

Annual Report 2013-2014



Student Teacher Outreach Mentorship Program



Tufts UNIVERSITY | Center for Engineering
Education and Outreach

Manager's Executive Summary

The following is a report to document the 2013-2014 efforts of the Tufts University Center for Engineering Education and Outreach's (CEEO) Student Teacher Outreach Mentorship Program (STOMP). Provided in this report is an overview of the program, what happened this school year, changes from previous years, and planned changes for the future.

2013-2014 was a very active and exciting year for STOMP! In March, the first ever STOMP retreat was held at the CEEO, with over 10 STOMP stakeholders coming together to discuss the future of STOMP. STOMP fostered new partnerships with international educators and like-minded supporters from industry. Initiatives to encourage young women in STEM pursuits continued, with an added event co-sponsored with the Society for Women Engineers.

All programmatic changes planned for last year have been successfully completed. A growing relationship between STOMP and the Novel Engineering Project (formerly Integrating Engineering and Literacy) continues to thrive. Two STOMP classrooms engaged in Novel Engineering units, and literacy related challenges were posed to students during several workshops. Additionally, STOMP has a brand new website, hosted through Tufts University and wordpress.com. Part of the new site is the "Activity Database," where STOMP fellows upload their lesson and unit plans. A new mission statement was also drafted.

In the upcoming year, STOMP will continue to progress. The STOMP retreat prompted thorough discussions about the future direction of STOMP. One major goal for the upcoming year is to jump start STOMP research, in effort to provide supporters of STOMP with true evidence of STOMP's success. Several changes in the role of STOMP fellows will occur as well, including renewed efforts in publicity, new meeting structures, and more responsibilities for executive board members.

Thank you for your interest in STOMP. I hope you share our excitement as the program continues to grow.

Jessica Scolnic
2013-2014 Program Manager



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The STOMP Model

What is STOMP?

The Student Teacher Outreach Mentorship Program (STOMP) partners pairs of Tufts University students (fellows) with K-8 teachers in the greater Boston area. The mission of STOMP is to *improve K-8 education through engineering with a strong partnership between educators and university students. Through this classroom collaboration, K-8 students engage in meaningful engineering work with positive STEM role models while educators learn technical skills. University students gain first hand education experience, as well as engineering enrichment as they must truly master technical concepts in order to teach them effectively.*

STOMP was founded at Tufts University in 2001 from a generous gift from the LLL Foundation for three years. As part of the initial funding for STOMP, the LLL Foundation asked that STOMP investigate the sustainability and dissemination of such an engineering education outreach program model. By maintaining low overhead, the Tufts University program can sustain a large number of fellows on a small budget. Since 2001, STOMP has maintained a strong presence in the local community and has reached over 3,500 K-8 students.

The ‘S-T’ in STOMP: A Student-Teacher Team

Both members of the fellow-teacher team uphold a responsibility to contribute their respective expertise to the program and support each other's roles. The fellow's role is to enhance the engineering knowledge of the teacher and students including: developing a curriculum with hands-on engineering activities, creating resource materials, and providing assistance in the classroom. In turn, the responsibilities of the teacher include: helping the fellow become familiar with working in a classroom setting and integrating engineering across disciplines taught in the classroom.

How Does STOMP Work?

Fellows are paired based on experience, with new fellows paired with more experienced fellows. Together, fellows work with a classroom teacher to create a 10-week curriculum, implemented in once-a-week, hour-long visits to a local classroom. Fellows are trained in working in a classroom and implementing engineering design-based lessons through their more experienced partner and through weekly meetings. Weekly meetings provide opportunities to introduce new lessons, listen to guest speakers, discuss progress and problems in the classroom, plan for upcoming classes, and run other professional development workshops.

Tufts STOMP

STOMP Management



Chris Rogers
Co-Director of CEEO



David Hammer
Co-Director of CEEO



Meredith Portsmore
Associate Director
of CEEO



Elissa Milto
Director of Outreach



Jessica Scolnic
STOMP Manager

Executive Board



Nikita Saxena
Class of 2014



Emily Taintor
Class of 2015



Matt Mueller
Class of 2015



Ali Boreiko
Class of 2017



Leticia Lopez-Benitez
Class of 2014



Andrew Bennett
Class of 2015



Devyn Curley
Class of 2015



Jessica Swenson
Class of G17

Tufts STOMP

STOMP Statistics

This year's STOMP program consisted of a record breaking 60 fellows. These fellows worked in 28 classrooms, impacting approximately 560 K-8 students, the largest number in STOMP history!

