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**exploring
bioengineering and
regenerative medicine**

CampBioE



*** STEM can be a fun and exciting field of learning with promising career opportunities**



mission statement

Since 2007, the University of Pittsburgh Department of Bioengineering has been addressing deficiencies in youth STEM education by offering CampBioE, an immersive summer camp that explores bioengineering and regenerative medicine. It is now the signature outreach program of the department and one of the most successful K-12 outreach initiatives at the University.

The goal of our program is to engage young minds in the wonders of science and bioengineering and the potential to benefit the human condition, while also showing them that STEM can be a fun and exciting field of learning with promising career opportunities. We seek to engage diverse groups of students, particularly those which are underrepresented in STEM fields. Relying on our nationally-ranked Department of Bioengineering and University of Pittsburgh Medical Center partnerships, our curriculum utilizes regenerative aspects of the natural world and current topics in bioengineering to explore how state-of-the-art research can be translated to human medicine and treatment. Our “near-peer” mentorship strategy integrates excellent undergraduate bioengineering students from Pitt’s Swanson School of Engineering as content creators and camp counselors.

We aim to provide middle and high school students who have burgeoning interests in science with an exceptional opportunity to explore our academic resources. Through hands-on experiences with new technologies, experimental strategies, and ethical considerations, we introduce them to the diverse fields of bioengineering and regenerative medicine.



PITT | **SWANSON**
ENGINEERING
B I O E N G I N E E R I N G



**the mini-camp
featured activities
that included
dissections, building
bones, and coding
space invaders**



2019 summary

CampBioE has moved! We are very excited to have completed the first year in our new home – the University of Pittsburgh’s Community Engagement Center (CEC) in Homewood. Homewood is a community with great pride and warm people; however, it also reflects the region’s economic inequality and has been an epicenter for major events that highlight continued racial tensions in Pittsburgh. The CEC is part of a 15-year effort by the University of Pittsburgh to join this community, empower its residents and form partnerships that complement and enhance existing organizations. As part of this effort, CampBioE helped to design the Homewood facility (located on N. Homewood Ave.), which includes computer and science laboratories. The center officially opened its doors in October 2018, allowing us to host all five weeks of camp there in summer 2019.

We want to thank all of the administrators and staff that made this move possible, and we especially want to thank our sponsors for providing the resources and support that allowed for a smooth transition. You can read more about this facility in subsequent sections of this report.

This year CampBioE served more than 89 campers, including 20 underrepresented minority students. The first week was once again an “unofficial week” in partnership with the Crossroads Foundation in Homewood. They provide the means for promising students to take advantage of educational opportunities that are generally not financially feasible for lower-income families. This partnership was once again a smashing success and was made more convenient for campers by moving to a facility that was specifically designed for science and technology education in the heart of Homewood.

The past summer also allowed CampBioE to establish new partnerships serving the Hill District, a community which in many ways shares the same strengths and challenges as those in

Homewood. While the University is in the process of building a CEC in that community as well, it is unlikely that we will be able to hold camps there until summer 2021. In the meantime, the Hill District CEC Director Kirk Holbrook created partnerships that enabled us to engage with 15 late elementary and early middle school youth from that community during a three-day engineering and technology camp. This mini-camp, jointly run by CampBioE and Pitt’s School of Computer and Information Sciences, featured activities that included dissections, building bones, and coding space invaders. The success of this new effort was highlighted by Pitt’s media (more details in subsequent sections of this report) and WTAE news.

This year we also saw a significant blossoming of our junior counselor program. To support our model of near-peer mentorship, our six undergraduate counselors were joined by 13 high school junior counselors in partnership with the City of Pittsburgh’s Learn and Earn Program – a summer youth employment program. We provided these junior counselors with employment experience and an opportunity to participate in education from the other side of the desk.

As we move forward to 2020, we are looking to make these types of engagements and opportunities more of our primary focus. The support of our sponsors in 2019 has once again allowed for free participation of 20 campers who could not otherwise afford to take advantage of such opportunities. Please help us by continuing your support so that we can achieve our goal of increasing diversity in STEM by igniting the passion in the youth of western PA regardless of their socioeconomic status.



