Biomedical Engineering

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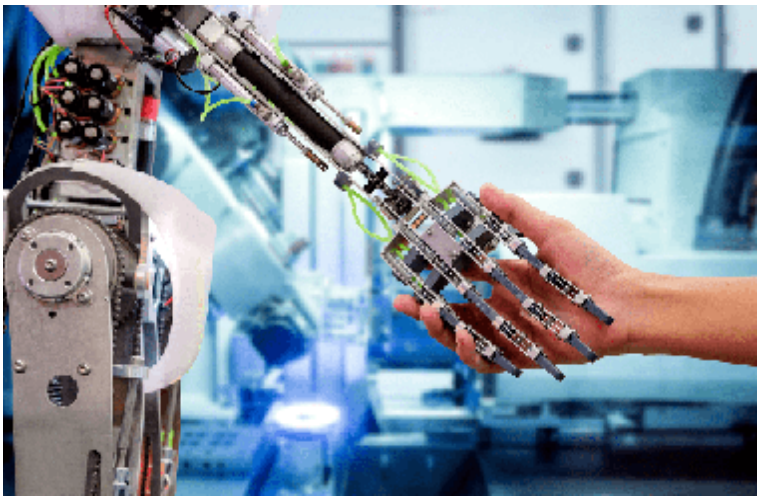
Engineering thrives on the basic need for a solution to any problem. Our generation will inherit the study of engineering as it has evolved over the decades and begin our journey into tackling the unsolved or unknown. Our curious human minds' inability to grasp the mystery behind the existence of forces, matter, life, and the universe itself sparked the beginnings of every field in science. Engineering applies the knowledge we gain every day to advance the scope of our existence.



A Biomedical engineering career has the potential to save many lives with innovation in medical technology. This fast-growing engineering field will revolutionize how the various studies in science and math can interlink beyond the natural world and develop a unique relationship between technology and the applications of medicine.

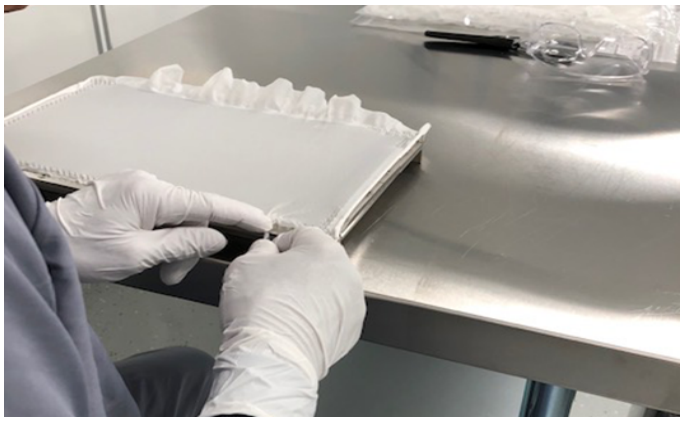
John G. Webster, a professor at the University of Wisconsin-Madison, along with Ramón Pallás-Areny, professor at the Technical University of Catalonia, are the authors of an extensive professional guide for the Biomedical Engineering design process. Their report covers every aspect of the design process, including collecting and presenting data, the legality process, various methods of production, and validation of a design. UC Berkeley's bioengineering web page provides online resources for students interested in innovation in Bioengineering, including a virtual course in design thinking and comprehensive insights into the field of bioengineering in the healthcare industry. These resources aided our quest to understand the design process of a

biomedical engineer.

Biomedical engineers apply biological and physical principles to solving medical problems concerning human health and providing healthcare. They begin by defining a problem in the healthcare industry based on the user's needs. From advancing medical equipment to perfecting prosthetics, Biomedical engineers never lose the desire to innovate. Their extensive research process includes communicating with patients, consulting with associates and doctors, and developing a thorough understanding of the specifications and restrictions of the product.

"For the NIH-funded UCI study, control software used in this robotic exoskeleton will be adapted for a compact, portable device to help stroke patients with at-home hand exercises" (Anna Lynn Spitzer).

Before a biomedical engineer can complete a conceptual design, ethical boundaries, environmental impacts, chemical stability, overall safety, societal costs, legal constraints, and hundreds more aspects of the required product must be considered. Similarly, in VEX, we are given several elements of a game design and robot constraints, leaving it up to us to develop a game strategy, establish the capabilities needed in our robot, design and build that robot, and constantly evaluate and improve our strategy and design. We create several designs, analyze the ideal efficiencies, and identify potential design flaws. Our team is restricted to the available vex parts that we can afford; however, biomedical engineers have to understand and select from the vast amount of materials in the world.



Biomedical Engineering led to the Biomedical Textile Industry.