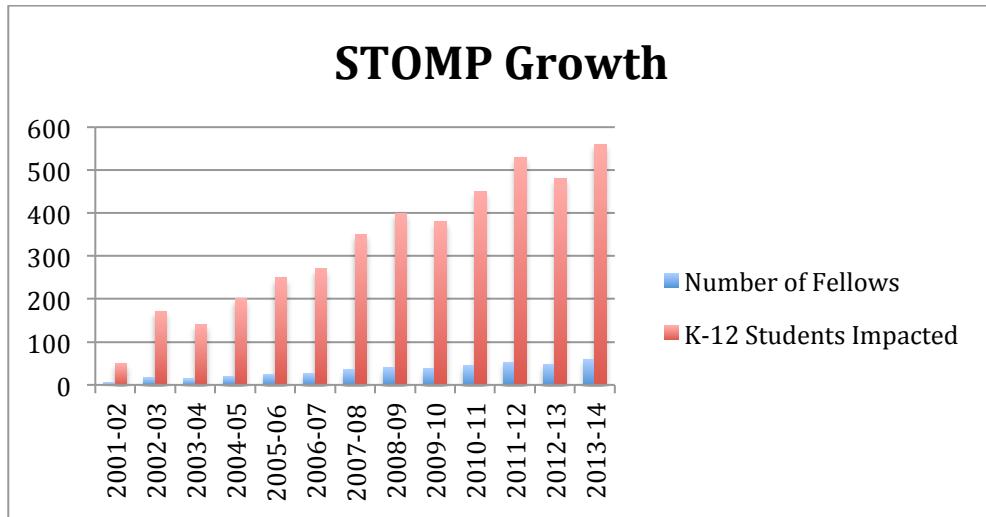


Figure 1: Number of fellows by year

The general make-up of the fellows maintained approximately a 70:30 ratio of females to males, which is highly unusual in a group comprised of mostly engineering students. Of the 42 female STOMP fellows, 27 are engineering undergraduate students and 6 are engineering graduate students. Therefore, 55% of STOMP fellows are female engineering students. This is a greater percentage than the total female population in the School of Engineering at 29% for undergraduates and 31% for graduate students. Overall, there are 48 undergraduate engineering students in STOMP, which make up about 9% of the total undergraduate engineering enrollment. The 27 undergraduate female engineers make up 17% of the total female undergraduate engineering enrollment.

Fellow Class Distribution	
# of freshmen	12
# of sophomores	17
# of juniors	12
# of seniors	12
# of graduate students	7
Fellow Gender Distribution	
# of female fellows	42
# of male fellows	18
Fellow School Distribution	
# of fellows in Arts and Sciences	12
# of fellows in Engineering	48

Figure 2: STOMP fellow statistics

Tufts STOMP

STOMP Statistics

Mechanical engineering is the most common major amongst fellows (35% of fellows). Other represented engineering majors included computer science, environmental engineering, chemical engineering, electrical engineering, civil engineering, human factors engineering and biomedical engineering. Fellows in non-engineering majors make up 20% of STOMP; these majors include physics, mathematics, human factors, biology, economics, and child development.

The 28 participating classrooms this year were spread across five local communities and 12 schools. As in previous years, fifth grade was the most represented grade in STOMP with 11 classrooms but other elementary and middle grades were also represented.

Participating Schools	
Somerville	Arthur D. Healey School, Dr. Albert F. Argenziano School
Medford	St. Joseph's School, Eliot Pearson School, Columbus Elementary, Brooks School
Cambridge	International School of Boston, Vassal Lane Upper School
Winchester	Vinson Owen Elementary School
Boston	Josiah Quincy Elementary School, Hurley School, Winship Elementary School
Number of Classrooms by Grade	
Kindergarten	1
Second	2
Fourth	8
Fifth	11
Sixth	2
Eighth	1
Combined 6-8	3

Figure 3: STOMP classroom statistics

A main goal of STOMP is to provide services to students in need in the communities most immediate to Tufts: Medford, Somerville, and Boston. In 2013-2014, nine schools out of the participating twelve were in these areas. Below is a table of free lunch and ethnic distribution for these schools during the 2013-2014 school year:

	Free/Reduced Lunch	African Amer.	Asian	Hispanic	White	Native Amer.	Multi-Race
Boston*	75.3	15.0	21.8	43.5	16.1	0.1	3.6
Medford*	31.3	15.6	6.2	9.3	64.3	0.0	4.7
Somerville*	67.4	9.6	9.1	43.8	35.1	0.1	2.5

*Averages

Figure 4: Free Lunch and Ethnic Distribution for STOMP Supported Schools in Core Tufts Communities

Tufts STOMP

Checking in with STOMP Alumni

Tory Sims, B.S. in Environmental Engineering, 2013

Participating in the STOMP program at Tufts played a large role in both my Tufts experience and my understanding of the engineering mindset. STOMP was a great place to meet engineering students in many different engineering majors with different backgrounds, and I became close friends with many people I worked with at STOMP. I really appreciated this network throughout my time at Tufts, and I have connected with STOMP Alumni since I have graduated as well.

Planning lessons and having discussions about how best to teach fundamental science and engineering concepts such as the engineering design process, complimented my Tufts degree in environmental engineering. In addition, working as a teaching fellow and serving on the STOMP executive board gave me an opportunity to further develop my public speaking and leadership skills.

Currently, I am pursuing a Master's degree in Environmental Engineering and Science at Stanford University. Participating in the STOMP program and being connected with the many graduate students in the CEEO definitely was part of the reason I chose to pursue a graduate degree. My time with the STOMP program also instilled in me a passion for engineering education. I have continued to attend lectures and read articles about strategies for teaching engineering and science, and I hope to always be involved with engineering outreach programs throughout my career.



Figure 5: Tory Sims (E13), Graduate Student at Stanford University

Tufts STOMP

Meeting Schedule: Fall 2013

In the fall semester, the meetings focused on exposing STOMP fellows to new ideas in education. Many guest speakers were brought in to provide expert opinions on innovative ideas for STOMPerers to consider in their teaching.

Fall Semester 2013

- 9/11/13 A meeting only for returning STOMP fellows. Discussion of goals for the year, how to start the semester off on the right foot, mentorship, and get to know you games.
- 9/18/13 First full meeting of the year. Professional Development Day 1: what to look for in classroom observations and how to begin to develop a curriculum.
- 9/23/13 New STOMP fellow training session. Including but not limited to: a brief history of STOMP, fellow roles and responsibilities, logistics, and an overview of the engineering design process.
- 9/25/13 Professional Development Day 2: introduction to documentation, small group discussions of overall curriculum goals.
- 10/2/13 Professional Development Day 3: viewing and discussion of research video of a STOMP teacher to explore interpretation of student ideas, and understanding student thinking. Education Specialist, Lija Yang, discussed how to have meaningful dialogues with your students.
- 10/9/13 Small group work: designing a new, innovative activity.
- 10/16/13 Executive Board member, Jessica Swenson, led a discussion about student engineering testing. That night, the first annual STOMP teacher open house was held: teachers were invited to the CEEO to mingle, hear about CEEO innovations, and discuss professional development opportunities.
- 10/30/13 Educator in Residence, Dan Wise, gave a presentation about Project Based Learning.
- 11/6/13 CEEO Ph.D. student, Brian O'Connell, discussed how to strive for a diversity of solutions in the classroom.
- 11/13/13 Small group discussions to troubleshoot different classroom problems such as communicating with your teacher, tailoring activities to a wide range of abilities, and how to design a final project.
- 11/20/13 Human Factors Professor, Dan Hannon, presented on considering human factors when designing lessons, and how to bring human factors concepts to your STOMP students.
- 12/5/13 End of semester surveys. STOMP fellows also wrote recommendations for their classroom for spring semester.