FUN FACT

CampBioE (formerly the Tissue Engineering Summer Camp) was established in 2007



FUN FACT

CampBioE has provided 160 scholarships to students in need since its diversity initiative in 2015

statistical report summary

CampBioE served a total of 89 students in 2019. Students were given a survey on the first day of the camp (pretest) and on the fifth day of the camp (posttest), with responses requested on a scale of 1 (strongly disagree) to 6 (strongly agree). The full Statistical Report provides detailed information about the students' background information and their camp experience and changes in STEM attitudes after attending the camp. (To see the full Statistical Report, visit engineering.pitt.edu/CampBioE.)

Based on the results of the posttest survey, students from underserved and non-underserved schools had an equally positive experience at the camp. There were no significant differences in their responses to the camp experience-related items, except for one item (*I want to learn even more about bioengineering in the coming years*) – mean rating of 4.9 (non-underserved group) versus 4.4 (underserved group).

For changes in STEM attitudes among **all students** (non-underserved + underserved), mean ratings were positive and essentially the same for all items from the pretest to the

posttest, except for one item (*I know what career opportunities are available in STEM*) – here there was a change from 4.5 (pretest) to 4.7 (posttest).

The following noteworthy pretest to posttest changes in STEM attitudes were observed in the **underserved group**: *I like STEM classes more than other classes* (4.5 – 5.1), *A job in STEM is for someone like me* (4.3 – 4.8), and *I know what career opportunities are available for me in STEM* (4.1 – 4.6). Thus, there were more positive changes in STEM attitudes for the underserved group, indicating that CampBioE is achieving its goals.



*** CampBioE
served a total
of 89 students
in 2019**



our new space



The CEC in Homewood is part of *Neighborhood Commitments*, Pitt's effort to build stronger communities and a stronger University based on long-term place-based partnerships. In partnership with residents and stakeholders in communities like Homewood, the University is making long-term commitments of investment, infrastructure, programming, and staffing in Pittsburgh's neighborhoods.

The Homewood CEC is a vibrant, welcoming space that houses services and programs for community members and multi-use spaces designed to encourage collaboration.

For more information, visit cec.pitt.edu/Homewood.

STEM Camp Sparks Pittsburgh Kids' Curiosity

Amerigo Allegretto, 7/12/2019

When Ameena Bradford entered the University of Pittsburgh Center for Biotechnology and Bioengineering, she didn't know what went into the creation of a video game, but she was excited to see what was in store.

What the 12-year-old Pittsburgh public school student found was a reignited interest in science and technology, with the help of a classic arcade game.

Ameena and 14 other students from Pittsburgh's Hill District put their coding skills to the test to recreate the 1978 game Space Invaders this June, using a computer program provided by Pitt's Swanson School of Engineering and the School of Computing and Information. The coding exercise was part of a three-day STEM mini-camp hosted by Pitt's Hill District Community Engagement Center (CEC) as part of the larger Swanson School's annual CampBioE.

At the camp, students ages 8 to 12 were helped along their interstellar journey by Pitt bioengineering and computing experts, as well as volunteer undergraduate students from bioengineering and biology.

Using graphics created prior to the event, the students were able to input simple commands for the spaceship, alien

invaders and the lasers – represented by cats – used to defeat the aliens.

"Before, I liked science, but it kept getting harder and harder to learn. This made it kind of easier," Ameena said.

"This is more fun, because the teachers are nice and they help us to learn by making it more interesting," said Alyssa, 9, Ameena's younger sister.

"It's a lot of fun working with these kids," said Dmitriy Babichenko, professor of practice at the School of Computing and Information, who led the students in coding the game. "They start out being skeptical and then you can see the light bulbs coming on as they get excited to see that something works. It's fun to see that excitement develop."

The STEM camp comes at a transitional time for the students; some studies, such as one published in the Journal of Women and Minorities in Science and Engineering, have shown that students, particularly girls, begin to lose interest in the sciences upon entering middle school. Camp leaders say they hope STEM learning opportunities like this encourage students – especially those from underrepresented populations – to further pursue science and technology studies during their high school and

college years. This could lead to better employment opportunities, too: STEM jobs in computer analyst and development fields are projected to increase as much as 32% beginning in the 2020s, according to the U.S. Department of Education.

