Annual Report
2017–2018 Academic Year

Kids can... Think. Discover. Solve. Invent. change the world.

Tufts University
School of Engineering
Center for Engineering Education and Outreach
With the changing administrative organization of the Tufts Center for Engineering Education and Outreach (CEEEO), the position of the Student Teacher Outreach Mentorship Program (STOMP) manager is no longer filled by a graduate student. I graduated from Tufts in 2016 and STOMP was one of the highlights of my undergraduate career. After pursuing a master’s degree at the Harvard University Graduate School of Education, I returned to Tufts CEEEO full-time as the education specialist. In this position, I am able to devote the bulk of my time to the center’s outreach efforts, including STOMP and the STOMP Residency. Having been a STOMP fellow and workshop leader at Tufts CEEEO, the transition to STOMP manager was a smooth one. I had the benefit of knowing the culture of the center, and the needs of the STOMP fellows, so I was able to dive in immediately.

The work my predecessors have done has grown the program significantly since its founding. This year, we continued to run a large program that brought STOMP to forty-three local classrooms and employed fifty-six STOMP fellows. Despite the large program size, the STOMP fellows are still held to high standards of work ethic and curriculum. STOMP fellows are expected to bring high quality, engaging, and fun lessons to their classrooms. Many of our Wednesday meetings focused on curriculum development, classroom management, and child development to help develop these skills in our STOMP fellows. STOMP fellows had the opportunity to listen and learn about these topics from many guest lectures from the Tufts community. This year, STOMP fellows created diverse curricula that ranged in topic from robotics to current events. The addition of the Residency Program has also strengthened the program by increasing its diversity and better preparing students to become STOMP fellows. As both the Residency Program coordinator and STOMP manager, I was better able to integrate the two programs and plan to continue to foster this relationship in future years.

This year was the first year in which observations were done entirely by the program manager. While it meant a hectic few months of classroom travel for me, it gave me a great snapshot of what was happening in each individual classroom and an opportunity to provide productive feedback for every pair of STOMP fellows.

This year, Tufts CEEEO was also awarded a National Science Foundation grant to study role models in engineering education. This study is examining the roles of the STOMP fellows in their classrooms and observing if the students view the STOMP fellows as role models. The project will generate and share knowledge of elementary students’ selection of role models, increase understanding of the ways in which students identify and select engineering role models, and it will contribute to understanding how role models promote interest in engineering careers. The results of this study will inform best practices in engineering outreach, and help university outreach leaders develop more effective educational interventions for elementary students in the future.

In future semesters, I look forward to strengthening the curriculum development skills of our STOMP fellows, encouraging creativity in the classroom, and providing more opportunities for feedback and community-building within the program.

Your continued support is vital to the success of our program, and we appreciate all contributions!

Best,
Laura Fradin
STOMP Manager
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What is STOMP?

The Student Teacher Outreach Mentorship Program (STOMP) is a program within Tufts Center for Engineering Education and Outreach (CEEo) that trains Tufts University students (STOMP fellows) to teach in K-12 classrooms of the greater Boston area. The mission of STOMP is to improve K-12 education through engineering with a strong partnership between educators and university students. Through this classroom collaboration, K-12 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 three-year gift from the LLL Foundation. 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 STOMP 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 STOMP 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 STOMP fellow become familiar with working in a classroom setting and integrating engineering across disciplines taught in the classroom.

How Does STOMP Work?

STOMP fellows are paired based on experience, with new STOMP fellows matched up with more experienced ones. Together, STOMP fellows work with a classroom teacher at a local school to create a ten-week curriculum, implemented in once-a-week, hour-long visits to the classroom. STOMP fellows are trained in working in a classroom and implementing engineering design-based lessons by their more experienced partner and through weekly meetings with the entire program. 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.

Residency Program

Students who are a good fit for STOMP, but may not have teaching experience are invited to STOMP Residency. In this program, residents assist with workshops at Tufts CEEO. They work alongside experienced teachers, observing the implementation of STEM curricula, and are given the opportunity to teach their own lessons.
Who We Are

STOMP Management

Merredith Portsmore  
Director of CEEO

Elissa Milto  
Director of Outreach

Laura Fradin  
Education Specialist

STOMP Executive Board

Daisy Draper  
Caitlin Duffy  
Shannon Geary  
Thomas George  
Elizabeth Moison  
Rati Srinivasan  
Eva Philips

Spring 2018 STOMP Fellows

Class of 2018: Daisy Draper, Caitlin Duffy, Liren Fu, Eva Philips, Rati Srinivasan, Jordan Tate Thomas

Class of 2019: Alex Kelin, Annie Geheran, Avni Rajpal, Camille Carlisle, Caroline Passalacqua, Clara Oppenheimer, Elise Gan, Kevin Dunn, Lauren Phan, Shannon Geary, Tessa Garces, Tommy George, Nikita Rao


Class of 2021: Abby Wilson, Athokshay Ashok, Ayani Ramachanran, Chris Hoerner, Claire Tierney, Emma Stevens, Isabel Freedman, Ketia Melsky, Lawson Mathew, Max Ratelle, Maya Kurzman, Jared Jaramillo, Libby Albanese, Monique Dubois, Paras Panaik, Reina Ashizawa, Robert Hoover, Ryan Weinstein, Sejal Dua, Sydney Pearce
Who We Are

Executive Board Positions

Publicity

Elizabeth Moison
This year on the STOMP Executive Board, I was partnered with Shannon doing publicity. This meant going to any events that Tufts or the surrounding community was putting on and representing STOMP, recruiting STOMP fellows to staff these events, and in the fall, recruiting new undergraduates to apply to STOMP. Some of the events that I went to included LCS’s Kids’ Day, Tufts Community Day, and the Reverse Career Fair. Part of my role in the Executive Board also included being a squad leader and trying to plan bonding events and sorting parties for my squad and the larger STOMP community.

