

[Cover sheet]

Basic Information

Science from Scientists

In-School Module-Based (ISMB) STEM Enrichment Program

Executive Director and Founder: Dr. Erika Angle

COO and administrator: Amanda Schutt (703-994-6542 / amanda@sciencefromscientists.org)

II. Goals & Objectives

Each grant award under the @Scale initiative target one or more goals of the state STEM Plan. In this section, we want to learn about your project's success in achieving these goals. (Note that under STEM Plan 2.0, the STEM goals have been renumbered). Please provide information about the following:

- List the state STEM goals of your project and anticipated outcomes.
- What statements, if any, can you make regarding increases in the number/percentage of your target audience(s)?

Goal 1. Increase student interest in STEM areas.

In the 2014-15 academic year, the ISMB program was evaluated by a third-party group called PEAR (Program in Education, Afterschool, and Resiliency) a joint initiative of Harvard University and McLean Hospital. The PEAR survey was designed to assess the quality of STEM learning opportunities and how they affect student interest in STEM. SfS contracted with the PEAR survey team to measure the change in students' attitudes towards STEM at a sample of our partner schools. Their results showed that students reported significant gains in critical thinking and relationship development with both peers and adults as a result of their participation in the our In-School Module-Based STEM Enrichment program. Results from the PEAR survey also indicated that the ISMB program had a significant positive impact on students' perceptions of grit, flexible thinking and teamwork/collaboration in STEM. As a result of our during school program, the following are the percentage of students surveyed that expressed improvements in the following areas: 82% of students reported feeling more interested in science-related careers as a result of the during-school program, 56% of students reported improvement in Science Interest, and 87% reported improvement in Critical Thinking and Perseverance.

Goal 2. Increase student achievement among all PreK-12 students in order to prepare graduates to be civically and college and/or career ready. (Note: This goal combines the former goals 2 & 3.) The overall goal of Science from Scientists' ISMB STEM Enrichment program is aligned with our mission – we want to improve student attitudes and aptitudes in STEM. In the short term (over the course of one academic year), our goals are 1) to see measurable, positive increases (i.e. +10% or more) in Science, Technology and Engineering (STE) MCAS scores for 5th grade students and measureable, and 2) to see positive increases (i.e. +10% or more) in pre/post quiz scores for all students. For our first goal, we have observed a 25% increase in the number of students scoring Proficient or Advanced on the 5th grade STE MCAS. For our second goal, the pre/post quizzes administered with each lesson have shown an ~10% improvement in STEM knowledge retention after SfS visits. As we serve many of the same teachers year over year, our goal is to maintain at least 95% of teachers reporting being “extremely satisfied” with SfS in their classrooms. Third, teacher surveys in the 2014-15 academic year demonstrated 95% “extreme satisfaction” with our program.

III. Implementation

We are interested in learning about the success that your project has had in scaling to a new region or population this year.

- Please describe the successes that have had in implementing your project via Phase II grant dollars of @Scale funding.
- Did you incur any unforeseen obstacles? If so, what did you do to overcome them?
- If you have not met your implementation goals, what can we do to support you?

- Have you retained implementation sites from previous years and, if so, how? (For where do the funding and resources come?)

During Phase II of the @Scale expansion, we allocated the award money from the @Scale grant towards expanding our ISMB program into a new location: Worcester - a gateway city. We opened our Worcester office in April 2015, and promoted one of our experienced instructors, Dr. Payal Patel, as the Director of Worcester Operations. From April through the start of the academic year in September, Science from Scientists staff worked on various aspects of the expansion. Through a connection made at a Central MA STEM Network event, we were able to find a shared office space at Running Start in Worcester, along with the creation of a secure kit closet for our lesson materials. We met with the Chief Academic Officer for the Worcester Public Schools to choose two schools to pilot our program in the region: Burncoat Elementary School and Chandler Magnet School. In our initial proposal, our goal was to pilot in two schools but we were able to secure an additional sponsor for a new partner school in Leicester, the Leicester Memorial Elementary School. We therefore exceeded our expansion goal of two schools. Over the summer, our staff duplicated kits for the Worcester office, in order to have lessons available for Worcester staff to take into our partner schools throughout the year. We also hired three part time instructors to provide provide our core STEM programming at each partner school. Our expansion was celebrated at a Ribbon Cutting Ceremony at Burncoat Elementary School on September 17, 2015, with representatives from Worcester Public Schools, the MA. Department of Higher Education, Lieutenant Governor Karyn Polito, and other distinguished guests.