While CampBioE has been providing summer STEM activities for mostly middle school-age students for the past 10 years, this year was the first time it teamed up with the CEC and the School of Computing and Information.

Camp director Steven Abramowitch said even though this year's students were the youngest CampBioE has worked with, they were also some of the most passionate and easily engaged.

"They were interested and curious, so when we saw this opportunity to make the connection (with the CEC) for the summer, we knew this was something we wanted to do," said Abramowitch, who is also an associate professor of bioengineering at the Swanson School. "The game design for Space Invaders is simple, so we thought this was something easy for the students to grasp in terms of game design. We hope that events like these give students confidence to pursue their passions."

FUN FACT

2019 marked the first year CampBioE was hosted in the new University of Pittsburgh Community Engagement Center in Homewood



FUN FACT

15 students from the Hill District community participated in a mini-camp, created by the Hill District CEC and run jointly by CampBioE and Pitt's School of Computer and Information Sciences

June's mini-camp was the first of many upcoming collaborations between the Pitt Community Engagement Centers, the Swanson School and the School of Computing and Information. One of these includes creating a STEAM Studio as part of the CEC's permanent space at the New Granada Theater.

The camp's in-community and on-campus curriculum is also an example of how the Hill District Community Engagement Center seeks to build bridges between the University and the community for mutual benefit: Pitt faculty establish new partnerships, Pitt students learn from and with community members in a real-world setting and Hill District youth have the opportunity to explore STEM fields in an enriching and educational setting.

"We wanted to help bring youth from the Hill District in one of the most underserved sections, Bedford Dwellings, here on campus to continue exploring possibilities in STEM fields," said Kirk Holbrook, director of the Hill District CEC. "We hope to start planting the seeds of future realities for these children. With activities like coding a video game, they're fun, but also educational. They're intensive, but we saw engagement."

The CECs are part of Pitt's Neighborhood Commitments, which build stronger communities and a stronger University based on long-term place-based partnerships. In collaboration with local communities, the University is making a minimum 15-year commitment of investment, infrastructure, programming and dedicated staff in neighborhoods such as Homewood and the Hill District. The CECs aim to host events and offer services for community members related to youth education enrichment, employment, health and wellness, the cultural arts and small business growth and development, among other topics. The Hill District CEC is Pitt's second Community Engagement Center – the CEC in Homewood opened in October 2018.

This story was originally published in *Pittwire*.



camp activities



E.T.eeth

Campers learn about and deepen their appreciation for dental technology and its applications in their lives. They are further exposed to CAD and the engineering design process.

activities developed/implemented in 2019

For this year's theme, the campers were recruits for the Alien Forensics Investigators (AFI) division of the Men in Black. One of the senior counselors was kidnapped, and an alien has assumed their identity. The recruits were tasked with using information they collected from the modules they completed to figure out "Who is the alien?" so that we could rescue the counselor.



Operation Tibia

Campers were taught about prostheses and learned more about components and properties of lower leg prostheses.

The campers then experienced different phases of the design process, from product ideation, to prototyping, to finalizing/presenting/testing. The product in question was a lower leg prosthesis, which each group of campers built with common materials while operating under monetary and time-based constraints.

* other activities

Gassin' Up the Galaxy

Campers learned about gas exchange, molecular transport, the structure and function of the respiratory system, and the uses of ECMO and other ventilation devices in patient care.

Campers were able to build a lung-diaphragm model as well as a Clarke electrode to test oxygen concentration in blood!

Nebular Nametag

Campers learned a little bit about the beginning stages of the design process, such as sticky note ideation and prototyping. They got to make their own name tags without any technological limitations and got to pitch their ideas in front of the class.