Shannon Geary
As a STOMP publicity coordinator, I am in charge of fall recruitment and spring advertisement of STOMP to incoming students. I am responsible for organizing volunteers and resources for outreach events at local schools and on campus at Tufts CEEO throughout the year, as well as working with Tufts CEEO to publicize the STOMP organization in the community.

Residency

Eva Phillips
As a member of the STOMP Executive Board, I am the STOMP Residency liaison. This means I am in charge of overseeing and organizing the STOMP Residency fellows exposure to the STOMP fellow Program. I also monitor the transition of individuals from the Residency Program to STOMP.

Rati Srinivasan
The STOMP Residency Program logistics coordinator works as part of the Residency Trio to guide the ten students selected for the Residency Program. This position involves sending out bi-weekly update emails, helping to coordinate student schedules for workshops, and serving as the squad leader for the residents.
Who We are

Website Management

Camille Mbayo
As webmaster, I am in charge of cleaning up and merging the different websites. I am also responsible for updating the list of curricula, STOMP fellows, and the resources. I am also in charge of making sure that the information on the website is up to date.

Social Chair

Daisy Draper
As social chair, I worked to foster a sense of community amongst STOMP fellows. This year, we implemented a more regular bonding time into STOMP meetings. Each meeting started with an icebreaker activity that allowed STOMP fellows to learn more about their peers. I also organized sorting parties.

Logistics

Caitlin Duffy
My main responsibility each week is finding subs for STOMP fellows who have to miss their STOMP classes. When the STOMP fellows’ weekly Tufts schedule is available, I narrow down the list of people who are free to sub during a certain time period and email this smaller group instead of STOMP as a whole. Other responsibilities whose time commitments vary from week to week include planning out Wednesday meetings, updating the STOMP calendar, and collecting photo release forms. Other odd jobs relating to logistics are assigned throughout the semester, and Tommy and I tackle those as they come along.

Tommy George
As one of STOMP’s two logistics coordinators, my main responsibilities are related to the STOMP closet in Tufts CEEE. All kits used in STOMP classrooms, such as LEGO robotics, Snap and Squishy Circuits, laptops, and Makey Makeys, are reserved through me, and I make sure that the kits are returned in time for other STOMP fellows to use them. I also send informational emails to the STOMP elist, updating STOMP fellows on Wednesday meetings, volunteer opportunities, logistical changes, and upcoming deliverable deadlines.
Who We Are

STOMP Statistics

The scheduling system implemented last year in an effort to extend outreach without increasing salary costs continued to be sustainable and was scaled further this past year. Including all the STOMP fellows, fifty-six taught in forty-three classrooms in the Boston area, impacting over 850 students!

The general makeup of the STOMP fellows exceeded a two to one ratio of females to males, an unusual ratio in a group comprised of mostly engineering students. Of the forty female STOMP fellows, twenty-three are engineering students, making up over 70 percent of the engineering student STOMP fellows. This is a greater percentage that the total female population in the School of Engineering. The thirty-one engineering students in STOMP make up 56 percent of the program. Additionally, 65 percent of our STOMP fellows are in the freshman and sophomore classes, indicating a promising future. All thirty-six have contributed greatly to the program and are eager to take on more responsibilities.

<table>
<thead>
<tr>
<th>STOMP Fellow Class Distribution</th>
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<tbody>
<tr>
<td>Number of Freshmen</td>
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<td>Number of Sophomores</td>
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<td>Number of Juniors</td>
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<td>Number of Seniors</td>
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<tr>
<th>STOMP Fellow Gender Distribution</th>
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<tbody>
<tr>
<td>Number of Female Fellows</td>
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<td>Number of Male Fellows</td>
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<tr>
<th>STOMP Fellow School Distribution</th>
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<tbody>
<tr>
<td>Number of Fellows in Arts and Sciences</td>
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<tr>
<td>Number of Fellows in Engineering</td>
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<tr>
<td>Number of Fellows Undecided</td>
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</tbody>
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The Impact of STOMP