Tufts STOMP

Meeting Schedule: Spring 2014

In the spring semester, meetings centered more on small group discussions and ways to be successful in curriculum design. STOMP fellows had the chance to troubleshoot issues they were having in their classes, and use the expertise and experience of their fellow STOMPer.

Spring Semester 2014

- | | |
|---------|---|
| 1/15/14 | Curriculum Development Day 1: Education Specialist, Lija Yang, led a discussion about focusing on learning goals when designing STOMP units. Fellows did an abbreviated curriculum mapping activity for practice. |
| 1/22/14 | Curriculum Development Day 2: Small group discussions to develop learning goals and curriculum maps for chosen unit topics. |
| 1/29/14 | Veteran STOMP fellows shared reflections on past units or activities, for example: incorporating storytelling into your units, and developing assistive technologies. |
| 2/26/14 | Small group discussions about instructional challenges, and forming learning goals for robotics activities for students of different ages. |
| 3/5/14 | Small group discussions to share classroom updates. Fellows using Snap Circuits in their classrooms participated in a focus group about the technology. |
| 3/12/14 | Fellows took time to update their entries in the activity database. Also, Brian O'Connell's "simple circuits" technology was explored as an option for future classroom use. |
| 3/26/14 | Professor of Child Development and Director of the DevTech research group, Dr. Marina Bers, gave a guest lecture. |
| 4/2/14 | Lija Yang and Elissa Milto, Director of Outreach, collected instructional challenges fellows faced and answered questions on how to stay calm in a chaotic STOMP class. |
| 4/9/14 | STOMP fellows shared final projects their classes worked on, and fellows met in small groups to discuss the last few weeks of their curriculum. |
| 4/16/14 | STOMP fellows participated in a "Sorting Party" to get LEGO kits ready for the summer. |
| 4/23/14 | End of semester surveys |

Tufts STOMP

In the Classroom

This year, STOMP fellows spent a lot of time learning about curriculum development, as well as attending to student thinking and working to become responsive teachers. Many guest speakers in the fall semester inspired students to try out new things in the classroom, as well as ask themselves some tough questions about teaching and learning. Some creative units designed by STOMP fellows include:

- **Building a Carnival with WeDo and Scratch:** Andrew Bennett and Emily Taintor
- **Magnetism, Electricity, and Alternative Fuels:** Catherine Coughlin and Keren Hendel
- **Engineering a Green City:** Katie Davis and Jorge Anton Garcia
- **The Engineering Design Process with LEGO EV3:** Marya Schnedeker
- **Designing Assistive Tech for the Classroom Next Door:** Alex Pugnali and Geena Lucibello
- **Detective Engineering:** Hannah Garfield and Kirsten Jorgensen

Below is the outline of Geena and Alex's assistive technology curriculum that they created. It can be found on the STOMP Activity Database, Spring 2014.

Week	Lesson
1	Introduction to Service Learning: Animal Disabilities Students were given a stuffed animal with "paralyzed limbs," and asked to think about all the actions that animal performs. Students then built something to aid the animals in performing those tasks.
2	Introduction to Service Learning: Animal Disabilities Students worked for a second week on their projects, and shared what they created with the class, discussing challenges and triumphs.
3	Classroom Partnership Day 1 Students with varied physical and mental disabilities in another class at JQS came to our class to participate in STOMP. As a Valentines Day treat for both classes we had the students make Candy Pushers. A brief lesson was given about programming directly on the brick (the NXT car was already built, students just had to add something to push the candy with.) After STOMP, students from the STOMP class were directed to either not use their dominant hand, or not speak for the rest of the day. They then wrote a journal about their experience.

Tufts STOMP

4	Classroom Partnership Day 2 During the second day of the classroom pairing, our STOMP students visited the partner class. While they were there, they interviewed both the teacher and the students about things in their classroom that they don't like, or things that they feel could be improved. Then students participated in a paper airplane challenge. Students were split up into pairs and were each given a different handicap (the inability to speak, hands tied together, arms tied to torso, hands tied to a partners, and the inability to move wrists or fingers). Students worked together to make a paper airplane.
5	Final Design Project: Brainstorm We had students reflect on the experiences that they had with the students from the partner classroom (the activities they did together, visiting their classroom, and the after-STOMP challenge). Then, as a class, we wrote down some difficulties that those students had that we could help make better using engineering. Then we had students split up into pairs and choose one problem and brainstorm solutions. After all the students wrote down their ideas we discussed how helpful and plausible (based on technology, material, and time constraints) each idea was. As a class we narrowed it down to six projects.
6	Final Design Project: Plan, Design, and Request Materials In their groups, students planned and drew prototypes for their projects. Students then began working on their projects with the basic materials that we brought (cardboard, Styrofoam, hot glue, felt, string). We told them to be specific about any extra materials that they were going to use because we would bring everything on their list the following week. The students with disabilities from the other class joined our students for STOMP.
7	Final Design Project: Construction Students finished building their projects without the help of the other class. Those who finished early prepared for their presentation the following week.
8	Final Design Project: Presentations The students from the partner class came back to watch the presentations. They stood alongside the groups that they worked with on Week 6 and helped present and model the things that were made.

