of Citizen Schools’ national ELT initiative found an annual effect of Citizen Schools of four additional months of learning gains in Math and five additional months of learning gains in English.

**COLLEGE READINESS & SUCCESS**
- Nine out of 10 Citizen Schools alumni passed state high school exit exams in math and English, closing the achievement gap in high school. Citizen Schools alumni achieved an on-time high school graduation rate 12 percentage points higher than matched peers.
- Citizen Schools alumni are enrolling in college at the same rate (62%) as students in the U.S. from all income levels and 1.5 times the rate for their low-income peers nationally, closing the achievement gap for college enrollment.
Massachusetts statewide (all income levels) attendance rate is 95%. Matched comparison students have an attendance rate of 81%. Citizen Schools participants have an attendance rate of 87%.

Massachusetts statewide (all income levels) - 75%
Matched comparison students - 44%
Citizen Schools participants - 53%

On-time High School Graduation

- National average (all income levels): 75%
- Matched comparison students: 59%
- Citizen Schools participants: 71%

College Enrollment

- National average (all income levels): 62%
- National average for low-income students: 41%
- Citizen Schools participants: 63%

Updated student and teacher survey results through the 2012-13 school year demonstrate striking, statistically significant differences between Citizen Schools ELT and matched comparison schools, particularly on elements driven by the Citizen Schools program model.

**Selected Significant Student Survey Results:**

<table>
<thead>
<tr>
<th>Percent of Respondents</th>
<th>Estimated Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual CS ELT Mean N size = 249</td>
<td>Estimated Matched Comparison (MC) Mean N size = 588</td>
</tr>
</tbody>
</table>

### Questions asked of all Citizen Schools students & matched comparison students

<table>
<thead>
<tr>
<th>Activity</th>
<th>Actual CS ELT</th>
<th>Estimated MC Mean</th>
<th>Estimated Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total time spent at school on a typical day</td>
<td>10 hours</td>
<td>8 hours</td>
<td>+2 hours</td>
</tr>
<tr>
<td>Activities to learn about college</td>
<td>70%</td>
<td>38%</td>
<td>+32%***</td>
</tr>
<tr>
<td>Activities to learn about careers</td>
<td>67%</td>
<td>40%</td>
<td>+27%***</td>
</tr>
</tbody>
</table>

### Questions asked of all ELT and MC students in after school programs: My after school activities help me...

<table>
<thead>
<tr>
<th>Activity</th>
<th>Actual CS ELT</th>
<th>Estimated MC Mean</th>
<th>Estimated Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn about helping others in my community</td>
<td>80%</td>
<td>68%</td>
<td>+12%*</td>
</tr>
<tr>
<td>Learn about how to get into college</td>
<td>88%</td>
<td>71%</td>
<td>+17%***</td>
</tr>
<tr>
<td>Learn skills that will help me get a job</td>
<td>87%</td>
<td>76%</td>
<td>+11%*</td>
</tr>
<tr>
<td>Learn about different jobs or careers</td>
<td>89%</td>
<td>73%</td>
<td>+16%***</td>
</tr>
</tbody>
</table>

**Statistical significance levels:**  * p<.05;  ** p<.01;  *** p<.001;  **** p<.0001
### Selected Significant Teacher Survey Results:

<table>
<thead>
<tr>
<th>Questions asked of all ELT and matched comparison teachers</th>
<th>Percent of Respondents</th>
<th>Estimated</th>
<th>Estimated Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time available for students to pursue topics of interest to them</td>
<td>Actual CS ELT Mean N size = 173</td>
<td>Estimated MC Mean N size = 196</td>
<td>54%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Questions asked of all ELT teacher and matched comparison teachers reporting on after school programs (smaller n sizes)</th>
<th>Percent of Respondents</th>
<th>Estimated</th>
<th>Estimated Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers and after school staff successfully collaborate to support students</td>
<td>Actual CS ELT Mean N size = 173</td>
<td>Estimated MC Mean N size = 192</td>
<td>76%</td>
</tr>
<tr>
<td>Communication and collaboration between teachers and after school staff</td>
<td>63%</td>
<td>43%</td>
<td>+20%***</td>
</tr>
<tr>
<td>After school activities are of high quality</td>
<td>86%</td>
<td>59%</td>
<td>+27%**</td>
</tr>
<tr>
<td>Teachers in this school discuss their expectations for homework with after school staff.</td>
<td>73%</td>
<td>47%</td>
<td>+26%**</td>
</tr>
</tbody>
</table>

Statistical significance levels:  * p<.05; ** p<.01; *** p<.001; **** p<.0001
Massachusetts would be the 2\textsuperscript{nd} highest performing country in Math worldwide in science.

American eighth-graders scored 525 in science. Massachusetts did markedly better, with an average score of 567.
The 8th grade class of 2012-13, the first 8th grade cohort to have participated in Citizen Schools ELT as 6th graders, erased the achievement gap in Math relative to their peers statewide in Massachusetts.

**Math Proficiency Rate**

- 2010 (Pre-ELT): 9%
- 2011: 13%
- 2012: 29%
- 2013: 58%

Massachusetts state-wide
In 2012-13, **69% of Citizen Schools’ students demonstrated growth in 21st century skills** (oral communication and leadership).

In 2013-14, Citizen Schools will **refine and pilot** enhanced 21st century skills measures to measure student’s growth and mastery of a broader set of 21st century skills critical to college and career readiness and aligned with STEM learning goals.