While we may not be looking to sell our product, we still need to perform cost-benefit analyses before setting aside the time to assemble major aspects of the design. Biomedical engineers must analyze every decision, from which type of material is used to the amount of risk the patient is willing to take. They learn from their experiences and patient feedback to improve their product and various communication skills.

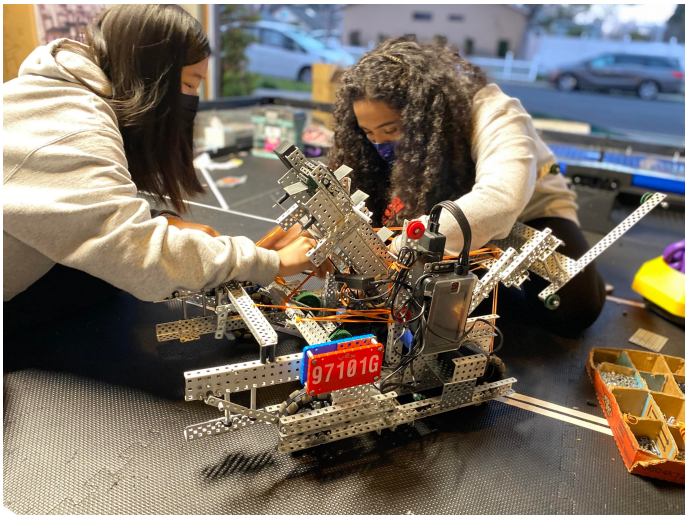
"Louis Washington, Alvin Yabut, Jay Damasco and Ed Saavedra swapping out the battery on a ventilator and repairing IV pumps" (Rady Children's Hospital).

Because biomedical engineering combines the health care and technological settings, professionalism comes with establishing a clear flow of information between engineers, doctors, patients, sponsors, managers, and marketers. In a robotics team, we must learn to maintain a

similar flow of communication amongst each other and with competition coordinators to learn as much as possible from every meeting and competition. Just as Biomedical engineers reevaluate their designs and advance technology, we take what we learn every day in order to always make the following design better than the last.

"Internal medicine residents collaborate with biomedical engineering students on Georgia Tech/Emory Biomedical Engineering (BME) Senior Capstone projects" (Emory Department of Medicine).

Vex robotics not only provides us with experience in the design process but exposes us to a constantly evolving world in need of newer innovations. Biomedical Engineers spend their career solving problems and designing improvements to the standards in medical care. Similarly, every season we are faced with a unique game and altered restrictions on our robot's design. Learning becomes a state of mind in order to turn the problems of today into the solutions of tomorrow. We learn to not limit ourselves to what we have achieved in the past, to be prepared to step into the unknown, and to tackle engineering, one problem at a time.

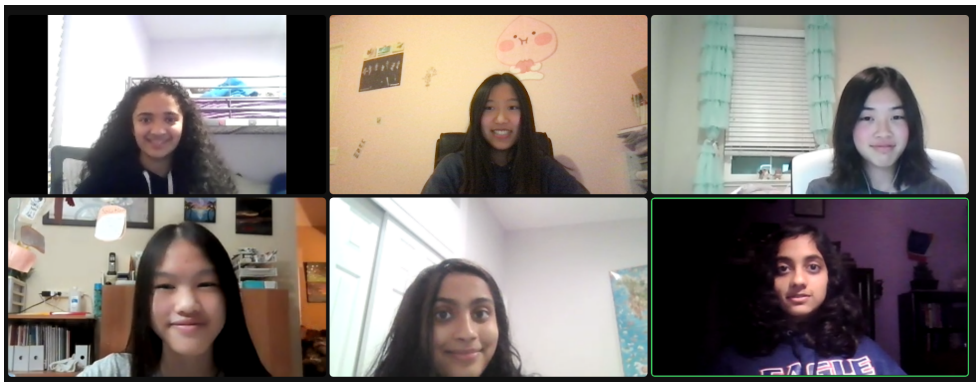


Nivedita Kamath and Carolin Pan fixing the robot.

During the pandemic, we were forced to limit the in-person designing and prototyping sessions we organized as a team. These last two years have taught us that with advances in virtual technology, we should never let this become an interference to our team's success. Every year, we see senior team members step away to begin their careers and leave the way for younger girls to advance their journey into STEM, girls who we would only meet during Zoom meetings. This has taught us that regardless of the circumstances, with determined individuals, a clear flow of communication, and good time management skills, our team will never falter. VEX reminds us that we are not just passionate about engineering; we also want to share this passion and lead the way for future generations of girls to unlock the mysteries which sparked the beginning of engineering.

Our Vex Team: Nivedita Kamath, Carolin Pan, Tiffany Chen,

Justine Chu, Sanjana Mohan, Meryl Mathew, Kunjal Purohit



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