Figure 6: Sample STOMP unit outline

Tufts STOMP

Publicity

For the sixth year in a row, T-shirts were made for all of the fellows to both advertise the program to the Tufts student body and to thank the fellows for their hard work. STOMP manager Jessica Scolnic created the design.

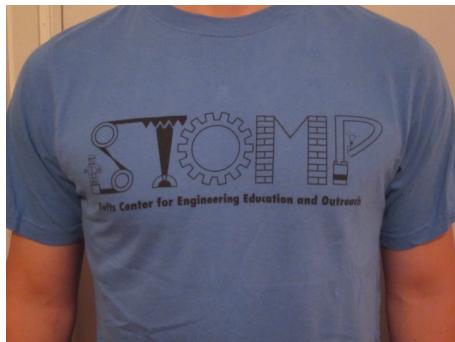


Figure 7: Front view of the STOMP T-shirt

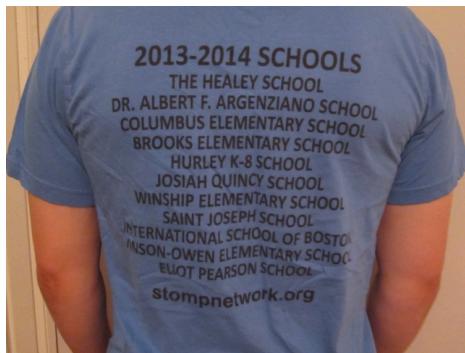


Figure 8: Back view of the STOMP T-shirt

The T-Shirts were used in a publicity stunt on April 25, 2014 to raise awareness for STOMP. Most students participated, and the blue shirts were seen all over campus.

Additionally, some of last year's remaining green STOMP shirts were raffled off during a fall publicity event on October 11, 2013. This event, organized by Executive Board member Devyn Curley and STOMP fellow Catherine Coughlin, took place on the Campus Center patio. STOMP fellows staffed a table with balloons, LEGO activities, candy, and information about STOMP. They also gave away STOMP job applications. The purpose of this event was to get the word out about STOMP in a casual setting, and publicize the program in a highly trafficked area of campus. The event was such a success that more are being planned for the 2014-2015 year.

What Happened in 2013-2014

Financial Statements

STOMP's expenditures for fiscal year 2013 (2013/2014 academic year) totaled \$71,897. Additional support comes from the Service Learning grant (Tufts Department of Civil and Environmental Engineering) and the Tufts School of Engineering Dean's Office, which supports the STOMP Manager position.

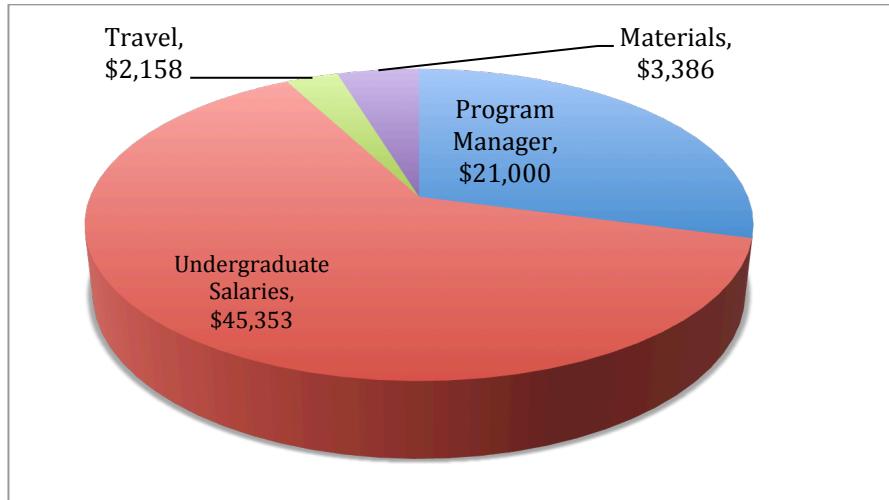


Figure 9: STOMP fiscal year 2013 expenditures: \$71,897

STOMP continues to be supported by carry-over from the LLL Foundation gift challenge and other previous grants and gifts. This year saw a marked increase in donations. A series of workshops took place during 2012-2013, generating \$8,250. STOMP also received material donations totaling \$4,280 from LEGO (EV3 kits) and Elenco (Snap Circuits kits.)

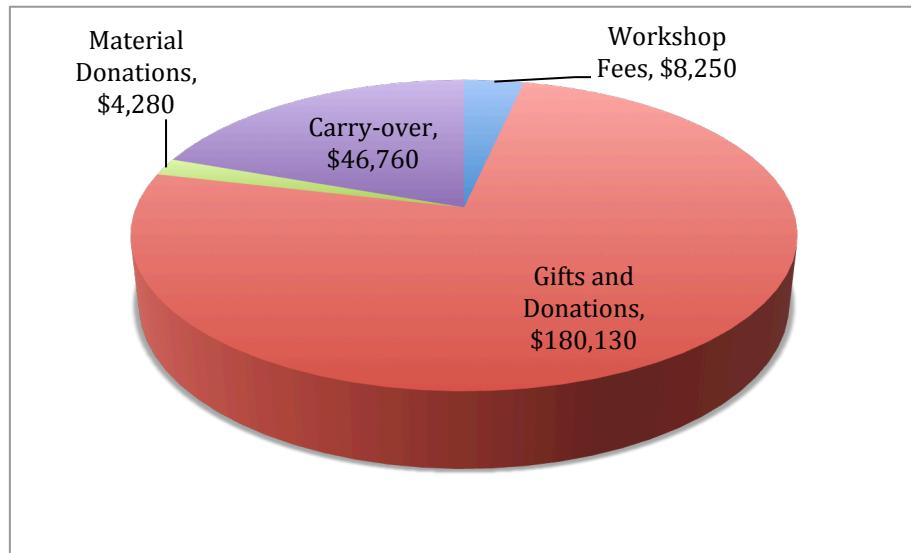


Figure 10: STOMP fiscal year 2013 revenue: \$239,420.