![Graph showing the Impact of STOMP](image-url)
## Meeting Schedule Fall 2017

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>9/20</td>
<td>At our first returning STOMP fellow meeting, we discussed the impact of STOMP on the community, students, and our STOMP fellows. Doctoral student Karen Miel introduced her role models research topic.</td>
</tr>
<tr>
<td>9/27</td>
<td>After hiring 23(!) new STOMP fellows and 6 residents, we met for the first time as a full program. Students were introduced to STOMP management, Tufts CEEO and its projects, and their STOMP partners. Director of Outreach Elissa Milto introduced Novel Engineering Challenges for the book <em>Weslandia</em> for students to use in their first class.</td>
</tr>
<tr>
<td>10/1</td>
<td>STOMP fellows met from 8a.m. to 4p.m. for an all day training that covered STOMP logistics, teaching methodology, technology training, design challenges, and team building activities.</td>
</tr>
<tr>
<td>10/4</td>
<td>STOMP fellows met at Tufts CEEO for a tour of the space.</td>
</tr>
<tr>
<td>10/11</td>
<td>This STOMP meeting was a curriculum workshop. Returning STOMP fellows presented past curricula, and STOMPers met in squads to discuss how to plan a curriculum. STOMP residents had orientation.</td>
</tr>
<tr>
<td>10/18</td>
<td>Improv Meeting. STOMP fellows were presented with real-class situations and had to improvise solutions.</td>
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<tr>
<td>10/25</td>
<td>Director of Outreach, and former special needs instructor Elissa Milto discussed working with students with special needs.</td>
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<tr>
<td>11/1</td>
<td>STOMP welcomed guest speaker Mindy Nirenberg to provide some diversity sensitivity training.</td>
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<tr>
<td>11/8</td>
<td>I Don't Get It. STOMP fellows discussed the adaptive learning (and teaching) approach to working with students.</td>
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<tr>
<td>11/15</td>
<td>Knowledge Cafe. STOMP fellows provided feedback about the all aspects of STOMP.</td>
</tr>
<tr>
<td>11/29</td>
<td>STOMP Fellows were given time to update and polish their curriculum documents so they could be uploaded to the website.</td>
</tr>
<tr>
<td>12/6</td>
<td>STOMP fellows enjoyed a well-deserved pizza party and filled out the end-of-semester survey.</td>
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## Meeting Schedule Spring 2018

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>1/24</td>
<td>STOMP fellows started the semester with a friendly competition to show off their STOMP knowledge in Squad Color Wars.</td>
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<tr>
<td>1/31</td>
<td>STOMP fellows experimented with mini NXT kits, Snap Circuits, Makey Makey kits, and BlocksCAD at a Tech Training meeting.</td>
</tr>
<tr>
<td>2/7</td>
<td>Curriculum Development Speed Dating. STOMP fellows discussed their plans for the semester and how to build a cohesive unit for their students. The spring cohort of the Residency Program had orientation.</td>
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<tr>
<td>2/14</td>
<td>Ethan Danahy guest lectured about creativity and making in the classroom. The Residency Program participants met separately to discuss how to work with students and technology training.</td>
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<tr>
<td>2/21</td>
<td>With a February break workshop going on at Tufts CEEO, STOMP fellows led their own meeting with Petcha Kucha talks about their research at Tufts, experiences with STOMP and residency, and child development.</td>
</tr>
<tr>
<td>2/28</td>
<td>This meeting focused on classroom management, and Manager Laura addressed specific classroom management challenges, as well as discussed how to handle various situations.</td>
</tr>
<tr>
<td>3/7</td>
<td>Marina Seevak from The Beautiful Stuff Project discussed building and play in early childhood classrooms.</td>
</tr>
<tr>
<td>3/14</td>
<td>Kristen Wendell presented about her research and many projects in engineering education.</td>
</tr>
<tr>
<td>3/28</td>
<td>STOMP fellows split up into groups to learn more about special topics, including How to Be a STOMPer for Life, Bringing Your Lab Equipment and Engineering Classes into Your STOMP Classroom, and STOMPing as a Non-Engineer.</td>
</tr>
<tr>
<td>4/4</td>
<td>Doctoral student Karen Miel gave an update on STOMP research findings.</td>
</tr>
<tr>
<td>4/11</td>
<td>The STOMP residents led a meeting about workshops that had been happening at Tufts CEEO and had the opportunity to get feedback from the STOMP Fellows about their own lesson plans for upcoming workshop.</td>
</tr>
<tr>
<td>4/18</td>
<td>Tufts education professor Steve Cohen discussed education in Boston, including history on schools and desegregation.</td>
</tr>
<tr>
<td>4/25</td>
<td>STOMP fellows took time to polish their curriculum documents and fill out an end-of-semester feedback survey with some pizza!</td>
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</table>
### Highlighted Lesson

At the beginning of each semester, STOMP pairs plan a unique and engaging curriculum that aims to introduce students to new and exciting concepts in STEM fields while still being fun!

This curriculum, made by Libby Albanese and Elizabeth Moison for a fourth-grade classroom, is a great example of the goals and hands-on lesson planning style that is characteristic of STOMP.

The overarching theme of this unit is superheroes. This curriculum has two parts, one for each semester. First semester, students were tasked with designing the next great superhero. Second semester, their superhero was in action, saving people with the help of their engineering team. There are three components we wanted to reinforce: 1) Civic engagement and the concept of civic engineering, as most of the activities are tailored to the idea of helping people. 2) The engineering design process (EDP), a component we tried to incorporate into every building lesson, teaching the students to improve on each design and accept that engineering is never really done. 3) Group work, as each activity required a partner or a group; we wanted to teach them how to listen to and incorporate each others ideas.