Between Phase I and II of the @Scale award expansion, Science from Scientists created a Funding Scalability Strategy to help maintain our current partners as well as address the many schools on the waitlist. For the current school year, the ISMB program is serving 5,000 students in 43 schools in Massachusetts and California. We currently have a 20+ school wait list for our program. The purpose of our funding scalability strategy is to have partner schools eventually contribute to the cost of the program, thus helping us to shift our resources towards our waitlisted schools and allowing us to scale the program more rapidly. Our funding scalability strategy works as follows: SfS will subsidize the cost of the program for the first two years, through donations and grants, in order to give schools an opportunity to experience the ISMB program and for us to demonstrate our measurable impact. During our second year of programming, SfS works with the school/district to start various fundraising initiatives to ensure that they can begin to bear the partial cost of the program during the third year. The partial subsidy by the schools of the SfS program is called 'Fund Local'. By the fourth year, the school and its local supporters will be able to support the program for as long they desire our partnership to continue. In cases of funding hardship, SfS is committed to finding a way forward; as long as the school is committed to working with us, we will find a way to keep the program going. Since launching our funding scalability strategy, 81% of eligible schools are contributing to funding the program at their school. In total, \$235K (24%) of our total ISMB program budget is currently coming from fundraising efforts driven by schools and districts. This strategy has been extremely effective in helping SfS to build deeper relationships with our current partner schools as well as leverage corporate/foundation dollars towards our waitlisted schools. Most importantly, this strategy establishes credibility amongst many school districts, and confirms to prospective supporters that schools see the positive impact of our program and are willing to provide financial support for their students to have access to real scientists on a regular basis, delivering hands-on lessons in STEM in a process that is both cost-effective and scalable.

We did not face any specific challenges relating to our Worcester expansion however, as an organization, there are always challenges faced by non-profit organizations. We make an effort to try and mitigate that risk, but the following could be areas of improvement. First, it would be extremely valuable to be able to track student career choices after they have gone through our program. Due to student privacy issues, it has not been possible for us to do this to date. However, we have had numerous students who have gone through the program return to us while in high school, stating that they have decided to pursue careers in STEM because of their experiences with SfS. We hope to be able to work with schools and districts in the future to better track student career choices in the future. Second, beyond funding, our greatest challenge is that of staffing. Based on our rigorous interviewing process, it can sometimes be challenging to find the right charismatic scientist(s) to join our team of instructors. Many scientists are not used to explaining scientific concepts at the 5th grade level. We are working on tapping into various communities to find appropriate candidates for our instructor position openings. Third, although we offer a professional development program for teachers, we have not been able to entice more than 5-10% of them in taking part in the program. We are in the process of amending the PD program to provide graduate credit for teachers. We hope that over the next year, this will incentivize more classroom teachers to participate, thus expanding their STEM knowledge and comfort level.

IV. Scale

- Please list the targets from your proposal which you have successfully met for scaling your project.
- If you had specific geographic areas of sites where you were unable to successfully scale, please the difficulty you encountered. Were you able to modify your plans to meet comparable targets?
- Describe and quantify additional scaling opportunities that have arisen as a result of your implementation projects. Have you received requests to expand your project or to bring it to a new site?

We set and met three targets to successfully scale our project.

1. Our first goal was to find space for a new office. We opened a new office location in Worcester in April 2015 which includes office space as well as a storage closet for the science module kits.
2. Our second goal was to hire a Director for this region. We promoted one of our instructors as the Director of Worcester, Dr. Payal Patel, who is familiar with region.
3. Our third goal was to add two new pilot schools in Worcester. We successfully expanded to the Greater Worcester area with the ISMB program running in two Worcester school (Chandler Magnet and Burncoat Elementary). In addition, we were able to secure additional funding for a third partner school in Leicester, the Leicester Memorial Elementary School.

We did not have any specific challenges with scaling to this new region.

In terms of additional scaling opportunities, our partnership with the Worcester Public Schools will play a central role in expansion in the region, as there is a high amount of need for STEM programming in the city. The Chief Academic Officer & Director of STEM are keen to add more schools to our list of current partners as SfS funding and staff becomes available to the region. As

mentioned above, one of our challenges is finding the right charismatic, role model scientists to bring into our partner schools to deliver our exciting hands-on STEM content. For the Greater Worcester area specifically, we are focusing on partnering with the universities and medical system to find instructors. The creation of our Instructor Career Tracks within the organization, that allow our staff to grow from part-time hourly teaching positions into full time roles, continues to attract a number of new potential candidates and helps us retain the instructors currently teaching for the program in Worcester.