What Happened in 2013-2014

STOMP Funding

In fundraising results for fiscal year 2014, generous friends and alumni/ae made gifts and pledges to STOMP totaling more than \$200,000. This support will maintain the excellence of STOMP and is providing operating funds, seed funding for new initiatives, and \$120,000 for a STOMP challenge campaign which began in the spring. We thank our 2013-14 donors Victoria Sims, Eric Fournier, Jordyn Wolfand, Natalie Varner Matson and five anonymous donors for their generous gifts.

We are excited to report that we have raised more than \$50,000 so far in the first year of the STOMP matching campaign! Help us reach our goal of \$120,000 in 2015. **Your donations will be matched dollar-for-dollar.** Make your mark on STOMP this year and give today.

Join us by visiting Tufts University's secure donation site http://giving.tufts.edu/make_a_gift/ and label your donation as CEEO-STOMP.



What Happened in 2013-2014

STOMP Retreat

On Friday, March 7, 2014, the first ever STOMP Retreat was held at the CEEO. Anyone deeply invested in STOMP was invited to attend, including past STOMP managers, CEEO alumni, education specialists, and select STOMP teachers. STOMP Executive Board members attended portions of the half-day workshop.

The following people were in attendance:

Merredith Porstmore, Associate Director, CEEO
Elissa Milto, Director of Outreach, CEEO
Jessica Scolnic, Manager of STOMP, CEEO
Daniel Wise, Educator in Residence, CEEO
Steve Cohen, Senior Lecturer, Tufts Department of Education
Linda Beardsley, Senior Lecturer, Tufts Department of Education
Magee Giarrosso, Administrative Assistant, CEEO
Lija Yang, Education Specialist, CEEO
Adam Carberry, CEEO Alum and Assistant Professor, Arizona State University
Michelle Wilkerson-Jerde, Assistant Professor, Tufts Department of Education
Erin Riecker, CEEO Alum

After introductions and a STOMP update by Merredith and Jessica, attendees broke into small groups to discuss the most pressing issues facing STOMP this year. The first discussion centered on programmatic elements of STOMP: how to improve the STOMP experience for all parties involved. There were two major parts to this topic: the role and support of the classroom teacher and continued development of STOMP fellows. The second discussion was about impact measurement: how to better measure and/or document the impact of STOMP. This discussion focused on possible research directions, and the different ways those research goals could be accomplished.

Merredith, Elissa, and Jessica met after the retreat to compile a list of planned changes for the upcoming STOMP year. These changes are detailed starting on page 30.

What Happened in 2013-2014

Collaboration with CEEO Partner Masao Ishihara

Last March, CEEO Advisory Board Member and Japanese educator, Masao Ishihara, brought a group of female high school and college students to the CEEO for a robotics workshop. This program continued during the 2013-2014 school year. On March 26-28, 2014, 12 female students from Japan in high school or college came to the CEEO. They completed robotics challenges such as “Build a Chair for Mr. Bear,” “Robo-Zoo,” and “Design and Make a Toy.” The students also heard from guest speakers Jessica Swenson and Elissa Milto about topics like being a woman in engineering, and the research work done at the CEEO. Graduate students from the CEEO joined the group for lunch one day to share experiences.

Based on the success of the workshop, a stronger partnership between Masao and the CEEO is being fostered. Manager Jessica Scolnic and STOMP fellow and CEEO graduate student Marya Schnedeker traveled to Japan from July 30 – August 12, 2014, to meet with educators, students, and university professors. Marya and Jessica held workshops with educators and students, as well as gave several presentations about the work of the CEEO throughout Japan.

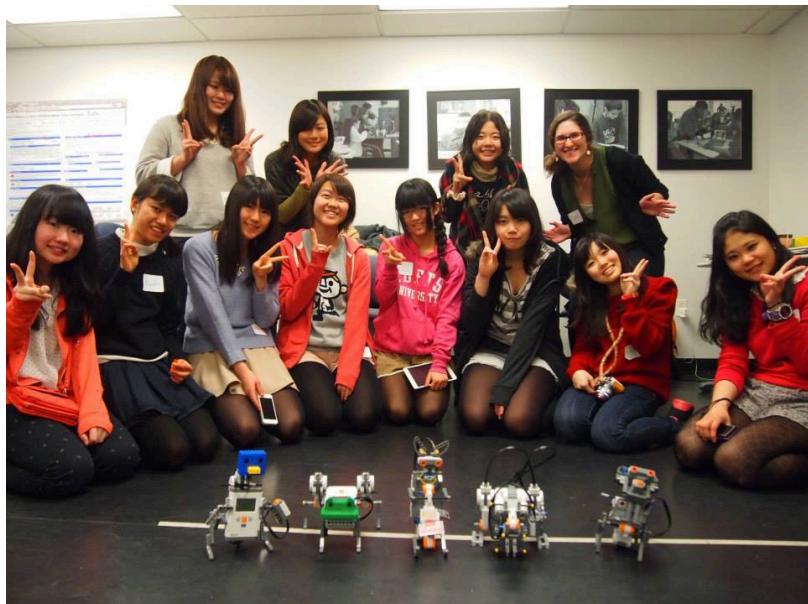


Figure 11: Students from Japan visit CEEO for an NXT workshop

What Happened in 2013-2014

Collaboration with Elenco® Technologies

In October of 2013, representatives from the educational toy company Elenco® visited the CEEO. After meeting with manager Jessica Scolnic, a partnership was started. Elenco® generously donated 13 basic Snap Circuits kits, as well as alternative energy kits to STOMP, in exchange for classroom testing, technology, and curriculum development reports. Snap Circuits kits quickly became a classroom favorite in STOMP classrooms, due largely to their convenience and easy intro for students to electronics and circuitry. STOMP teachers love the hands-on, no mess approach to electricity lessons, a major topic on the elementary school MCAS (Massachusetts state standardized tests.) A report was submitted to Elenco® on March 25th, outlining the work done in STOMP using Snap Circuits.