<table>
<thead>
<tr>
<th>Lesson 1: Spaghetti Towers</th>
<th>Objective: The students will be introduced to the engineering design process by going through the steps of the EDP with the expectation that each group of two will complete each step at least once. They will also learn and explore elementary architectural concepts and learn which shapes are the strongest. Finally, they will be introduced to the idea that failure can be a good thing, and success isn’t necessarily completing the assignment.</th>
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</thead>
<tbody>
<tr>
<td>Activity: Spaghetti towers. Students in groups of two are tasked with building a free-standing tower to hide the lab in which they are to build their superhero. They will attempt to make their tower as tall as possible using spaghetti, tape, and the marshmallow that needs to be on top (representing their “lab”). They are given 20 minutes. At the end of class, a discussion of what went well versus what didn’t work will take place, emphasizing the successes in a tower that isn’t necessarily standing.</td>
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<thead>
<tr>
<th>Lesson 2: Flight</th>
<th>Objective: The students will have an understanding of forces as a push or a pull and understand that gravity is not “down,” but rather the pull of the Earth. They will also understand air resistance and how it acts on their parachute, as well as review the EDP.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity: The students’ superhero gets powers, including learning to fly! They are tasked with protecting their superhero while they learn to fly, by designing a parachute for their superhero. First, a brief lesson on forces, gravity, and air resistance teaches students what to consider when building their parachute. Students then use a variety of materials to create parachutes (coffee filters, string, cardboard, paper, etc.).</td>
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<tr>
<td>Lesson 3: Superheroes Dive Into Their First Assignment</td>
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<td>-----------------------------------------------------</td>
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<tr>
<td><strong>Objective:</strong> The students will learn about buoyancy. The EDP is also reviewed, with an emphasis on multiple iterations and testing different materials to see what floats, what sinks, and what is waterproof. Students additionally learn about the civic duty of scientists and engineers to help people and the planet.</td>
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<tr>
<td><strong>Activity:</strong> Their superhero is tasked with their first assignment in addition to gaining water powers. The students are tasked with building a boat to collect pollution and garbage that their superhero will collect from the bottom of the ocean. The students use a variety of materials to create their boats, including aluminum foil, Saran wrap, duct tape, masking tape, electrical tape, paper, cardboard, foam, and Popsicle sticks. There is a testing area set up by the sink, where students test their boats by putting them in the water and filling them with pennies until they sink. They are encouraged to improve and rebuild their boats after testing.</td>
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<thead>
<tr>
<th>Lesson 4: Insignias and BlocksCAD</th>
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<tbody>
<tr>
<td><strong>Objective:</strong> The students will learn how to use BlocksCAD, understand 3D space, and understand how negative numbers relate to this 3D space. They will also learn how to code 3D objects and begin to develop an understanding of how 3D printing works.</td>
</tr>
<tr>
<td><strong>Activity:</strong> This works best over two class periods. The students will design an insignia for their superhero, that will be raised off of a cylinder, so that the insignia looks similar to a large coin. First, students will sketch out their design. Then, using BlocksCAD, each student will individually translate their design from paper to digital space. This insignia will then be 3D printed. Group work is encouraged to best understand the different tricks of BlocksCAD.</td>
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<tr>
<th>Lesson 5: Human Robot</th>
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<tr>
<td><strong>Objective:</strong> Students will learn an introduction to coding by “coding” a person. They will learn that coding is just a string of very specific instructions.</td>
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<tr>
<td><strong>Activity:</strong> Their superhero has developed mind control powers! This can then be connected to coding. As a class, the students must mind control one of the STOMPers and help them make a sandwich. Students will call out instructions to the STOMPer (with the other facilitating), and they will take it literally. If the command is too vague, undefined words are used, or if there are too many commands at once, the STOMPer shuts down and won’t do the action, much like a computer giving errors.</td>
</tr>
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</table>
## Highlighted Lesson

<table>
<thead>
<tr>
<th>Lesson 6: Capture the Villain</th>
<th>Objective: The students will review all the forces learned throughout the semester, including gravity, air resistance, and the concept of buoyancy.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Activity: The students must stop a supervillain with their superhero by designing a trap. The trap cannot harm the villain and must be remotely operated. The fight takes place on an oil rig, so the students must be sure their traps will not destroy the oil rig and thus the environment. This also adds the challenge of being on the water. Using a variety of found objects, students will create traps.</td>
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<thead>
<tr>
<th>Lesson 7: Electricity and Electrical Engineering</th>
<th>Objective: Students will learn about electricity, current, electrons, and circuits by acting out how a circuit works with their bodies and by using play dough to model circuits with batteries. They will also learn about electrical engineering, a model engineer being Edith Clarke.</th>
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<tbody>
<tr>
<td></td>
<td>Activity: The students’ superhero gets the new superpower of controlling electricity, with a model superhero being Storm from X-Men. Students are tasked with helping their superhero learn about electricity and their powers. The class starts with a human circuit activity, where students act out how a circuit works. The class starts with passing little balls around as electrons, slowly adding things like a light bulb, a resistor, a switch, etc. The rest of the class is spent using Squishy Circuits to get an LED to light up. Students who finish early are introduced to parallel circuits or are challenged to get their light bulb to dim or get brighter.</td>
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<thead>
<tr>
<th>Lesson 8: Bridge Building and Civil Engineering</th>
<th>Objective: The students will learn about civil engineering, review the force of gravity, and learn the force tension by building bridges. They also learn about the civil engineer Howard P. Grant.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Activity: The students are introduced to a supervillain for their superhero to fight: CC (Climate Change). The villain introduces themselves by causing storms that knock down bridges. The students are tasked with rebuilding bridges that CC has destroyed. This is a two day project, with the first day spent planning and designing and the second day building and testing.</td>
</tr>
<tr>
<td>Lesson 9: Prosthetic Limbs and Biomedical Engineering</td>
<td>Objective: The students will learn biomedical engineering by designing and creating prosthetic limbs. Students will also understand human factors engineering by designing prosthetic limbs for a specific client. They are also introduced to a Tufts biomedical engineer, Qiaobing Xu.</td>
</tr>
<tr>
<td>Lesson 10: Silly Walks</td>
<td>Objective: The students will understand how to use the EV3 LEGO kits, how to code on the EV3 brick, and become familiar with the idea of mechanical engineering.</td>
</tr>
<tr>
<td>Lesson 11: EV3s and Mechanical Engineering</td>
<td>Objective: The students will understand mechanical engineering and building and coding EV3s bricks by creating robots using LEGO MINDSTORMS kits.</td>
</tr>
<tr>
<td>Lesson 12: Presenting Robots</td>
<td>Objective: The students will learn how to give a brief presentation of their robot, be respectful listeners, and be able to see all different approaches to the same problem.</td>
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Checking In with STOMP Alumni