Leadership



Sanjeev Shroff

Distinguished Professor and Gerald McGinnis Chair
Department of Bioengineering
Swanson School of Engineering
University of Pittsburgh



Steven Abramowitch

Associate Professor
Department of Bioengineering
Swanson School of Engineering
University of Pittsburgh
CampBioE Director



Juel L. Thomas-Smith

Interim Associate Dean of Academic Affairs
Professor of Natural Sciences
Community College of Allegheny County
CampBioE Co-Director/Education & Mentoring
Specialist



Mark Krotec

Biology Teacher
Central Catholic High School
CampBioE Master Educator



FUN FACT

For the second consecutive year, CampBioE hosted an additional 20 (majority URM) students during an extra week of camp in partnership with the Crossroads Foundation in Homewood



FUN FACT

More than 60 activities have been developed and taught by undergraduate senior counselors since 2008

senior counselors



Emma Chen, *Senior Counselor*,
Bioengineering

I am a rising senior at the University of Pittsburgh, majoring in bioengineering with a minor in chemistry. My concentration is medical product engineering, and I am currently involved in the Medical Devices Lab at the McGowan Institute for Regenerative Medicine. After graduation, I am hoping to attend medical school and work in the field of pediatric orthopedics. At Pitt, I am the Business Manager for Design Hub as well as a team mentor for a few design groups. I also just came back from study abroad in Beijing, studying traditional Chinese medicine and the healthcare system in China, as well as much sightseeing! Outside of school, I enjoy swimming, particularly synchronized swimming, making food with friends, exploring the city of Pittsburgh, watching Grey's Anatomy, as well as going down the shore (NJ-born and raised!).



Patricia Donehue, *Camp Manager*,
Biology

I am a rising senior biology major at the University of Pittsburgh. It is my fourth year with CampBioE and my second year as the camp manager. In my spare time, I like to read, hang out with family and friends, and watch movies. In the future, I want to go to graduate school for science education.



Dana Kelly, *Senior Counselor*,
Bioengineering/Pre-dental

I am a bioengineering major in a pre-dental track with a certificate in innovation and design at the University of Pittsburgh. I come from a suburb just south of Chicago and my hobbies include knitting, needlepoint, and all things crafty. I am a lover of SNL, dance parties, the Beach Boys, old sitcoms, and cheesecake. Making, creating, and teaching are lifelong habits of mine, and I love using them to turn the world into a better, happier, more comfortable place.

counselors

camp activities



* other activities

Alien Aquarium

Campers were introduced to pitching and its importance in the technological industry.

They were able to practice presentation skills by pitching their favorite activity or module, weighing the costs and benefits of the activity, and introducing future ideas for the activity to improve the activity. They were given five minutes to present in front of parents and staff during the closing ceremony.



Mad about CAD

Campers learn the basics of an introductory CAD software, Tinkercad. They also learn entry-level knowledge of 3D printing and got to take home a 3D-printed keychain!

camp activities



* other activities

Illuminate Eye

Campers were exposed to the ideas of circuit building, hermetic encapsulation (creating an airtight enclosure for circuits that enter the body), and visual prosthesis. They then were able to perform “surgery” on a brain to implant their encapsulated devices. They were judged on whether their “eyes,” which were LEDs, lit up signifying their circuit was correctly connected and successfully encapsulated.



Space Suckers

Campers were introduced to how vacuum technology is used in different facets of the medical device industry, such as surgery and wound healing, to greatly improve patient outcome.

Moreover, they got to build their own 3D-printed mini vacuum device and learned about the relevant circuitry. They also played a game to test their vacuum extraction surgery skills using a USB camera scope!

senior counselors *continued*



Oreoluwa Odeniyi, *Senior Counselor*,
Bioengineering

I am a rising junior studying bioengineering at the University of Pittsburgh. I am specializing in biomechanics and pre-med. My plan post-graduation is medical school in hopes of going into orthopedic surgery or becoming an OB/GYN. In my free time, I love to play soccer, sleep, and compose music – I sing and play the piano and cello.



Samil Paul, *Senior Counselor*,
Bioengineering

I am a rising junior studying bioengineering (focusing in medical product engineering) at Pitt. Once I graduate, I want to work in industry and help push out biotech that everyone can benefit from and afford. Outside of school, I am the Public Relations Chair for Engineers Without Borders, so I get to manage our digital media and work on social initiatives. My hobbies are playing volleyball, basketball, and video games, and watching TV shows and movies.