V. Outputs, Outcomes & Evaluation

@Scale is a state initiative, supported by the MA STEM advisory council, to focus public and private resources in support of an integrated portfolio of education enhancement projects aligned to achieve the goals of the Commonwealth's STEM plan. Bear this essential premise in mind:

- Describe the significant results and key outcomes, including major findings, developments, or conclusions (both positive and negative) in achieving your goals. What would you attribute as influencing factors for these outcomes?
- Quantify the number of students, teachers and/or workers impacted by your @Scale project. To what degree has your program achieved its target outcomes?
- Describe in detail the tools used to measure the impacts of your program. Explain your confidence in each tool's efficacy and reliability to assess program outcomes. How are you assessing the outcomes of your project within the context of the goals of @Scale? Did you incorporate formative evaluation findings into your project? What best practices have you learned and incorporated? (Please provide copies of your surveys and other evaluation tools. Please also provide the associated summative data.)

The goals of the program are to improve student attitudes and aptitudes in STEM. We measure the success of the program in several ways: by tracking Science, Technology/Engineering (STE) MCAS exam scores, by administering pre and post quizzes, by conducting teacher surveys, and by collecting third party assessment of student interest before and after the program.

First, for the STE MCAS administered in 5th grade, we observe the improvement in these scores, comparing scores before our program entered the school and after the school's participation in the ISMB program. The before score is calculated using a two year average of the percentage of 5th grade students scoring Proficient or Higher on the STE MCAS prior to SfS implementation. Once the program begins, we start tracking the percentage of 5th grade students scoring Proficient or Higher and compare it to the two year baseline. For schools where we have a long-running partnership, we taking a running average of the percentage every year since the program began. For the 2014-15 school year, SfS observed an average 25% improvement in the number of students scoring Proficient/Advanced on the 5th grade STE MCAS. For schools performing below the state average, the average percentage increase in STE MCAS scores after the ISMB program was 42%.

Second, each module we present to students contains a pre and post quiz that allows us to assess the effectiveness of each lesson as well as students' retention of the subject matter. Each quiz includes two multiple choice questions from released MCAS exams. The quiz is first administered as a pre-quiz before the lesson is taught, and then the same quiz is administered as a post-quiz two weeks later, prior to reviewing the material. During the 2014-15 academic year, SfS collected 88,000 quiz results that demonstrated the following percent improvements from pre- to post-

quiz by subject area (10% increase equates to a “letter grade” improvement in content competency amongst students in a classroom): 15% in Chemistry, 13% in Earth Sciences, 11% in Life Sciences, 11% in Physics, 6% in Engineering, and 6% in the Scientific Method.

Third, we collect teacher surveys twice a year, in January and June, to verify that our program is piquing students' interest in STEM and complementing teachers' STEM curriculum objectives. Teacher surveys have consistently demonstrated that our partner classroom teachers and administrators are on average 95% “extremely satisfied” with our work. Over 93% of our partner schools request us back year after year.

Finally, in the 2014-15 academic year, the ISMB program was evaluated by a third-party group called PEAR (Program in Education, Afterschool, and Resiliency). The evaluation included two parts, an observation by a PEAR evaluator and student pre-assessment in September, and an additional observation and student post-assessment in the late spring. Analysis was conducted by the PEAR team and results were shared with SfS. In the 2014-15 academic year, results showed that students reported significant gains in critical thinking and relationship development with both peers and adults as a result of their participation in the ISMB program. Results from the PEAR test also indicated that the ISMB program had a significant positive impact on students' perceptions of grit, flexible thinking and teamwork/collaboration in STEM. As a result of our during school program, the following are the percentage of students surveys that expressed improvements in the following areas: 82% of students reported feeling more interested in science-related careers as a result of the during-school program, 56% of students reported improvement in Science Interest, and 87% reported improvement in Critical Thinking and Perseverance. The PEAR assessment ranked SfS atop the list in positive outcomes in the above areas amongst the 28 different programs that participated in the study.