Erynne Van Zee

Environmental Engineering, 2017

During the last STOMP class of my three-year tenure as a teaching fellow, I received a card from one of my students, “Thank you for opening my imagination!” along with a few others praising our baking soda and vinegar volcanic eruptions and soil painting endeavors. Fighting back tears, I packed the note in my boxes and moved across the country to Washington. I collaged the various notes from my STOMP class and hung them on my wall, wanting to keep the spirit of STOMP alive in my next steps as an educator for the Mt. Adams Institute’s Cascade Mountain School program.

As a STOMP fellow, I developed teaching practices founded in project-based learning. Teaching in elementary school classrooms across Boston—the Healey School, Josiah Quincy School, Acera School, and Vinson-Owen Elementary—I gained confidence in teaching students of many abilities and backgrounds. I learned crucial lessons in classroom management and curriculum development, and was encouraged to think outside the box as an educator. Teaching for STOMP expanded my sense of community far beyond the boundaries of the Tufts University campus as I connected with students and teachers around the area.

Through STOMP, I experienced how creativity and curiosity in—and out—of the classroom captivate the mind, allowing students (and educators) of any age to become better stewards of their communities by developing problem solving, teamwork, inquiry, and design skills. I now work for a non-profit in the Columbia River Gorge committed to connecting people to the natural world through education, service learning, career development, and research. I work as the summer program coordinator and a year-round STEM educator, strengthening existing partnerships and developing new programs to offer kinesthetic, place-based environmental science and STEM education opportunities in the Columbia Gorge. I bring the essence of STOMP forward with me in my work at the Mt. Adams Institute, drawing on activities, facilitation practices, and problem-based pedagogy I learned through STOMP.

Working alongside many dedicated educators and faculty at the Tufts University Center for Engineering Education and Outreach who share my passion for problem-based learning inspired me to pursue a career in STEM education. An environmental engineer by training, but an educator at heart, I’ve been lucky to find a job where I can continue to bring hands-on, creative educational experiences to my community, hopefully kindling the imaginations of our youngest generations.
Recruitment Success

Dining Halls

Recruitment strategies this year started about a week into the school year, including contacting directors of both Carmichael and Dewick Dining Halls in order to set up tabling events at peak meal times around noon to maximize program exposure. STOMP fellows tabled a total of six times over two weeks and captured the interest of soon-to-be diners with various educational technologies we utilize in the classroom. Those interested in applying are able to write down their email and receive further information and applications.

Activities Fair

The Student Activities Fair occurs a week or so into the school year and is highly attended by freshman students. At the activity fair, four STOMP fellows were present with information about Tufts CEEO, candy, and a notebook in order to collect email addresses where further information could be sent. The fall activity fair was well-attended, and most of our applicants for this year came from the list of student names acquired during the fair. Students had lots of questions about what being in STOMP entailed and what sort of skills STOMP was looking for in its applicants. Ideally, it would be nice to start a little earlier, and to have more of a presence during orientation week as incoming freshman begin searching out organizations they may want to join. In addition to the mentioned recruitment strategies, tabling during orientation week or posting flyers in highly travelled areas of campus would be a good way to ensure early knowledge about STOMP.

GIM

This year we had a General Interest Meeting (GIM) for STOMP. This gave prospective applicants a chance to get more information about STOMP than they could at a table. The GIM was successful, and many applicants had been to it. We are planning to have another next year, as this year’s was so successful!
Halloween on the Hill

This year, STOMP set up a table for the Leonard Carmichael Society (LCS)'s event, Halloween on the Hill. Each year, Tufts hosts hundreds of local children from Medford and Somerville for a day of costumes, trick-or-treating, fun, and games! In pairs, Tufts volunteers lead a group of five to ten kids around campus and the surrounding Tufts community to tables where kids complete events, make crafts, and have fun! Halloween on the Hill is one of LCS's biggest events during the year, and this year the STOMP table included a lot of fun activities.