Grace Varughese, *Senior Counselor*,
Bioengineering

I am a rising senior bioengineering student on the medical product engineering track with a minor in industrial engineering at Pitt. I was born and brought up in Philly. In my free time, I love to try different kinds of foods, spend quality time with friends, and binge on Netflix! I am also very passionate about dance, and am trained in styles such as hip hop, jazz, Bollywood fusion, and Indian classical dance. In the future, I aspire to develop surgical devices, which better aid surgeons during procedures, reduce patient recovery time, and post-surgical complications. I view both engineering and dance as creative processes, which expand the mind to think unconventionally, and that's why I love them both!



FUN FACT

Through the City of Pittsburgh's Learn and Earn Program, CampBioE recruited a total of 13 junior counselors to assist the camp's 6 senior counselors



junior counselor program

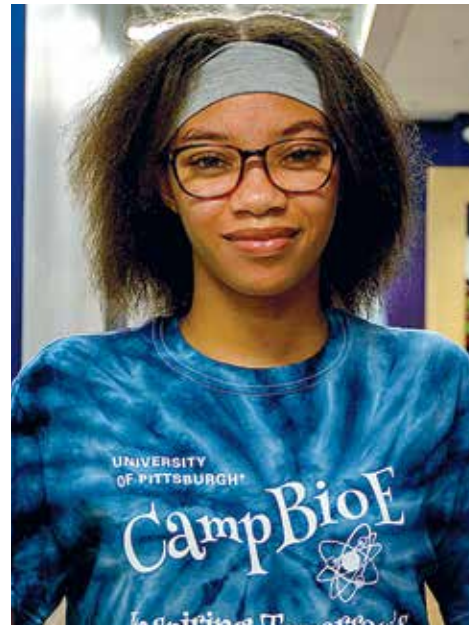
CampBioE's Junior Counselors participate in the Learn & Earn Summer Youth Employment Program, a six-week summer employment program for teens and young adults ages 14-21 in the Pittsburgh region. The program allows students to gain valuable work experience with the aim of developing skills that will help them succeed in their academic life and future careers.

Trasean Bates	Rashan Thomas	Crystal Bass	Daral Hayes
Shamar Bowles	Jah'Liyah Smith	Mia Addison	Lundyn White
Amari Turner Ford	Ashanti Anderson	Makayla Wilson	Imani Lee
Donte Reith			



Imani, *Junior Counselor*

"This has been a great learning experience, and I think it will help my future career because the leaders are guiding me in the right direction. Getting advice from the senior counselors and watching them manage the camp has been helpful for me."



Ashanti, *Junior Counselor*

"When I go to college, I want to do some sort of social work. Though CampBioE isn't directly connected to social work, it has given me the experience of working with students of different ethnicities and cultures and allowed me to learn how to connect with them."



parent feedback

"My son said it was an incredible experience and returned home every day to tell me about the new things he learned. He exercised his brain and broadened his scope of understanding more in this week than I have in quite some time."

"She loved the exposure to the professors and their firsthand knowledge, learning new research, lab experience, and participating in the final presentation."

"My son liked all the topics and can't stop talking about the projects he did. After the camp, he is more sure that he wants to go into biomedical engineering."

"My son loved all of the aspects of the camp. He particularly enjoyed his role as a 'Forensic Detective.'"

"I just want to know when the next camp enrollment is so I can register my current 6th grader and my 9th grader."

"The camp was good, and I hope you do it again with different things to study so when my son comes, he will be just as excited as he was with the first."

"The entire team did a wonderful job keeping the children engaged."

camper feedback

"I really like biology and seeing how life works and how different systems in our body all work together. There was one activity at CampBioE where we had different DNA samples that we put in a machine, and it tells you whose DNA matches the sample. That was really cool!" – Alexis, camper

"I came back for a second year because I just thought CampBioE was really fun so I brought some more friends this year." – Karina, camper



**for more information
about CampBioE, visit
engineering.pitt.edu/CampBioE**



we would like to thank the following sponsors

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**University of
Pittsburgh**

Swanson School of Engineering
Department of Bioengineering
302 Benedum Hall
3700 O'Hara Street
Pittsburgh, PA 15261

engineering.pitt.edu