Figure 12: Snap Circuits in a STOMP class at JQS

What Happened in 2013-2014

G-TEC: Weekend Engineering for Girls

On Saturday, March 8th, 51 girls in grades five through eight came to Tufts University for a free, day-long workshop entitled G-TEC: Girls at Tufts Engineering for the Community. Throughout the day, the girls took part in engineering design challenges all focused on helping the community. Research on girls' attitudes toward STEM indicate they are more attracted to professions in which they

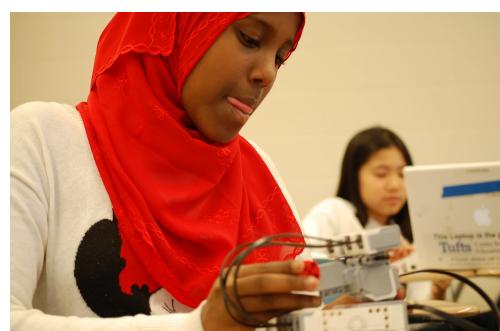
help people or give back to their community — all of our activities focused on designing for a user or client.



All girls participating in STOMP were invited to attend G-TEC, with special focus placed on inviting girls from the immediate Tufts communities such as Somerville, Medford, and Boston. 14 girls from Somerville, 16 from Medford, and five from Boston attended, as well as 19 girls from other surrounding towns such as Revere, Cambridge, and Malden. Twenty-four women in STEM volunteered to staff the event throughout the day. The volunteers were mostly graduate and undergraduate engineering students from Tufts, but also included one working engineer and one full-time teacher.

The morning included a rotation of three activities: designing an ergonomic sled for a LEGO minifigure, using EV3 Robotics to develop wearable assistive devices, and creating a device to help the main character from the book "Island of the Blue Dolphins." In the afternoon, the girls tackled three sustainability problems that included a way of conserving water while showering, a device to help manage compost, and a way of detecting if an item could be recycled or not.

There was an overwhelming interest from the community to participate in this event. We received over 100 applications for the 50 spots in our workshop. It was clear that the girls thrived in this environment. Before the formal design challenges were introduced, the girls spontaneously began to design LEGO doorstops to keep the door to their room open. When we entered the classroom to meet as a group, the girls had drawn diagrams of their working prototypes on the chalkboard, and there was a crowd of girls around the door testing out new designs. This unprompted display of enthusiasm was an amazing representation of the day: girls working together and being excited about engineering.



This unprompted display of enthusiasm was an amazing representation of the day: girls working together and being excited about engineering.

What Happened in 2013-2014

Continuation of W-STOMP Workshop

Made possible by a gift from Verizon in 2011, W-STOMP (Women in STOMP) is a program that focuses on engaging girls in engineering. While the Verizon gift has run out, W-STOMP continues to be an active part of STOMP.

This past July, 17 girls ages 11-14 came to the CEEO for a week-long engineering workshop at little or no cost: full scholarships were available to participating students. The girls engaged in a wide variety of projects, illustrated below. Participants began the week by creating personalized nametags using Tinkercad.com, a free, web-based 3D design program. Their nametags were then 3D printed through a partnership with the Mechanical Engineering Department. W-STOMP students learned the basics of programming with LabVIEW, using the in-development software called Botspeak (botspeak.org) and LabVIEW for LEGO Mindstorms to program the Arduino microcontroller and the LEGO EV3. This technology was used in service of a project where students designed and created automatic plant watering robots.

Students also engaged in a Novel Engineering project based on the book “Long Walk to Water.” The girls read a chapter from the story aloud, practiced carrying large amount of water to empathize with the main character, and then designed and created products to make her life easier. Students tested a new, web-based version of SAM Animation (in development at the CEEO) to document their design process.

The last project for the week was solving a problem for the staff and residents of Wolf Hollow, a wolf sanctuary just north of Tufts University. Problems were proposed by the staff of the facility, such as keeping the wolves’ water cool, giving them a way to exercise while getting food, and helping the staff throw many pounds of food over a tall and bulky fence.

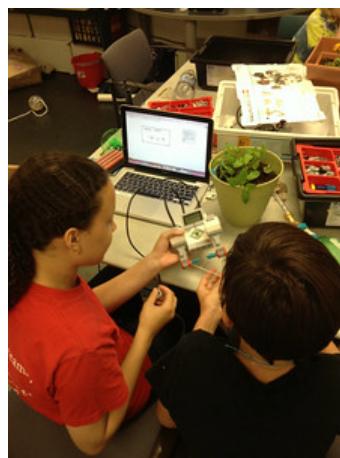


Figure 13: W-STOMP participants work on their plant watering robots.

What Happened in 2013-2014

2013-2014 Changes

The following changes were successfully implemented:

- **STOMP Website.** STOMP has maintained multiple websites for a number of years: stomppnetwork.org and stomppnetwork.org/tufts. After evaluating the needs of the program it was decided to combine STOMP's online material to one new site (STOMPPnetwork.org) with updated content and an updated format.
- **Novel Engineering Classrooms.** With the success of incorporating engineering service learning research into STOMP, this past year saw increased collaboration between STOMP and the Novel Engineering (NE) research project. Novel Engineering took place in two STOMP classrooms as well as at all STOMP-sponsored workshops.
- **Mission Statement.** STOMP is constantly in a process of improvement and adaptation. To help guide the program's new efforts while maintaining focus on its core goals, a new mission statement was drafted.



Figure 14: STOMP group photograph

What Happened in 2013-2014

STOMP Website

As proposed last year, a new STOMP website has been developed and is constantly being improved. The new site, hosted through Tufts University via wordpress, has two sections: the main site and the activity database.