We attribute our success in achieving our goals to:

- our instructor recruitment and training (We seek candidates with advanced degrees, charisma and excitement for teaching children. We offer a 3 step apprenticeship training model for our instructors. They are paired with a mentor within the organization and providing coaching and professional development from our Teacher Liaisons, retired classroom teachers who now work for SfS part time)
- our program delivery model (a year-long partnership of scientists visiting every other week for the entire school year)
- our library of high-quality, MCAS & NGSS frameworks-aligned hands-on lessons that get students excited about science, help to build their content knowledge to perform better on exams, and to expose teachers to new ways to introduce and reinforce curriculum frameworks

Over the last 10+ years SfS has grown to be an organization employing 6 full-time staff, 38 part-time staff and 9 volunteers who are bringing their love and knowledge of science to communities across Massachusetts and California. SfS instructors are currently teaching our core In-School Module-Based (ISMB) STEM Enrichment Program in 43 schools in Massachusetts and California, providing programming to over 5000 students and over 190 teachers. Since it's founding in 2002, Science from Scientists has worked with over 20,000 students across Massachusetts and California. The @Scale grant has specifically allows SfS programming to expand to the Greater Worcester area, where we currently provide programming to 251 students and 10 teachers.

VI. Budget and Plan for Program Sustainability

Please account for your grant expenses to date by filling out Form 1A. In the comments box, explain any unusual or unexpected costs or activity. Also use the comments box to clarify expenses that do not fit nicely/align with the pre-designated expense categories. Within your report narrative, please tell us the following:

- Describe how the @Scale funds have been used to advance your project.
- Describe your experience in being able to raise external funding, including whether or not these funds came from a new partner, well established relationships, or other grant dollars. Additionally please indicate how much the @Scale designation has had on your ability to attract or retain funders.
- Describe any plans you have for sustaining your current work and for funding further expansion of your program. Do you anticipate other funding or support?

The award from the Massachusetts Department of Higher Education was \$50,000 of which \$25,000 was allocated towards our expansion including office space rental, kit duplications, and promoting Dr. Payal Patel to the Director of the Worcester office. The remaining funds (\$25,000) were allocated equally amongst the three new partner schools in the region (\$8,333 each). The additional support from Greater Worcester Community Foundation was a new source of funding for our organization and we look forward to the opportunity of drawing on local support in Worcester to help scale the program to this region and beyond.

In every grant we submit, we highlight the @Scale award to demonstrate the effectiveness and scalability of our during school program. Many of our current donors and prospective donors are very impressed with this award, especially when we highlight that only a handful of other programs were recognized.

We developed a funding scalability strategy to have schools contribute to the cost of the program at their school, after two free years where success has been proven and a relationship has been established. This strategy is helping us to leverage our corporate and foundation grants to support the many schools on the waitlist and allows us to strategize on which regions we can expand into next. In addition, we have many long term donors that are increasing their contributions year after year. For example, this year, one of our long term sponsors, Amgen, has increased their donation from \$20,000 to \$55,000. We hope to continue building our support amongst our current partners in addition to finding new sources of funding in the new communities we expand into.

Form 1a: Expenditure Worksheet

Please complete the expenditure worksheet below. In the first column, identify how you divided your grant among the identified expense categories. In the second column, list your expenditures to date. The third column will automatically populate with the difference (remaining balance). Make sure to sign and date this worksheet before submission and include any necessary explanations or comments in the "Comments Box".

Instructions: Double-Click on the table for it to become an interactive spreadsheet. Click outside the table to return to MS Word. ONLY FILL IN CELLS HIGHLIGHTED IN YELLOW: Non-Yellow cells contain formulas and will fill in automatically. Also, all cells are formatted for currency; you do not need to type in \$ signs.

Categories	Grant Funds Received		
	Grant Funds Received	Grant Funds Expended	Grant Funds Remaining
Total Salaries:	\$ -	\$ -	\$ -
<i>Administrator</i>			\$ -
<i>Support Staff</i>			\$ -
<i>Other</i>			\$ -
Fringe Benefits			\$ -
Contractual Services			\$ -
Travel/Transportation			\$ -
Total Supplies & Materials:	\$ -	\$ -	\$ -
<i>Curriculum</i>			\$ -
<i>Equipment</i>			\$ -
<i>Other</i>			\$ -
Training			\$ -
Tuition & Stipends			\$ -
Evaluation			\$ -
Other (Identify)			\$ -
Other (Identify)			\$ -
Indirect Costs (10% Max)			\$ -
Total	\$ -	\$ -	\$ -

Project Name/Organization:

In-School Module-Based STEM Enrichment Program/Science from Scientists

Project Manager: Dr. Erika Angle **Date:** Jan 21 2016

Comments Box

Contractual Services included building a Kit Closet in Worcester to house all of the supplies and materials.

Curriculum costs included duplication of kits for Worcester schools as well as development and revision of modules.

Training costs include the New Staff Trainings as well as All Staff Training meetings.

Other-Rent includes paying Running Start for shared space.