Halloween on the Hill involved three 2-hour shifts of 2-3 volunteers each. For activities, candy pushers were brought; the kids were excited to get candy and even those who weren’t as interested in building a “candy pusher” had a lot of fun simply building with legos. The children who attended Halloween on the Hill were very young this year, and it may be a good idea to bring some play dough and do Squishy Circuits as well next year to have a wider variety of activities for kids of all ages and abilities!

Community Day

Community Day at Tufts is a fun day in September where the surrounding community is invited to Tufts to watch live performances, go to booths set up by community organizations from Medford and Somerville, learn about Tufts research and organizations, play “Kidditch” (Quidditch for kids), and many other fun activities! This past year, STOMP had a table at Community Day that featured candy pushers, a design challenge where kids had to build a device to push candy using LEGO EV3 Robotics kits. Any candy that the robot successfully captured, the kids got to keep! Kids loved the activity, and often there were kids who would stay at our table for half an hour or more, building plows and testing out new designs, or helping new kids who would come to our table. There were also other LEGO kits set aside for any younger kids who couldn’t use the EV3 robotics, or anyone (including parents) who just wanted to do some good old-fashioned building with LEGO kits.
Publicity

Kids’ Day

This spring, STOMP partnered with the Leonard Carmichael Society (LCS) for their Kids’ Day event, filled with fun and games for local children. As one of LCS’s oldest programs, Kids’ Day has been bringing kids from Medford, Somerville, and Boston to campus for over fifty years. Volunteers partner up and lead a group of five to ten children around campus to all sorts of activities. STOMP had a table at one of these activity fairs, and we had almost as much fun as the kids did!

Kids day is an event put on by the Leonard Carmichael Society (LCS), the umbrella organization at Tufts for community service. Every spring, LCS hosts children from all over the surrounding community to participate in a fun-filled day of activities, bounce-castles, and more! This year’s theme was dinosaurs, and STOMP volunteers sat at the coloring table, putting the ‘A’ for arts in STEAM. As children would come over, we would ask them about their day, how school was going, what they liked about science and engineering, and generally helped them have the best day they could.

These kinds of fun, student-oriented activities are a hallmark of STOMP, and LCS’s Kids’ Day provided the perfect opportunity for community outreach in this way. STOMP fellows are a part of the program because they love teaching and STEAM. Being able to participate in this activity was a great way to combine these passions with community outreach for a fun day that everyone enjoyed. We hope to continue this partnership with LCS next year, bringing some of our engineering projects!

Reverse Career Fair

A reverse career fair is when student organizations staff tables, and community networkers, employers, and organizations come to the students, instead of the other way around. This spring, Tufts University hosted a reverse career fair in the Science and Engineering Complex atrium. STOMP was one of the student organization represented, and we had a very busy table with LEGO robotics on display, a LEGO business card collector, and information about STOMP and Tufts CEEO displayed. Although most people did not know what STOMP was, once we explained, they were very interested. Many of the most enthusiastic employers were from teaching organizations, who were interested in STOMP for our focus on preparing Tufts undergraduates to teach not only engineering, but STEM in general. STOMPer’s hands-on teaching experience at an undergraduate level helps to make our undergraduates attractive to employers looking for fresh teachers after college.

Student-made rockets
Growth and Development

Greater Expectations for STOMP Fellows

Teaching in Back-to-Back Classrooms

The limiting factors for STOMP’s outreach have been money required to pay STOMP fellows and scheduling the STOMP car. With the good word of STOMP spreading through schools, we received many applications from within the same school. To maximize outreach, classrooms that were able to coordinate schedules with other teachers to arrange back-to-back class times were prioritized. This allowed us to reach as many classrooms in the same school as possible, sometimes even reaching all classrooms of the same grade within a single school. This scheduling model allows one STOMP pair to travel to the school and back once, but teach the same lesson twice. There is no extra travel time, no further curriculum development needed, and just one extra hour a week and a single STOMP pair’s outreach is doubled. This proved to be beneficial for more than just scaling outreach. STOMP fellows felt much more comfortable teaching the same lesson on their second run through, having learned lessons during the first class. STOMP pairs with one inexperienced STOMP fellow used this second class as a perfect practice opportunity to provide more experience to new hires scaffolded by the experienced STOMP fellow setting an example in the first class. While the coordination of back-to-back classroom requires some additional work, it is well worth the potential of doubling outreach without hiring a single extra STOMP fellow.

As a result of this new method, outreach has increased from thirty classrooms in fall 2015 to forty-three classrooms in spring 2018, while hiring seven fewer STOMP fellows (sixty-three in fall ‘15 to fifty-six in spring ‘18). This has taken our STOMP fellow to classroom ratio down from 2.1 to 1.3.