Figure 15: STOMP main website: STOMPNetwork.org

The main site has recent publicity about STOMP, resources for fellows and teachers, photos, and information on what the program does and how to apply. The activity database has replaced last year's Trunk Wiki, and is where STOMP fellows document their classroom activities. STOMP fellows can fill out a form to upload either new unit documentation or new activity documentation. Other fellows can then comment on what is posted.

A screenshot of the STOMP Activity Database. The left side shows a search interface and a list of activities. The right side shows a detailed view of a specific activity titled "Capturing the Wind: Building a LEGO Anemometer". This page includes fields for Name of Activity, Author, Keywords, Subject, Grade Level, Time, Brief Description, Lesson Objectives, and Materials Needed. It also features a "Where am I?" breadcrumb trail and a "Popular Tags" sidebar.

Figure 16: STOMP Activity Database and example unit

Over the 12 year tenure of STOMP, many different documentation strategies have been tried in an effort to spark knowledge transfer between generations of STOMP fellows. The activity database has shown promising results in its first year, with most fellows posting well-documented units, linking to thorough activity descriptions. In the coming year, commenting will be emphasized more. During the summer, units and activities are in the process of being evaluated and re-organized in a way that will be useful to future STOMP fellows.

There has also been interest this year in opening up the activity database to similarly-minded programs around the world to encourage international collaboration around in-class engineering activities.

What Happened in 2013-2014

Novel Engineering Classrooms

One goal for the 2013-2014 STOMP year was forming a stronger partnership with the Integrating Engineering and Literacy (now called Novel Engineering) project. This initiative is well under way. STOMP had a Novel Engineering classroom in both fall and spring semesters during the 2013-2014 year. Additionally, Novel Engineering activities were done at G-TEC and the W-STOMP summer workshop, two STOMP-sponsored community outreach events.

In the fall semester, one STOMP classroom at Vassal Lane Upper School, with teacher Madvhi Patil and STOMP fellows Emma Coltoff and Brittany Lewis completed Novel Engineering Projects. A class of eight students, half of whom were English language learners, worked with six books over the course of a semester. Each student, or pair of students, worked on a different book, aligned with what they were reading in another subject.

One project completed by students was from the novel "A Series of Unfortunate Events: The Bad Beginning" by Lemony Snicket. Students identified that in the book, a city experiences a drought due to an excessive amount of heat coming in from the sun. STOMP students designed and created a dome to limit the amount of sunlight a city is exposed to. Other problems students tackled were: a boy who is being bullied in the book "Weslandia" by Paul Fleischman and characters who must escape a burning church in "The Outsiders" by S.E. Hinton.

STOMP fellow Emma Coltoff created a professional document outlining her experiences in this trial classroom. This document will be used in the upcoming year to design more Novel Engineering STOMP units.

In the spring, STOMP fellows Matt Mueller and Sarah Coppola engaged 4th graders in teacher Ben Garton's class at the Healey School in a Novel Engineering unit. One project completed in this class was using the book "Danny, Champion of the World" by Roald Dahl. The students had to design and build a device to get Danny's father out of a large pit. STOMPer Matt reflected that one of the lowest learners in the class excelled at this task, in a great moment that helped him see how STOMP was raising the confidence of his students.

What Happened in 2013-2014

Mission Statement

The following mission statement is an adaptation of that which was proposed at the end of the 2012-2013 year.

STOMP's mission is to improve K-8 education through engineering with a strong partnership between educators and university students. Through this classroom collaboration, K-8 students engage in meaningful engineering work with positive STEM role models while educators learn technical skills. University students gain first hand education experience, as well as engineering enrichment as they must truly master technical concepts in order to teach them effectively.

What Happened in 2013-2014

Publications and Presentations

In September 2013, the Tufts Daily published an article featuring the research projects of the CEEO and STOMP entitled: “Tufts’ Center for Engineering Education and Outreach brings STEM Education to local schools.” The article focuses on the CEEO’s mission to make engineering accessible to everyone.

“Tufts’ Center for Engineering Education and Outreach brings STEM Education to local schools” by Sarah Vivinetto. September 26, 2013.

<http://www.tuftsdaily.com/news/view.php/659344/Tufts-Center-for-Engineering-Education-a>

In November 2013, STOMP teacher Anna McCormick published an article on her classroom website about the activities her students were engaging in through STOMP. Anna featured photos and descriptions of the simple machines work her students did with the STOMP fellows.

“Engineering: Student Teacher Outreach Mentorship Program” by Anna McCormick. November 2013.

<http://www.msMcCormick5.com/stomp.html>

In April 2014, the CEEO and STOMP were featured on education innovator Neil Bramsen’s blog, “Purpose Based Learning – Education for the 21st Century.” This post occurred after Neil visited the CEEO.

“Purpose Based Learning – Education for the 21st Century” by Neil Bramsen. April 2014.

<http://neilbramsen.edublogs.org/churchill-fellowship-to-the-usa-and-uk-exploring-effective-stem-teaching/tufts-center-for-engineering-education-and-outreach-ceeo/>

In July 2014, manager Jessica Scolnic presented a paper co-written with Executive Board member Jessica Swenson about engaging all students in classroom robotics through STOMP at the Robotics in Education conference in Padova, Italy. After presentations, there was a discussion among teachers and engineers about the goals and direction of robotics in education.

Jessica Scolnic and Jessica Swenson (2014). Creative Classroom Robotics through the Student Teacher Outreach Mentorship Program. Teaching With Robotics/Teaching Robotics and Robotics in Education Conference, Padova, Italy.

Planned Changes for 2014-2015

Areas of Focus for 2014-2015

The following areas will be a focus for change during the 2013-2014 academic year. These changes may take more than one year to complete and may require multiple iterations.