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**21st century skills**

- **Interpersonal skills**
  - Communication
  - Collaboration
  - Global awareness

- **Informational skills**
  - Data analysis
  - Advanced literacy
  - Technology

- **Critical thinking skills**
  - Problem solving
  - Effective reasoning
  - Innovation
CEREAL BOXES

A cereal company uses cereal boxes that are rectangular prisms. The boxes have the dimensions shown.

- 12 inches high
- 8 inches wide
- 2 inches deep

The managers of the company want a new size for their cereal boxes. The new boxes have to be rectangular prisms. You will evaluate one box design the company proposed. Then you will create and propose your own design for the company.

Requirements for the new boxes:
- The new boxes have to use less cardboard than the original boxes.
- The new boxes have to hold the same or a greater volume of cereal as the original boxes.

The company proposes a new cereal box with dimensions 10.5 inches high, 7.5 inches wide, and 4 inches deep. The new cereal box is a rectangular prism. Determine if this new box meets each of the requirements. Explain why or why not.

Design a new cereal box for this company. All cereal boxes are rectangular prisms. Then explain why your design is better for the company, based on the requirements.

In your response,
- give the dimensions of your box;
- explain how your box meets each of the requirements for new boxes.
Closing the Achievement Gap Through College

- Nationally, **only 9 percent** of low-income students earn a four-year college degree by age **25**, which is **8 times less** than their peers from high-income families.

- Citizen Schools alumni **enroll in college** at the same rate as students in the U.S. from all income levels and 1.5 times higher than for their low-income peers. The **graduation rate** is more than double the national rate for low-income students.
Return on Investment to Society: MacCalvin’s Pathway

MacCalvin Romain's Overview

Current
Senior Technology Analyst at Digitas
Curator at TEDxBeaconStreet
Data Collection Subcommittee at Massachusetts Science Technology Engineering Mathematics (STEM)
CEO and Co-Founder at Swag Media Entertainment
Volunteer - Citizen Teacher/Ambassador at Citizen Schools

Past
Associate Business Consultant at EMC Corporation
Senior Student Technology Specialist at Boston College: Information Technology Services
Technical Intern at Fidelity Investments

Education
Boston College
Boston Latin School

Recommendations
1 person has recommended MacCalvin

Connections
500+ connections

Websites
My Tedx Boston Talk
The Critical Role of Social Capital

HIGH-INCOME STUDENTS’ PORTFOLIOS OF COLLEGE APPLICATIONS

LOW-INCOME STUDENTS’ PORTFOLIOS OF COLLEGE APPLICATIONS

Tiana, Ithaca College

- A Posse Scholarship winner, graduated with honors from Codman Academy.
- Her first semester at Ithaca College was an academic shock for this high-achieving student. “It was my worst academic performance ever.” She earned Bs and Cs in classes in courses like anatomy and physiology, which she needs for her exercise science degree.
- Ithaca, a private liberal arts institution serving approximately 6,000 undergraduates, was a big adjustment for Tianna after graduating from a high school with fewer than 50 seniors at Codman, a charter high school in Dorchester.
- Although Tianna considered transferring to a school closer to home, she views her academic struggles first semester as a learning opportunity to help her grow. “You will fail at something, you’ll adjust the things you do and you’ll get better at it. That’s the big thing. You’ve got to learn it and get through it.”
- Tianna’s already taken the first steps to improve her grades by seeking out two tutors and building an academic support network with other exercise science majors on the basketball team.
Roobvia, College of the Holy Cross

- Roobvia earned several scholarships and a substantial financial aid package from her university and shares that she is "lucky to be financially stable".
- She participated in the one-week Odyssey program, which connects incoming international students and students of color to faculty members and organizations which will support their college transition.
- In her first year, earned a B average as a pre-med and music double major.
- She attends office hours regularly, forms study groups and “rewrites her notes until they are memorized”
US2020: Moments of Discovery

Our guiding theory: experiential, sustained engagement with underserved students

- High-impact STEM mentoring
- STEM career interest
- STEM career access
- Equity, economic stability

For more information, visit: http://us2020.org/city-competition/
US2020: High-Impact Mentoring

US2020 supports mentoring engagements that include these elements:

- Underserved K-20 students
- In- or Out-of-School Time
- About 20 hours per volunteer
- STEM professionals
- Hands-on learning
- Measure student interest, participant satisfaction

For more information, visit: http://us2020.org/city-competition/
US2020: Movement-Building

- Our goal: 1 Million Mentors
- Building a movement
  - Presidents Obama and Clinton, CTO Todd Park
  - Cisco, Cognizant, SanDisk, Tata Consultancy Services

For more information, visit: http://us2020.org/city-competition/
City Competition: Overview

**Why**
- Exciting local work already happening
- Competitions jumpstart new action

**What**
- Local resources and ideas + US2020 support

**Goals**
- Identify challenges and best practices
- Showcase outstanding efforts
- Build effective, national movement

For more information, visit: http://us2020.org/city-competition/
City Competition: Why apply?

Benefits to applicants

$1M package (cash and in-kind) split between 3-5 cities
- $50,000 cash + $50,000 match
- 3-5 service corps members
- Online platform
- Consulting services

Value added for all participants
- Action catalyzed within community
- Implementable plan
- Recognition as STEM leader

For more information, visit:
http://us2020.org/city-competition/