All Day Training

This past fall 2017, a Sunday was entirely devoted to training new STOMP fellows as well as those returning. The day began at 8 a.m. with some candy, goldfish, and introductions. STOMP Manager Laura Fradin went over logistics with new STOMP fellows as well as some introductions to teaching, common lessons, and curricula. When the returning STOMP fellows arrived, the difference between teaching engineering vs. other types of teaching was discussed, as well as the Center for Engineering Education and Outreach philosophy on teaching. Guest lecturer Ben Garton, a fourth-grade teacher from Arthur D. Healey, discussed the merits of STOMP from his own experience with STOMP fellows. Then, classroom management tactics were discussed before STOMP fellows broke for lunch. When the STOMP fellows came back, they got some technology training with NXT and EV3 LEGO kits, doing the classic challenge Silly Walks. Manager Laura gave a talk on age appropriate lessons, and the difference between teaching kindergarteners and middle schoolers. Finally, the STOMP fellows and Manager Laura debriefed before the STOMP fellows began to brainstorm ideas for their curriculum with their partners.
Growth and Development

Focus on Teaching

Review of Changes

During the 2017-2018 academic year, STOMP management began to focus on the teaching aspect of STOMP. The goal of increasing knowledge of teaching to create an environment of stronger teachers in addition to just engineers. To make this change, more time during weekly Wednesday meetings has been devoted to curriculum development, squad time, and learning about classroom management. Some meetings were spent allowing pairs of STOMP fellows to work on their curriculum documents and discuss ideas with other STOMP fellows. This was also encouraged in squads, where STOMP fellows could discuss different classroom experiences and how best to handle situations. Additionally, there were many guest lectures focusing on different aspects of teaching, from children with special needs to racial awareness in the classroom.

Technology Training

Throughout the year, some Wednesday meetings would be devoted to technology training, where STOMP fellows practiced using the different materials and resources that they can use in their classrooms. STOMP fellows had the option of practicing with Makey Makey kits, mini NXTs/EV3 LEGO kits, Snap Circuits, or BlocksCAD. By building these skills, STOMP fellows become more equipped to teach them in the classroom and use these newer technologies to have fun with students. As a result of these tech training workshops, spring semester saw a significant spike in robotics lessons and curricula.
Residency

Residency Program Goals

Since its founding in 2001, STOMP has grown from five STOMP fellows in two classrooms to fifty-six STOMP fellows in forty-three classrooms. With the increase in popularity and success of the program, it has become more and more competitive to join the program. Only STOMP fellows with experience with children and/or teaching are invited to be STOMP fellows. However, this may disproportionately disadvantage minority populations in the STOMP hiring process. To combat this issue, the STOMP Residency Program was launched at the start of the fall 2016 semester with the goals of creating a more inclusive environment within the program, creating spaces for racial minorities within STOMP, and more closely matching the STOMP fellows to the demographics of the schools in which they teach. STOMP Residency gives students who do not have much teaching experience, but have a passion for STEM education, the opportunity to join the STOMP program. STOMP Residents work alongside workshop leaders at Tufts CEEO and STOMP fellows in the classroom to gain the necessary skills to be a STOMP fellow.

In its first year, STOMP residency hired ten residents per semester. In the 2017–2018 year, we decided to have a smaller cohort of residents per semester so that they may receive more individualized attention and feedback from the management staff.

The residents for the fall semester were Robert Hoover, Reina Ashizawa, Isabel Whittaker-Walker, Kristen Schretter, Paras Patnaik, and Lawson Mathew. All six of the residents were invited to join as STOMP fellows in the spring semester. Feedback from residents stated that they loved their first semesters in STOMP and felt that residency had prepared them for working with students and designing lessons!

The residents in the spring semester were Matthew Oh, Ethan Oliver, Aidan Shertz, Karina Aguilar, and Sophie Fox. All were invited to participate as STOMP fellows for the 2018–2019 academic year.

STOMP Residency Fellow Responsibilities

Students in the program have the opportunity to assist with workshops at Tufts CEEO. They work alongside experienced teachers, observing the implementation of STEM curricula, and even have the opportunity to teach their own lessons. STOMP Residency fellows work an average of five hours a week and get paid. These paid responsibilities include the following:

- Assist workshop leaders with K-8th grade workshops
- Register students, set-up and clean-up, work with small groups, etc.
- Work with other STOMP Residency fellows to develop and run a STEM workshop activity
- Observe a STOMP classroom
- Partner with a pair of STOMP fellows to prepare and teach a one-hour lesson in a classroom
- Attend Wednesday STOMP meetings
- Attend trainings
- Sorting Hours
- Attend Wednesday meetings from 12:00 to 1:00 p.m.
- Attend trainings
Growth and Development

Residency

Changes and Future Directions

Some residents expressed that they felt a slight disconnect between the Residency Program and the STOMP Program. In the spring semester, we piloted some changes to help combat this disconnection. These changes included:

STOMP residents being placed in regular STOMP squads during discussions. This served to introduce them to more people in the program.

The STOMP residents are required to go into a STOMP classroom twice, but they were offered the opportunity to return multiple times should they so choose. Many residents took advantage of this opportunity and returned to their classroom three or four times, fostering a better relationship with both the students and the STOMP fellows they were paired with!

STOMP residents were also offered the opportunity to act as substitutes or “extra hands” for classrooms that needed them.

The STOMP residents led their own Wednesday meeting about the workshops in which they had been helping. They also presented their lesson ideas to the group, and received feedback from the STOMP fellows. Many STOMP fellows reported this “curriculum workshopping” as their favorite Wednesday meeting, and the residents found the feedback incredibly useful as they continued to plan for leading their own lesson!