- **Jump-Starting STOMP Research**
- **Improving STOMP Fellow Resources**
- **Growing the STOMP Reputation**
- **New Roles for Executive Board Members**
- **New Meeting Structures**



Figure 17: Fifth grade students in a STOMP classroom at the Josiah Quincy School in Boston

Planned Changes for 2014-2015

Jump-Starting STOMP Research and Evaluation

STOMP continues to be one the CEEO's most successful programs when we look at the number of undergrad participants, the number of classrooms involved, and the longevity of the program. However, measuring STOMP's impact on STEM learning and attitudes in conventional ways and understanding the dynamics of the complex relationship between fellow, teacher, and K-12 students continues to be a challenge. A focus of this next year will be exploring new evaluation measures to try and better capture how the program impacts all three of the stakeholders. In addition, we are looking to pilot measures for research that would look at understanding the dynamics of the impact of STOMP on stakeholders. Generous donations to STOMP have provided seed funding for this effort. However, a key component of extending this work to scale will be identifying funding specific to STOMP research.

Planned Changes for 2014-2015

Improving STOMP Fellow Resources

This summer, STOMP Executive Board member Alison Boreiko began developing renewed resources for STOMP fellows. This work will continue into the school year. Resources in development include:

1. **Formalized STOMP Units:** New STOMP fellows always request more formal curriculum resources to be used as a starting point in developing a personalized classroom plan. At least four example curricula will be developed and posted, based on tried-and-true units STOMP fellows have done in the past.
2. **Classroom Dossiers:** This year, we will test out keeping hard copies of folders for each classroom. As a resource for STOMPers, the folders will be filled with school calendars, information about the capabilities of their age group, past STOMP units done with the teacher, and past fellow reflections. This will be a trial year for the hard copy of the folders, to be kept in the CEEQ. We will reflect on testing electronic folders as well.
3. **Updated STOMP Fellow Handbook:** The STOMP Handbook, created in 2008, has fallen into disuse. This year, it will be re-worked for brevity and updated with new philosophies and strategies. We will advertise its existence and require all new STOMP fellows to read it at the beginning of their employment.
4. **Programming Assistance Tools:** New programming tools including, but not limited to, paper programming blocks will be created to support the new EV3 software. The conversion from NXT to EV3 robotics platforms will require all STOMP fellows to be re-trained

These resources will be found on the website, stompnetwork.org. The website will be reorganized to assure the resources are easy to find and accessible for STOMP fellows.

Growing the STOMP Reputation

Through a publicity committee started last year by STOMPers Devyn Curley and Catherine Coughlin, the STOMP reputation on campus is growing. See page 14 for information on last year's publicity activities.

In the upcoming year, the publicity committee will continue to spread the word on campus and in the community about STOMP.

Planned Changes for 2014-2015

New Roles for Executive Board Members

All Executive Board members will take on new responsibilities in the upcoming year, including interviewing new fellow applicants and having one-on-one meetings with STOMP fellows to approve new curricula. Additionally, there will be formalized leadership positions in efforts to grow the impact of STOMP beyond just what the manager can accomplish. The new roles include:

Publicity Manager: This Executive Board member will hold at least one publicity event each semester to encourage new students to apply and create a buzz around STOMP. The Publicity Manager will also keep the STOMP facebook page up to date with new activities, resources, and photos.

Media Manager: The Media Manager will handle photo release forms, as well as organizing for an official STOMP photographer to take one professional set of in-classroom photos each semester. The Media Manager will make sure all students in the chosen class have submitted photo release forms, and organize and edit the photos after the shoot.

Website Managers: One or two Executive Board members will be responsible for keeping up the STOMP website. Duties include: checking and posting STOMPer activity and unit submissions, uploading new website features such as “Activity of the Week” or “Star STOMPer,” and updating a website calendar with current events.

Other new roles for Executive Board members will be discussed and assigned as needs arise this year.

Planned Changes for 2014-2015

New Meeting Structures

At the STOMP retreat, one common theme when discussing STOMP fellow development was the highly varied experience levels of STOMP fellows. Some are brand new, just beginning STOMP for the first semester, while others have six or seven semesters of experience. Therefore, repeating the same meetings year after year with the same concepts, activities, or guest speakers, loses its utility for the more experienced STOMP fellows. This year, new meeting structures will be explored, giving new and different roles to fellows based on experience level. For example, veteran STOMPer will have the opportunity to give presentations, or sit on advice panels for newer fellows. While new fellows get trained in how to develop a curriculum, veteran fellows can discuss larger scale improvements to be made to the program. Different structures for Wednesday meetings will be tried and evaluated.

Additionally, at the beginning of the school year, all STOMP fellows will take part in an EV3 challenge — with their assigned STOMP partner, fellows will get an EV3 kit and one week to create something awesome! The STOMP fellows will share their creations at the next STOMP meeting. The purpose of this challenge is to ensure all fellows have proficiency building and programming the new EV3.

Appendix A

Free Lunch and Ethnic Distribution for STOMP Supported Schools in Core Tufts Communities by School

The following table is comprised of average data for participating STOMP schools in the Tufts core communities. The data comes from the Massachusetts Department of Education State Enrollment Reports from the 2013-2014 school year.

	School	Free/Reduced Lunch	African Amer.	Asian	Hispanic	White	Native Amer.	Multi-Race, Non-Hispanic
Boston	Josiah Quincy	78.5	16.2	56.7	15.5	7.9	0	3.7
Boston	Joseph J. Hurley	72.6	3.9	0	73.5	19.6	0	3
Boston	Winship Elementary	74.9	24.8	8.6	41.4	20.9	0.3	4
Medford	Brooks School	14.3	9.6	4.2	5.4	74.9	0	5.8
Medford	Christopher Columbus	48.3	21.5	8.2	13.2	53.6	0	3.6
Medford	St. Joseph's	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Somerville	Albert F. Argenziano	68.8	6.1	11.4	45.2	34.3	0.2	2.7
Somerville	Arthur D. Healey	66	12.9	6.8	42.3	35.8	0	2.2