In future semesters, we plan to further integrate the residents into STOMP.

Residents lead their first lesson on unplugged coding
Role Models in Engineering Education

The Center for Engineering Education and Outreach offers STOMP engineering education outreach to deepen interest in and understanding of engineering and to increase and broaden participation in engineering. In STOMP, pairs of Tufts undergraduate students collaborate with local classroom teachers to offer hands-on engineering design challenges to elementary students.

Many people consider the undergraduate STOMP fellows to be potential engineering role models for the elementary students who participate in STOMP. However, little research has been done on how elementary students select role models and how interactions between young students and university students influence role model selection. In August 2017, we received a three-year National Science Foundation grant (DRL-1657519) to study role model development in STOMP. The Role Models in Elementary Engineering Education study aims to:

1. Understand the mechanisms that support or thwart elementary students in taking up engineering outreach providers as role models,
2. Understand the impact of that role model connection on engineering career interest, and
3. Develop resources for other university-based engineering outreach programs to support classroom interactions which encourage elementary students to consider the undergraduate outreach ambassadors as role models.

Study Year 1: Gathering Information

Tufts University and Indiana University are collaborating on this project. In this first year of the study, we observed and video recorded eighty lessons in six classrooms and three schools. We interviewed and surveyed ninety fourth and fifth-grade students about their experiences in STOMP and impressions of engineering, and interviewed fourteen STOMP fellows about their experiences in STOMP. We tested new ways of connecting STOMP fellows and elementary students, such as creating STOMP fellow “trading cards” that showed photographs of and fast facts about STOMP fellows.

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Name: Finn  
Favorite Place: The top of any mountain!  
Super Powers: Quoting my favorite movies

siblings & Pets:  
I have a brother and twin sisters, two big dogs, and three cats.

something i am learning:  
I’m learning how the cells in our body replicate and heal themselves! So cool, right?!

favorite things to do:  
I love to play quidditch! Unfortunately we can’t fly yet, but we are working on it!

favorite Class: Chemistry  
Hardest Class: Chemistry, but I still love it!  
Favorite Part of Engineering: I love problem solving in a group and how everyone brings their own unique ideas to the table.
Initial Findings

Many elementary students connected with STOMP fellows and considered them to be kind, helpful, and knowledgeable. Several students identified the STOMP fellows as role models. For example, students said:

“They actually made you feel like an engineer.”

“Since [my STOMP fellow] did coding, she was an inspiration to learn more about coding.”

“[My STOMP fellows] are my role models. I want to be like them.”

We asked students to tell us about their role models and what they looked for in a role model. In general, students described their role models as people who worked in jobs they aspired toward and people who demonstrated traits such as kindness, integrity, and perseverance.

Looking Forward

In the coming year, we will continue to try to identify the types of interactions that are likely to lead to students selecting STOMP fellows as engineering role models. Ultimately, we plan to develop a toolkit to help other engineering outreach programs promote role model development.

Thank You

We are grateful to the schools, teachers, students, and STOMP fellows who participated in STOMP research this year and last year. You expanded understanding of how K-8 students learn engineering and how schools and universities can partner to support and advance the teaching and learning of engineering. The information we learned helped us make it to the final round in a National Science Foundation grant program. We expect to hear this summer if we have been awarded a grant to study how STOMP fellows could serve as role models who inspire elementary students to enjoy engineering and consider future engineering careers. Thank you for your invaluable work and support!
STOMP’s expenditures for fiscal year 2018 (July 1, 2017 through June 30, 2018) totaled $86,616.41. Expenditures decreased this year as STOMP cut costs of materials and travel, as well as employing a full-time STOMP manager (eliminating research expenses). Support comes from Crowdfunding as well as other gifts to STOMP.

### Revenue

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### Expenses

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<td><strong>Total Expenses:</strong></td>
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</tbody>
</table>

**Overall FY 2018 Expenses**

**Total: $86,616.41**
Fundraising

In fundraising results for fiscal year 2018, generous friends, community members, and alumni made gifts as well as contributed to the STOMP crowdfunding campaign, totalling $10,805. This support contributes to STOMP’s excellence, and is providing operating funds, seed funding for new initiatives, and funding to extend STOMP’s outreach in the community.

Join us by visiting Tufts University’s secure donation site at go.tufts.edu/STOMPdonate.

Overall FY 2018 Revenue
Total: $10,805

Other STOMP Gifts 52%
Crowdfunding 48%

Help us reach our fundraising goals!

go.tufts.edu/STOMPdonate
Financial Support

Crowdfunding

STOMP decided to begin a crowdfunding campaign at the start of the 2017–18 school year. This campaign was meant to increase financial support for STOMP fellows as the program continues to grow and stretch the limits of the resources available to us. Our goal was to raise at least $5,000, which would cover two STOMP classrooms for a year. By the end of the crowdfunding deadline, we had raised $5,170! STOMP fellows, Tufts CEEO staff, and friends of our program all worked together to pull from multiple resources and tap into our supportive community both within Tufts and beyond. The money is going toward supporting STOMP fellows in the classroom and paying for materials that we can bring in, like Squishy Circuits or new Makey Makey kits.

Thank you to all of our donors, and to everyone who has helped STOMP along the way. We could never do this program without your support.
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